

Project Manual



Tooele UT Deseret Peak Sr Seminary

Approximately 2234 North Berra Boulevard
Tooele, Utah 84074

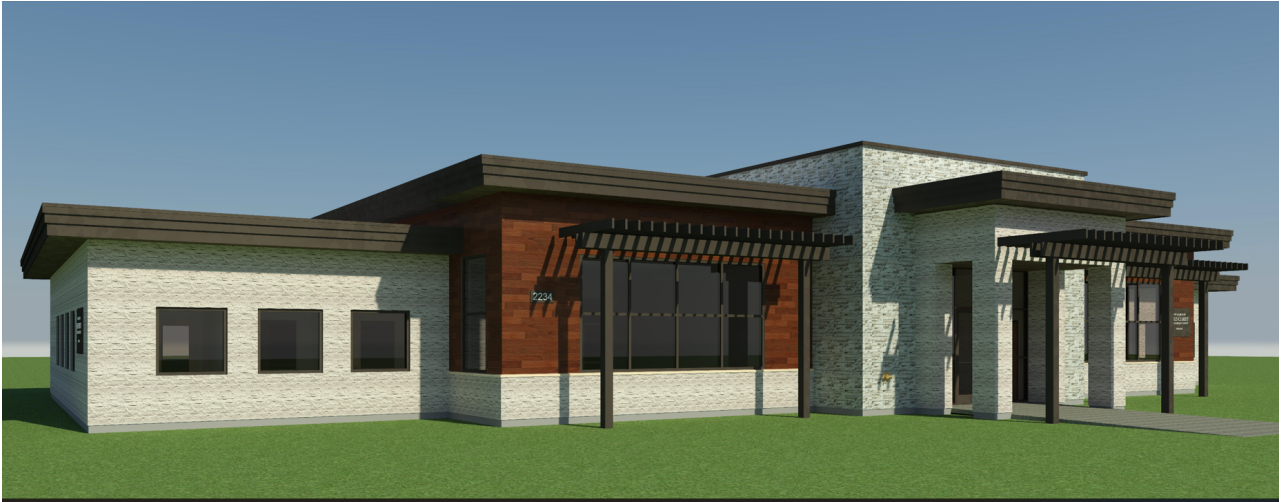
THE CHURCH OF
JESUS CHRIST
OF LATTER-DAY SAINTS

Property Number: 501-3450-21010101

Plan Series: Custom 5 CR

Parcel: 02-143-0-0115

BHD Number: 2326



Project Team

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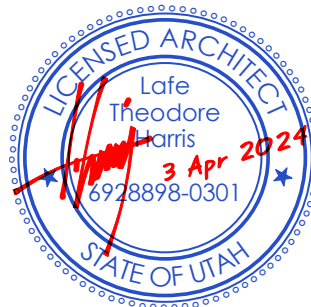
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Project Manual Revisions

3 Apr 2024 Bid Documents



3 Apr 2024

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BIDDING REQUIREMENTS

FIXED SUM PROJECT (U.S.)

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INVITATION TO BID (U.S.)

1. GENERAL CONTRACTORS INVITED TO BID THE PROJECT:

BC Builders
Saunders Construction Inc
Stallings Construction Inc
Stone River Construction
Warner & Associates Construction

2. PROJECT:

Tooele UT Deseret Peak Sr Seminary

3. LOCATION:

2234 North Berra Boulevard, Tooele, Utah

4. OWNER:

The Church of Jesus Christ of Latter-day Saints, a Utah corporation sole
c/o
Ryan Haughton
US & Canda New Space
50 East North Temple, COB 12th Floor
Salt Lake City, UT 84150

5. CONSULTANT:

BHD Architects, Mike Davey, mike@bhdarchitects.com, 801-631-9722

6. DESCRIPTION OF PROJECT:

- A. Custom 5 Classroom Seminary and associated site work.
- B. Products or systems may be provided through relationships the Owner has negotiated with suppliers as indicated in the Specifications.

7. TYPE OF BID: Bids will be on a lump-sum basis. Segregated bids will not be accepted.

8. TIME OF SUBSTANTIAL COMPLETION: The time limit for substantial completion of this work will be 270 calendar days and will be as noted in the Agreement.

9. BID OPENING: Bids will be received in ConsLog by 24 Apr 2024 at 2:00 pm. Bids will be publicly opened in ConsLog on 24 Apr 2024 at 2:00 pm.

10. BIDDING DOCUMENTS:

- A. Bidding Documents may be examined at the following plan room locations:
 - 1) Dodge Data Analytics, 859-885-1091 (office), 417-683-6560 (mobile), 801-606-7722 (fax), kim.mccallon@construction.com
 - 2) Builders Exchange Plan Rooms, Frank Hawbolt, 844-384-5379 (office), 775-762-3369 (mobile), info@utahplanroom.com

- B. Bidding Documents may be obtained from the Architect.
 - C. Bidding Documents may be obtained from Owner's electronic bidding tool.
11. **BID BOND:** If required, bid security in the amount of 5 percent (5%) of the bid will accompany each bid in accordance with the Instruction to Bidders.
 12. **BIDDER'S QUALIFICATIONS:** Bidding by the General Contractors will be by invitation only.
 13. **OWNER'S RIGHT TO REJECT BIDS:** The Owner reserves the right to reject any or all bids and to waive any irregularity therein.

END OF DOCUMENT

INSTRUCTIONS TO BIDDERS (U.S.)

1. DEFINITIONS:

- A. The definitions set forth in Section 1 of the General Conditions are applicable to the documents included under Bidding Requirements.
- B. Bidding Documents include the Bidding Requirements and the proposed Contract Documents. The proposed Contract Documents consist of the documents identified as Contract Documents in the Form of Agreement, except for Modifications. The Bidding Requirements are those documents identified as such in the proposed Project Manual.
- C. Addenda are written, or graphic documents issued by the Architect prior to execution of the Contract which modify or interpret the Bidding Documents. They become part of the Contract Documents as noted in the Form of Agreement upon execution of the Contract.

2. BIDDER'S REPRESENTATIONS:

- A. By submitting a bid, the bidder represents that
 - 1) Bidder has carefully studied and compared the Bidding Documents with each other. Bidder understands the Bidding Documents and the bid is fully in accordance with the requirements of those documents,
 - 2) Bidder has thoroughly examined the site and any building located thereon, has become familiar with local conditions which might directly or indirectly affect the contract work, and has correlated its personal observations with the requirements of the proposed Contract Documents, and
 - 3) Bid is based on the materials, equipment, and systems required by the Bidding Documents without exception.

3. BIDDING DOCUMENTS:

- A. Copies
 - 1) Bidding Documents may be obtained as set forth in the Invitation to Bid.
 - 2) Partial sets of Bidding Documents will not be issued.
 - 3) Bidders will use complete sets of Bidding Documents in preparing bids and make certain that those submitting sub-bids to them have access to all portions of the documents that pertain to the work covered by sub-bid, including General Conditions, Supplementary Conditions, and Division 01. Bidder assumes full responsibility for errors or misinterpretations resulting from use of partial sets of Bidding Documents by itself or any sub-bidder.
- B. Interpretation or Correction of Bidding Documents
 - 1) Bidders will request interpretation or correction of any apparent errors, discrepancies, and omissions in the Bidding Documents.
 - 2) Corrections or changes to Bidding Documents will be made by written addenda.
- C. Substitutions and Equal Products
 - 1) Generally speaking, substitutions for specified products and systems, as defined in the Uniform Commercial Code, are not acceptable. However, equal products may be approved upon compliance with Contract Document requirements.
 - 2) The terms '*Acceptable Manufacturers*', '*Approved Manufacturers*', '*Suppliers*', '*Installers*' and '*VMR (Value Managed Relationship) Manufacturers / Suppliers / Installers*' are used throughout the Project Manual to differentiate among the options available to Contractor regarding specified products, manufacturers, and suppliers. See Section 016000 for options available regarding acceptance of equal products.

- 3) Base bid only on materials, equipment, systems, suppliers or performance qualities specified in the Bidding Documents.
- 4) Architect is only authorized to consider requests for approval of equal products to replace specified products in Sections where the heading '*Acceptable Manufacturers*' is used and statement, '*Equal as approved by Architect before bidding. See Section 016000*' or '*Equal as approved by Architect before installation. See Section 016000,*' appears. In Sections where the afore-mentioned statements do not appear and a different heading is used, Architect is authorized as Owner's representative to decline consideration of requests for approval of equal products. Approvals of equal products in such Sections must be made by Owner and will generally be for subsequent Projects.

D. Addenda - Addenda will be sent to bidders and to locations where Bidding Documents are on file no later than 2 business days prior to bid opening.

4. BIDDING PROCEDURES:

A. Form and Style of Bids

- 1) Use Owner's online bidding tool.
- 2) Fill in all blanks on online bidding tool. Signatures will be executed by representative of bidder duly authorized to make contracts.
- 3) Bids will bear no information other than that requested on bid form. Do not delete from or add to the information requested on the bid form.

B. Bid Security

- 1) If required, each bid will be accompanied by a bid bond naming Owner, as listed in the Agreement, as obligee. If Bidder refuses to enter into a Contract or fails to provide bonds and insurance required by the General Conditions, amount of bid security will be forfeited to Owner as liquidated damages, not as a penalty.
- 2) Bid bond will be issued by a surety company meeting requirements of the General Conditions for surety companies providing bonds and will be submitted on AIA Document A310, Bid Bond or AIA authorized equivalent provided by surety company. The attorney-in-fact who executes the bond on behalf of the surety will affix to the bond a certified and current copy of the power of attorney.
- 3) Owner may retain bid security of bidders to whom an award is being considered until -
 - a. Contract has been executed and bonds have been furnished,
 - b. Specified time has elapsed so bids may be withdrawn, or
 - c. All bids have been rejected.

C. Submission of Bids

- 1) Follow the instructions in the Owner's bidding tool when submitting your bid.
- 2) It is bidder's sole responsibility to see that its bid is received at specified time.
- 3) No oral, facsimile transmitted, telegraphic, or telephonic bids, modifications, or cancellations will be considered.

D. Modification or Withdrawal of Bid

- 1) Bidder guarantees there will be no revisions or withdrawal of bid amount for 45 days after bid opening.
- 2) Prior to bid opening, bidders may withdraw bid from Owner's bidding tool.

5. CONSIDERATION OF BIDS:

A. Opening of Bids - See Invitation to Bid.

B. Rejection of Bids - Owner reserves right to reject any or all bids and to waive any irregularity therein.

- C. Acceptance of Bid
 - 1) No bidder will consider itself under contract after opening and reading of bids until Agreement between Owner and Contractor is fully executed.
 - 2) Bidder's past performance, organization, subcontractor selection, equipment, and ability to perform and complete its contract in manner and within time specified, together with amount of bid, will be elements considered in award of contract.

6. POST-BID INFORMATION:

- A. The conditionally accepted bidder submitting a bid involving subcontractors will submit its list of proposed subcontractors within 24 hours after bid opening.

7. PERFORMANCE BOND AND PAYMENT BOND:

- A. Bond Requirements - Performance Bond and Labor and Material Payment bond may be required for this Project as specified in the General Conditions.
- B. Time of Delivery of Bonds - Bonds will be delivered to Owner with Agreement signed by bidder.

8. FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR:

- A. Agreement form will be "Agreement Between Owner and Contractor for a Fixed Sum (U.S.)", "General Conditions Fixed Sum (U.S.)" and "Supplementary Conditions Fixed Sum (U.S.)".

9. MISCELLANEOUS:

- A. Pre-Bid Conference
 - 1) A pre-bid conference will be held on ConsLog on 10 Apr 2024 at 10:00 am.
- B. Liquidated Damages - Conditions governing liquidated damages are specified in the General Conditions and in the Supplementary Conditions.
- D. Exemption from local taxes - See Supplementary Conditions.

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INFORMATION AVAILABLE TO BIDDERS (U.S.)

1. GEOTECHNICAL DATA

A. Geotechnical Report -

- 1) Owner has secured the services of a geotechnical engineer to aid in design of the Project. Following conditions apply -
 - a) A geotechnical report has been prepared by AGECE Applied GeoTech, referred to as the Geotechnical Engineer.
 - b) A copy of this report will be issued to each invited Contractor.
 - c) This report was obtained solely for use in design by Consultant and is not a part of the Contract Documents. It is not intended that Contractor rely on geotechnical engineer's report.
 - d) Reports are provided for Contractor's information but are not a warranty of subsurface conditions.
- 2) Prior to bidding, Contractor may make his own subsurface investigations to satisfy himself with site and subsurface conditions.

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SUBCONTRACTORS AND MAJOR MATERIALS SUPPLIERS LIST

Project Name: _____ Date: _____

Stake: _____ Project No: _____

General Contractor: _____

General Contractor is to provide the names of the following subcontractors and suppliers to the Owner’s Project Manager immediately following the bid opening:

VMR SUBCONTRACTORS

Roofing _____

Doors, Frames & Hardware _____

Storefronts _____

Other _____

Other _____

SUBCONTRACTORS AND SUPPLIERS

Grading / Site work _____

Site Utilities _____

Demolition _____

Paving _____

Termite Control _____

Site Concrete _____

Fencing _____

Irrigation System _____

Landscaping _____

Building Concrete _____

Masonry _____

Structural Steel _____

Framing _____

Trusses _____

Insulation _____

Aluminum Siding _____

Soffit / Fascia _____

Millwork _____

Drywall _____

Ceramic Tile _____

Acoustical Tile _____

Painting _____

Wall Coverings _____

Window Coverings _____

Fire Sprinklers _____

Plumbing _____

HVAC _____

Electrical _____

Controls _____

Sound / Satellite _____

EQUAL PRODUCT APPROVAL REQUEST FORM (U.S.)

Project Name: _____ Request Number: _____

TO: _____

FROM: _____

BID DATE: _____

A proposed product is not legally approved and cannot legally be included in a bid or used in the Work until it appears in an Addendum or other Contract Modification as defined in the General Conditions. See Instructions To Bidders Paragraph 3.C, General Conditions, and Section 016000.

PROPOSED EQUAL PRODUCT:

Specification Section: _____

Specified Products: _____

Proposed Product: _____

The Undersigned certifies:

1. Proposed equal product has been fully investigated and determined to be equal or superior in all respects to specified products.
2. Same warranty will be furnished for proposed equal product as for specified products.
3. Same maintenance service and source of replacement parts, as applicable, is available.
4. Proposed equal product will have no adverse effect on other trades and will not affect or delay progress schedule.
5. Proposed equal product does not affect dimensions and functional clearances.

ATTACHMENTS:

Include the following attachments -

1. Copy of the Project Manual Section where the proposed equal product would be specified, rewritten or red-lined to include any changes necessary to correctly specify the proposed equal product. Identify completely changes necessary to the original Project Manual Section.
2. Copies of details, elevations, cross-sections, and other elements of the Project Drawings redone as necessary to show changes necessary to accommodate proposed equal product. Identify completely the changes from the original Drawings.
3. Complete product literature and technical data, installation and maintenance instructions, test results, and other information required to show complete conformance with requirements of the Contract Documents.

SIGNED: _____

Printed Name _____

Company _____

Address _____

City, State, Zip Code _____

Telephone _____ Fax _____

REVIEW COMMENTS:

_____ Accepted. See Addenda Number _____.

_____ Submission not in compliance with instructions. Respond to attached comments and resubmit.

_____ Proposed equal product not acceptable. Use specified products.

_____ Not Reviewed. Submission received too late. Use specified products.

ADDITIONAL COMMENTS:

BY: _____ **DATE:** _____

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AGREEMENT BETWEEN OWNER AND CONTRACTOR FOR A FIXED SUM (U.S.)

The Church of Jesus Christ of Latter-day Saints, a Utah corporation sole ("Owner") and _____ ("Contractor") hereby enter into this *Agreement Between Owner and Contractor for a Fixed Sum (U.S.)* ("Agreement") and agree as follows:

1. **Property/Project.**

Property/Project Number:
Property Address ("Project Site"):
Project Type:
Project Name ("Project"):
Stake Name:

2. **Scope of the Work.** Contractor will furnish all labor, materials, equipment, construction, and services necessary to complete the Work in accordance with the Contract Documents.

3. **Contract Documents.**

- a. The Contract Documents consist of:
 - 1) This Agreement;
 - 2) The General Conditions for a Fixed Sum (U.S.), the Supplementary Conditions for a Fixed Sum (U.S.), and the Specifications (Divisions 01 through 49) contained in the Project Manual entitled _____, dated _____ and prepared by _____ ("Architect");
 - 3) The Drawings prepared by Architect entitled _____, sheet numbers _____, dated _____;
 - 4) Addendum No. _____ dated _____; and
 - 5) All Modifications to the Contract Documents.
- b. The Contract Documents are incorporated into this Agreement by reference as if fully set forth herein.
- c. The definitions set forth in the General Conditions for a Fixed Sum (U.S.) will apply to the Contract Documents.
- d. The Contract Documents contain the entire and integrated agreement between the parties hereto and supersede all prior negotiations, representations, or agreements, either written or oral.
- e. Modifications or other amendments to the Contract Documents must be in writing and as provided in the General Conditions for a Fixed Sum (U.S.).

4. **Time of Commencement and Substantial Completion.**

- a. Contractor will commence the Work on the date for commencement set forth in the Written Notice to proceed from Owner to Contractor.
- b. Contractor will achieve Substantial Completion and have the Work ready for Owner's inspection no later than _____ (_____) days from the date of commencement set forth in the Written Notice to proceed from Owner to Contractor, as adjusted in accordance with the Contract Documents.
- c. Time is of the essence.

5. **Contract Sum.**

- a. Owner will pay Contractor for performance of Contractor's obligations under the Contract Documents the Contract Sum in the amount of _____ Dollars (_____), subject to additions and deductions as provided in the Contract Documents.
- b. Owner will make payments to Contractor in accordance with the Contract Documents.

6. **Independent Contractor Relationship.** Contractor is an independent contractor and is not the agent or employee of Owner.

7. **Assignment.** Neither party to this Agreement will assign any right or obligation hereunder without the prior written consent of the other, which consent may be granted or withheld in such party's absolute discretion. Contractor will not assign moneys due or to become due to Contractor hereunder, nor will Contractor pledge the credit of Owner or bind Owner to any third party.

8. **Notice.** The parties designate the addresses, facsimile numbers, and email addresses as set forth in the signature blocks below to be used for sending Written Notice to the other party:

9. **Effective Date.** The effective date of this Agreement is the date indicated by the Owner's signature.

OWNER: The Church of Jesus Christ of Latter-day Saints, a Utah corporation sole	CONTRACTOR: (company)
Signature:	Signature:
Print Name:	Print Name:
Title:	Title:
Address:	Address:
Telephone No:	Telephone No:
Facsimile No:	Facsimile No:
Email:	Email:
Effective Date:	Fed. I.D. or SSN:
Reviewed By:	License No:
	Date Signed:

Sample Form of Agreement

GENERAL CONDITIONS

For a Fixed Sum (U.S.)

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SECTION 1 - GENERAL PROVISIONS

1.1 DEFINITIONS

- A. Adverse Weather: weather conditions that are seasonally abnormal and could not have been reasonably anticipated.
- B. Agreement: the document entitled "Agreement Between Owner and Contractor for a Fixed Sum (U.S.), executed by Owner and Contractor for performance of the Work.
- C. Architect: the entity identified as such in the Agreement.
- D. Change In The Work: a modification to the requirements of the Contract Documents or a delay in Substantial Completion resulting from an instruction from Owner or Architect to Contractor or from another event or circumstance.
- E. Change Order: a written instrument prepared by Architect and signed by Owner, Contractor, and Architect stating their agreement upon the following: (1) the occurrence of a Change in the Work; (2) the amount of the adjustment, if any, in the Contract Sum as a result of the Change in the Work; and (3) the extent of the adjustment, if any, in the Contract Time as a result of the Change in the Work.
- F. Construction Change Directive: a written order prepared by Architect and signed by Architect and Owner which: (1) orders a Change in the Work if the terms of a Change Order cannot be agreed upon prior to performance of a Change in the Work described in Section 7.1 or after occurrence of an event or circumstance described in Section 7.2; and (2) states a proposed basis for adjustment, if any, in the Contract Sum, the Contract Time, or both, resulting from the Change in the Work.
- G. Contract Documents: the documents identified as such in the Agreement.
- H. Contract Sum: the total amount set forth in the Agreement payable by Owner to Contractor for performance of the Work.
- I. Contract Time: the period of time set forth in the Agreement for the Substantial Completion of the Work.
- J. Contractor: the entity identified as such in the Agreement.
- K. Day: calendar day unless otherwise specifically defined.
- L. Direct Costs: actual costs for labor, materials, equipment, insurance, bonds, subcontract costs and onsite supervision relating to the Project. They do not include labor costs for project managers or other off-site administration.
- M. Drawings: the documents identified as such in the Agreement.
- N. Field Change: a written order prepared by Architect and signed by Architect and Contractor for a minor Change in the Work consistent with the general intent of the Contract Documents costing \$1,000 or less, resulting in no time extension, and which is necessary to avoid delaying the Work.
- O. Modification: a written amendment to the Contract Documents in the form of a:
 - 1. Change Order;
 - 2. Construction Change Directive; or
 - 3. Field Change.
- P. Owner: the entity identified as such in the Agreement.

- Q. Project: the total construction designed by Architect of which the Work performed under the Contract Documents may be the whole or a part.
- R. Product Data: standard illustrations, schedules, performance charts, instructions, brochures, diagrams, and other information furnished by Contractor to illustrate details regarding materials or equipment to be used in the Work, or the manner of installation, operation, or maintenance of such materials or equipment.
- S. Project Manual: the document identified as such in the Agreement.
- T. Samples And Mock-ups: physical examples that illustrate materials, equipment, or workmanship and establish standards by which the Work will be judged.
- U. Shop Drawings: drawings, diagrams, illustrations, schedules, performance charts, fabrication and installation drawings, setting diagrams, patterns, templates, and other data which illustrate some portion of the Work and confirm dimensions and conformance to the Contract Documents specially prepared by Contractor or any Subcontractor, manufacturer, supplier, or distributor.
- V. Specifications: the documents identified as such in the Agreement.
- W. Subcontractor: any entity supplying labor, materials, equipment, construction or services for the Work under separate contract with Contractor or any other Subcontractor.
- X. Submittals: Shop Drawings, Product Data, Samples and Mock-ups and any other documents or items furnished by Contractor or its Subcontractors to Owner or Architect to demonstrate how any portion of the Work will be accomplished or the type of materials or products that will be used in the Work.
- Y. Substantial Completion: Completion of the Work to a point where Owner can use the Work for its intended purposes. The date of Substantial Completion is the date certified as such by Architect in accordance with the Contract Documents.
- Z. Work: all labor, materials, equipment, construction, and services required by the Contract Documents.
- AA. Written Notice: notice in writing given from one party to the other at the addresses or facsimile numbers listed in the Agreement, or at such other addresses or facsimile numbers as the parties will designate from time to time by Written Notice, and will be effective at the earliest of:
 1. The date of personal delivery to the other party with signed acknowledgment of receipt; or
 2. The date sent by facsimile transmission to the other party provided receipt of the facsimile is verified by an electronic confirmation report by the party sending the facsimile transmission and further provided that a confirmation copy is sent to the other party by courier or by registered or certified mail within twenty-four (24) hours after the time and date of the facsimile transmission; or
 3. The date of receipt by the other party as stated on the return receipt if sent by registered or certified mail, or by courier.

1.2 CORRELATION AND INTENT OF CONTRACT DOCUMENTS

- A. The intent of the Contract Documents is to require Contractor to provide all labor, materials, equipment, construction, and services necessary for the proper execution and completion of the Work. The Contract Documents are complementary and what is required by any one will be as binding as if required by all. Contractor will perform the Work in accordance with the requirements expressly set forth in or reasonably inferable from the Contract Documents.
- B. The organization of the Contract Documents is not intended to control Contractor in dividing the Work among Subcontractors or to establish the extent of the Work to be performed by any trade.
- C. Words used in the Contract Documents that have well known technical or trade meanings are used therein in accordance with such recognized meanings.
- D. In the interest of brevity, the Contract Documents may 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.

1.3 OWNERSHIP AND USE OF CONTRACT DOCUMENTS

The Drawings, the Project Manual, and copies thereof are the property of Owner. Contractor will not use these documents on any other project. Contractor may retain one copy of the Drawings and the Project Manual as a contract record set and will return or destroy all remaining copies following final completion of the Work.

1.4 PUBLIC STATEMENTS REGARDING PROJECT

Contractor will not make any statements or provide any information to the media about the Project without the prior written consent of Owner. If Contractor receives any requests for information from media, Contractor will refer such requests to Owner.

1.5 OWNERSHIP AND USE OF RENDERINGS AND PHOTOGRAPHS

Renderings representing the Work are the property of Owner. All photographs of the Work, whether taken during performance of the

Work or at completion, are the property of the Owner. The Owner reserves all rights including copyrights to renderings and photographs of the Work. No renderings or photographs shall be used or distributed without written consent of the Owner

1.6 NO COMMERCIAL USE OF TRANSACTION OR RELATIONSHIP

Without the prior written consent of Owner, which Owner may grant or withhold in its sole discretion, neither Contractor nor Contractor's affiliates, officers, directors, agents, representatives, shareholders, members, Subcontractors, Sub-subcontractors or employees shall make any private commercial use of their relationship to Owner or the Project, including, without limitation:

- A. By referring to this Agreement, Owner, or the Project verbally or in any sales, marketing or other literature, letters, client lists, press releases, brochures or other written materials except as may be necessary for Contractor to perform Contractor's obligations under the terms of this Agreement;
- B. By using or allowing the use of any photographs of the Project or any part thereof, or of any service marks, trademarks or trade names or other intellectual property now or which may hereafter be associated with, owned by or licensed by Owner in connection with any service or product; or
- C. By contracting with or receiving money or anything of value from any person or commercial entity to facilitate such person or entity obtaining any type of commercial identification, advertising or visibility in connection with the Project.

Notwithstanding the foregoing, Contractor may include a reference to Owner and the services and equipment provided under this Agreement in a professional résumé or other similar listing of Contractor's references without seeking Owner's written consent in each instance; provided, that such reference to Owner, the services and equipment is included with at least several other similar references and is given no more prominence than such other references.

1.7 CONFIDENTIALITY / PROPERTY RIGHTS

- A. Owner will retain ownership and intellectual property rights in all plans, designs, drawings, documents, concepts, and materials provided by or on behalf of Owner to Contractor and to all work products of Contractor for or relative to Work performed under this Agreement, such products, services, and Work of Contractor constituting works made for hire. Contractor will not reuse any portions of such items provided by Owner or developed by Contractor for Owner pursuant to this Agreement, or disclose any such items to any third party without the prior written consent of Owner. Owner may withhold its consent in its' absolute discretion.
- B. In addition, Contractor shall ensure that Contractor, Subcontractors, and the employees, agents and representatives of Contractor and its Subcontractors maintain in strict confidence, and shall use and disclose only as authorized by Owner all Confidential Information of Owner that Contractor receives in connection with the performance of this Agreement. Notwithstanding the foregoing, Contractor may use and disclose any information to the extent required by an order of any court or governmental authority, but only after it has notified Owner and Owner has had an opportunity to obtain reasonable protection for such information in connection with such disclosure. For purposes of this Agreement, "Confidential Information" means:
 - 1. The name or address of any affiliate, customer or contractor of Owner or any information concerning the transactions of any such person with Owner;
 - 2. Any information relating to contracts, agreements, business plans, budgets or other financial information of Owner to the extent such information has not been made available to the public by the Owner; and
 - 3. Any other information that is marked or noted as confidential by the Owner at the time of its disclosure.

1.8 COMPLY WITH INTELLECTUAL PROPERTY RIGHTS OF OTHERS

Contractor represents and warrants that no Work (with its means, methods, goods, and services attendant thereto), provided to Owner will infringe or violate any right of any third party and that Owner may use and exploit such Work, means, methods, goods, and services without liability or obligation to any person or entity (specifically and without limitation, such Work, means, methods, goods, and services will not violate rights under any patent, copyright, trademark, or other intellectual property right or application for the same).

SECTION 2 - OWNER

2.1 OWNER'S DESIGNATED REPRESENTATIVE

Owner will designate in writing a representative who will have express authority to bind Owner with respect to all matters requiring Owner's approval or authorization.

2.2 INFORMATION AND SERVICES REQUIRED OF OWNER

- A. Owner will be responsible for establishment of property lines and benchmarks for grading.
- B. Owner will furnish to Contractor any information or services it is required to furnish under the Contract Documents with reasonable promptness to avoid delay in the orderly progress of the Work.
- C. Owner will furnish to Contractor a reasonable number of copies of the Drawings, the Project Manual, and the Addenda.

2.3 OWNER'S RIGHT TO INSPECT THE WORK

Owner and its representatives will have the right to inspect any portion of the Work wherever located at any time.

2.4 OWNER'S RIGHT TO STOP THE WORK

If Contractor fails to carry out the Work in accordance with the Contract Documents or fails to correct Work which is not in accordance with the Contract Documents in a timely manner, Owner may order Contractor in writing to stop the Work, or any portion thereof, until the cause for that order has been eliminated.

SECTION 3 - CONTRACTOR

3.1 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

- A. By executing the Agreement, Contractor represents that it has visited the Project site, familiarized itself with the local conditions under which the Work is to be performed, and correlated its own observations with the requirements of the Contract Documents.
- B. Contractor will carefully review and compare the Contract Documents and any other available information relating to the Project prior to commencing and during performance of each portion of the Work and will immediately report to Architect any errors, inconsistencies, and omissions it discovers.
- C. Should Contractor or any of its Subcontractors become aware of any question regarding the meaning or intent of any part of the Contract Documents prior to commencing that portion of the Work about which there is a question, Contractor will request an interpretation or clarification from Architect before proceeding. Contractor proceeds at its own risk if it proceeds with the Work without first making such a request and receiving an interpretation or clarification from Architect. If neither Contractor nor its Subcontractors become aware of the question until after work on the relevant portion of the Work has commenced, then the following precedence will govern for purposes of determining whether resolution of the question constitutes a Change in the Work:
 - 1. The Agreement takes precedence over all other Contract Documents.
 - 2. The Supplementary Conditions take precedence over the General Conditions.
 - 3. The General Conditions and Supplementary Conditions take precedence over the Drawings and the Specifications.
 - 4. An Addendum or a Modification takes precedence over the document(s) modified by the Addendum or Modification.
 - 5. The Specifications take precedence over the Drawings.
 - 6. Within the Drawings, larger scale drawings take precedence over smaller scale drawings, figured dimensions over scaled dimensions, and noted materials over graphic indications.
- D. Contractor will give Architect notice of any additional drawings, specifications, or instructions required to define the Work in greater detail, or to permit the proper progress of the Work, sufficiently in advance of the need for information so as not to delay the Work.
- E. It is not Contractor's responsibility to ascertain that the Contract Documents are in accordance with requirements of applicable laws, statutes, ordinances, building codes, rules and regulations. However, if Contractor observes that portions of the Contract Documents are at variance with those requirements, Contractor will immediately notify Architect in writing. Contractor will not proceed unless Owner and/or Architect effects Modifications to the Contract Documents required for compliance with such requirements. Contractor will be fully responsible for any work knowingly performed contrary to such requirements and will fully indemnify Owner against loss and bear all costs and penalties arising therefrom.
- F. Contractor will take field measurements and verify field conditions and will compare such field measurements and conditions and other information known to Contractor with the Contract Documents before ordering any materials or commencing construction activities. Contractor will immediately report errors, inconsistencies, and omissions that it discovers to Architect. If Contractor orders materials or commences construction activities before taking field measurements and verifying field conditions, Contractor will not be entitled to any compensation for additional costs to Contractor resulting from field measurements or conditions different from those anticipated by Contractor which would have been avoided had Contractor taken field measurements and verified field conditions prior to ordering the materials or commencing construction activities.
- G. If site conditions indicated in the Contract Documents or other information provided by Owner or Architect to Contractor differ materially from those Contractor encounters in performance of the Work, Contractor will immediately notify Architect in writing of such differing site conditions.
- H. Where the Contract Documents require the Contractor to provide professional services for architecture or engineering, the Contractor shall cause such services to be performed by appropriately licensed professionals.

3.2 SUPERVISION OF CONSTRUCTION PROCEDURES

- A. Contractor will supervise and direct the Work. Contractor will be solely responsible for all construction means, methods, techniques, sequences, and procedures and for coordinating all portions of the Work. All loss, damage, liability, or cost of correcting defective work arising from the use of any construction means, methods, techniques, sequences or procedures will be borne by Contractor, notwithstanding that such construction means, methods, techniques, sequences or procedures are referred to, indicated or implied by the Contract Documents, unless Contractor has given timely notice to Owner and Architect in writing that such means, methods, techniques, sequences or procedures are not safe or suitable, and Owner has then instructed Contractor in writing to proceed at Owner's risk.
- B. Contractor will utilize its best skill, efforts, and judgment to provide efficient business administration and supervision, to furnish at all times an adequate supply of workers and materials, and to perform the Work in an expeditious and economical manner consistent with the interests of Owner.
- C. Contractor will be responsible for:

1. The proper observance of property lines and set back requirements as shown in the Contract Documents;
 2. The location and layout of the Work as shown in the Contract Documents with respect to the position of the Work on the property and the elevation of the Work in relation to grade; and
 3. Setting and maintaining construction stakes.
- D. Contractor will be responsible to Owner for the acts and omissions of its employees and Subcontractors as well as persons either directly or indirectly employed by Subcontractors.
- E. Contractor will not be relieved of its obligation to perform the Work in accordance with the Contract Documents as a result of any tests, inspections, or approvals by Owner, Architect or their consultants.
- F. Contractor will be responsible for inspection of portions of the Work already completed to determine that such portions are in proper condition to receive subsequent portions of the Work.
- G. Contractor recognizes that the Project site and the surrounding area is frequently visited by the public and is important to Owner's image and function and will maintain the premises free from debris and waste materials resulting from Construction. At the completion of Construction, Contractor shall promptly remove construction equipment, tools, surplus materials, waste materials and debris.

3.3 LABOR AND MATERIALS

- A. Unless otherwise provided in the Contract Documents, Contractor will provide and pay for all labor, materials, equipment, tools, water, heat, utilities, transportation, and other facilities and services necessary for the proper execution and completion of the Work.
- B. Contractor will at all times enforce strict discipline and good order among those performing the Work and will not permit employment of any unfit person or anyone not skilled in the tasks assigned to them.
- C. Contractor is fully responsible for the Project and all materials and work connected therewith until Owner has accepted the Work in writing. Contractor will replace or repair at its own expense any materials or work damaged or stolen, regardless of whether it has received payment for such work or materials from the Owner.
- D. Contractor will remedy all damage or loss to any property caused in whole or in part by Contractor, any Subcontractor, or by anyone for whose acts any of them may be liable.
- E. Contractor will be responsible for determining that all materials furnished for the Work meet all requirements of the Contract Documents. Architect may require Contractor to produce reasonable evidence that a material meets such requirements, such as certified reports of past tests by qualified testing laboratories, reports of studies by qualified experts, or other evidence which, in the opinion of Architect, would lead to a reasonable certainty that any material used, or proposed to be used, in the work meets the requirements of the Contract Documents. All such data will be furnished at Contractor's expense. This provision will not require Contractor to pay for periodic testing of different batches of the same material, unless such testing is specifically required by the Contract Documents to be performed at Contractor's expense.
- F. Contractor will coordinate and supervise the work performed by Subcontractors so that the Work is carried out without conflict between trades and so that no trade, at any time, causes delay to the general progress of the Work. Contractor and all Subcontractors will at all times afford each trade, any separate contractor, or Owner, reasonable opportunity for the installation of Work and the storage of materials.
- G. Contractor warrants to Owner that the materials and equipment furnished for the Work will be new unless otherwise specified by the Contract Documents, and that the Work will be free from defects, and will conform with the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective in the discretion of Owner. If required by Architect, Contractor will furnish satisfactory evidence as to the kind and quality of the materials and equipment used in performing the Work.
- H. Owner may elect to purchase materials required for the Work. In that event, Contractor will comply with the procedures set forth in the Contract Documents relating to such materials.

3.4 COMPLIANCE WITH LAWS

Contractor will comply with all applicable laws, ordinances, rules, regulations, and orders of any public authorities relating to performance of the Work.

3.5 TAXES

- A. Contractor will pay all sales, use, consumer, payroll, workers compensation, unemployment, old age pension, surtax, and similar taxes assessed in connection with the performance of the Work.
- B. Owner will pay all taxes and assessments on the real property comprising the Project site.

3.6 PERMITS AND FEES

- A. Owner will obtain and pay for all zoning and use permits and permanent easements necessary for completion of the Work.

- B. Contractor will obtain and pay for the building permit, and all other permits, governmental fees, licenses and inspections necessary for the proper execution and completion of the Work.
- C. Contractor will secure any certificates of inspection and of occupancy required by authorities having jurisdiction over the Work. Contractor will deliver these certificates to Architect prior to issuance of the Certificate of Substantial Completion by Architect.

3.7 CONTRACTOR'S ON-SITE REPRESENTATIVE

Contractor will employ a competent representative acceptable to Owner to supervise the performance of the Work. This representative will be designated in writing by Contractor prior to commencement of work and will not be changed prior to final inspection of the Work without prior written consent of Owner. This representative will represent Contractor for all purposes, including communication with Owner.

3.8 CONTRACTOR'S CONSTRUCTION SCHEDULES

- A. Contractor will prepare and submit for Owner's and Architect's information Contractor's construction schedule for the Work in accordance with the requirements of the Contract Documents.
- B. Contractor will prepare and maintain a Submittal schedule which is coordinated with Contractor's construction schedule and sets forth specified times for Architect to review Submittals.

3.9 DOCUMENTS AND SUBMITTALS AT THE SITE

Contractor will keep at the Project site for use by Owner, Architect, or their representatives, a record copy of the Project Manual, the Drawings, all Addenda, and all Modifications. These documents will be maintained in good order and currently marked to record changes and selections made during construction. In addition, Contractor will keep at the Project site one copy of all Submittals.

3.10 SUBMITTALS

- A. Submittals are not Contract Documents and do not alter the requirements of the Contract Documents unless incorporated into the Contract Documents by a Modification.
- B. Contractor will review, approve, and submit to Architect Submittals in accordance with the Contract Documents. By approving Submittals, Contractor represents that it has determined and verified field measurements, field construction criteria, materials, catalog numbers, and similar data, and that it has checked and coordinated each Submittal with the requirements of the Work and of the Contract Documents or will make such determination, verification, check, and coordination prior to commencing the relevant portion of the Work. In reviewing Submittals Architect will be entitled to rely upon Contractor's representation that such information is correct and accurate.
- C. Contractor will inform Architect in writing at the time of submission of any Submittal or portion thereof which deviates from the requirements of the Contract Documents. Contractor will provide Architect with documentation demonstrating to Architect that the Submittal is equal to or better than the specified product or work. Contractor will not be relieved of responsibility for deviations from the requirements of the Contract Documents by Architect's acceptance of a Submittal unless Contractor has informed Architect in writing of the deviation and Architect has incorporated the deviation into the Contract Documents by a Modification.
- D. Contractor will not perform any portions of the Work requiring Submittals until the respective Submittal has been reviewed and accepted in writing by Architect.
- E. When professional certification of performance criteria of materials, systems or equipment is required by the Contract Documents, Owner will be entitled to rely upon such certifications, and neither Owner nor Architect will be expected to make any independent examination with respect thereto.
- F. Submittals not required by the Contract Documents may be returned to Contractor without action.

3.11 CUTTING AND PATCHING

Contractor will be responsible for any cutting, fitting, and patching that may be required to complete the Work and make its parts fit together properly.

3.12 ACCESS TO WORK

Contractor will permit Owner, Architect, their representatives and consultants, access to the Work wherever located at any time.

3.13 ROYALTIES AND PATENTS

Contractor will pay all royalties and license fees required by the Work or by Contractor's chosen method of performing the Work. Contractor will defend and hold Owner harmless from all suits or claims for infringement of any patent, license or other intellectual property rights or any loss on account thereof.

3.14 INDEMNIFICATION

- A. Contractor will indemnify and hold harmless Owner and Owner's representatives, employees, agents, architects, and consultants from and against any and all claims, damages, liability, demands, costs, judgments, awards, settlements, causes of action, losses and expenses (collectively "Claims" or "Claim"), including but not limited to attorney fees, consultant fees, expert fees, copy costs, and other expenses, arising out of or resulting from performance of the Work, attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of real or personal property, including loss of use resulting therefrom, except to the extent that such liability arises out of the negligence of Owner, its representatives, agents, and employees. This indemnity includes, without limitation, indemnification of Owner from all losses or injury to Owner's property, except to the extent that such loss or injury arises out of the negligence of Owner, its representatives, agents, and employees. This indemnity applies, without limitation, to include Claims occurring both during performance of the Work and/or subsequent to completion of the Work. In the event that any Claim is caused in part by a party indemnified hereunder, that party will bear the cost of such Claim to the extent it was the cause thereof. In the event that a claimant asserts a Claim for recovery against any party indemnified hereunder, the party indemnified hereunder may tender the defense of such Claim to Contractor. If Contractor rejects such tender of defense and it is later determined that the negligence of the party indemnified hereunder did not cause all of the Claim, Contractor will reimburse the party indemnified hereunder for all costs and expenses incurred by that party in defending against the Claim. Contractor will not be liable hereunder to indemnify any party for damages resulting from the sole negligence of that party.
- B. In addition to the foregoing, Contractor will be liable to defend Owner in any lawsuit filed by any Subcontractor relating to the Project. Where liens have been filed against Owner's property, Contractor (and/or its bonding company which has issued bonds for the Project) will obtain lien releases and record them in the appropriate county and/or local jurisdiction and provide Owner with a title free and clear from any liens of Subcontractors. In the event that Contractor and/or its bonding company are unable to obtain a lien release, Owner in its absolute discretion may require Contractor to provide a bond around the lien or a bond to discharge the lien, at Contractor's sole expense.
- C. In addition to the foregoing, Contractor will indemnify and hold Owner harmless from any claim of any other contractor resulting from the performance, nonperformance or delay in performance of the Work by Contractor.
- D. The indemnification obligation herein will not be limited by a limitation on the amount or type of damages, compensation or benefits payable by or for Contractor or a Subcontractor under worker's compensation acts, disability benefit acts, or other employee benefit acts.

3.15 PROJECT MEETINGS

Contractor will attend and participate in meetings as required by the Contract Documents.

SECTION 4 - ADMINISTRATION OF THE CONTRACT

4.1 ARCHITECT

In the event that Owner terminates its contractual relationship with Architect, Owner will appoint in writing another architect, whose status under the Contract Documents will be that of the former Architect in all respects.

4.2 ARCHITECT'S ADMINISTRATION OF THE CONTRACT

- A. Architect will make periodic visits to the site to familiarize itself generally with the progress and quality of the Work and to determine if the Work is proceeding in accordance with the Contract Documents. Although Architect is required to make periodic inspections, it is not required to make exhaustive or continuous onsite inspections. On the basis of its observations while at the site, Architect will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defects and deficiencies in the Work. Architect's failure to observe a defect or deficiency in the Work will not relieve Contractor of its duty to perform the Work in accordance with the Contract Documents.
- B. Architect will review Contractor's payment requests and determine the amounts due Contractor in accordance with Section 9.
- C. Communications between Contractor and Owner relating to the Work will be through Architect. Communications between Owner or Contractor with Architect's consultants relating to the Work will be through Architect. Communications between Owner or Architect and subcontractors relating to the Work will be through Contractor. Communications between Contractor and any separate contractor will be through Architect, except as otherwise specified in the Contract Documents.
- D. Owner and/or Architect will have the right to reject and require removal of the following at Contractor's expense:
 1. Any portion of the Work that does not meet the requirements of the Contract Documents.
 2. Any portion of the Work damaged or rendered unsuitable during installation or resulting from failure to exercise proper protection.
- E. Architect will have authority to suspend the Work, with concurrence of Owner, whenever such suspension may be necessary in its reasonable opinion to insure the proper performance of the Work.
- F. Architect will review Contractor's Submittals and will accept or take other appropriate action regarding the Submittals. Architect's review of the Submittals will be for the limited purpose of checking for general conformance with the Contract Documents and will not be conducted for the purpose of determining the accuracy and completeness of 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 Contractor. Architect's review of Submittals will not relieve Contractor of its obligations under the

Contract Documents. Architect's review of Submittals will not constitute acceptance of safety precautions or construction means, methods, techniques, sequences or procedures. Architect's acceptance of a specific item will not indicate acceptance of an assembly of which the item is a component.

- G. Architect has authority to order Construction Change Directives and Field Changes in accordance with Section 7.
- H. Architect will conduct inspections to determine the dates of Substantial Completion and final completion, will receive and review written guarantees and related documents required by the Contract and assembled by Contractor, and will review and certify or reject Contractor's final payment request.
- I. Architect will be the interpreter of the performance and requirements of the Contract Documents. Architect's interpretations will be in writing or in the form of drawings.
- J. Architect's decisions in matters relating to aesthetic effect will be final if consistent with the Contract Documents and approved by Owner.

SECTION 5 - SUBCONTRACTORS

5.1 AWARD OF SUBCONTRACTS FOR PORTIONS OF THE WORK

- A. Contractor will enter into contracts with Subcontractors to perform all portions of the Work that Contractor does not customarily perform with its own employees.
- B. Contractor will not contract with any Subcontractor who has been rejected by Owner. Contractor will not be required to contract with any Subcontractor against whom it has a reasonable objection.
- C. If Owner rejects any Subcontractor proposed by Contractor, Contractor will propose an acceptable substitute to whom Owner has no reasonable objection.
- D. Contractor will not make any substitution for any Subcontractor that has been accepted by Owner and Architect without the prior written approval of Owner and Architect.

5.2 SUBCONTRACTUAL RELATIONS

- A. Contractor's responsibility for the Work includes the labor and materials of all Subcontractors, including those recommended or approved by Owner. Contractor will be responsible to Owner for proper completion and guarantee of all workmanship and materials under any subcontracts. Any warranties required for such work will be obtained by Contractor in favor of Owner and delivered to Architect. It is expressly understood and agreed that there is no contractual relationship between Owner and any Subcontractor, and under no circumstances will Owner be responsible for the non-performance or financial failure of any Subcontractor or any effects therefrom.
- B. Contractor agrees to pay the Subcontractors promptly upon receipt of payment from Owner for that portion of the funds received which represents the Subcontractor's portion of the Work completed to Contractor's satisfaction for which Owner has made payment.
- C. Contractor will require each Subcontractor to:
 - 1. Be licensed by the state in which the Project is located where such licensing is required by the governing authority;
 - 2. Be bound by the terms of the Contract Documents as far as they are applicable to the Subcontractor's work;
 - 3. Assume toward Contractor the same obligations Contractor has assumed toward Owner, including the prompt payment of its Subcontractors;
 - 4. Submit its applications for payment to Contractor in time to permit Contractor to make timely application to Owner;
 - 5. Execute claim or lien releases or lien waivers for payments made by Contractor; and
 - 6. Make all claims for Changes in the Work to Contractor in the same manner as Contractor is required to make such claims to Owner.

SECTION 6 - CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

6.1 OWNER'S RIGHT TO PERFORM WORK OR AWARD SEPARATE CONTRACTS

- A. Owner reserves the right to perform work itself or to award separate contracts in connection with the Project.
- B. When separate contracts are awarded, "Contractor" in the Contract Documents in each case will mean the contractor who signs each separate contract.

6.2 MUTUAL RESPONSIBILITY

- A. Contractor will afford other contractors reasonable opportunity to place and store their materials and equipment on site and to perform their work and will properly connect and coordinate its Work with theirs where applicable.
- B. If any part of Contractor's Work depends upon the work of any separate contractor for proper performance or results, Contractor will inspect and promptly report to Architect any apparent discrepancies or defects in such work that render it unsuitable for

proper performance and results. Failure of Contractor to so inspect and report will constitute an acceptance of the work of the separate contractor as fit and proper to receive Contractor's Work, except as to defects not then reasonably discoverable.

- C. Contractor will promptly remedy damage caused by Contractor or any Subcontractor to the completed or partially completed work of other contractors or to the property of Owner or other contractors.

6.3 OWNER'S RIGHT TO CLEAN UP

If a dispute arises among Contractor and separate contractors as to the responsibility under their separate contracts for maintaining the Project free from waste materials and rubbish, Owner may clean the Project, allocate the cost among those responsible as Owner and Architect determine to be just, and withhold such cost from any amounts due or to become due to Contractor.

SECTION 7 - CHANGES IN THE WORK

7.1 CHANGES IN THE WORK RESULTING FROM AN INSTRUCTION BY OWNER OR ARCHITECT TO CONTRACTOR

- A. If Owner or Architect gives Contractor an instruction that modifies the requirements of the Contract Documents or delays Substantial Completion, Contractor may be entitled to an adjustment in the Contract Sum and/or the Contract Time. If compliance with the instruction affects the cost to Contractor to perform the Work, the Contract Sum will be adjusted to reflect the reasonable increase or decrease in cost subject to the conditions set forth in Section 7.1, Paragraphs B through G. If compliance with the instruction delays Substantial Completion, the Contract Time will be extended for a period of time commensurate with such delay subject to the conditions set forth in Section 7.1, Paragraphs B through G and Section 7.3, Paragraph A and Contractor will be paid liquidated damages for the delay as set forth in Section 7.3, Paragraph B.
- B. If Contractor receives an instruction from Owner or Architect that Contractor considers to be a Change in the Work, Contractor, before complying with the instruction, will notify Architect in writing that Contractor considers such instruction to constitute a Change in the Work. If Architect agrees that compliance with the instruction will constitute a Change in the Work, Contractor will furnish a proposal for a Modification in accordance with Section 7.1, Paragraphs C. and D. within ten (10) days.
- C. If Contractor claims that it is entitled to an adjustment in the Contract Sum (including without limitation costs related to a time extension) as a result of an instruction by Owner or Architect, Contractor will furnish a proposal for a Change Order containing a price breakdown itemized as required by Owner. The breakdown will be in sufficient detail to allow Owner to determine any increase or decrease in Direct Costs as a result of compliance with the instruction. Any amount claimed for subcontracts will be supported by a similar price breakdown and will itemize the Subcontractor's profit and overhead charges. Profit and overhead will be subject to the following limitations:
 - 1. The Subcontractor's profit and overhead will not exceed ten (10) percent of its Direct Costs on work performed. Subcontractor's profit and overhead will not exceed five (5) percent on work performed by its sub-subcontractors.
 - 2. Contractor's profit and overhead on work performed by its own crews will not exceed ten (10) percent of its Direct Costs.
 - 3. Contractor's profit and overhead mark up on work performed by its Subcontractors will not exceed five (5) percent of the Subcontractors' charges for such work.
 - 4. Amounts due Owner as a result of a credit change will be the actual net savings to Contractor from the Change in the Work as confirmed by Architect. On credit changes, profit and overhead on the originally estimated work will not be credited back to Owner. If both additions and credits are involved in a single Change in the Work, overhead and profit will be figured on the basis of net increase, if any, related to that Change in the Work.
- D. If Contractor claims that it is entitled to an adjustment in the Contract Time as a result of an instruction from Owner or Architect, Contractor will include in its proposal justification to support Contractor's claim that compliance with the instruction will delay Substantial Completion.
- E. Upon receipt of Contractor's proposal for Modification, Architect and Owner will determine whether to proceed with the Change in the Work. If Architect and Owner determine to proceed with the Change in the Work, they will issue a Change Order, a Construction Change Directive or a Field Change as appropriate.
- F. Contractor agrees that if it complies with an instruction from Owner or Architect without first giving written notice to Architect as provided in Section 7.1., Paragraph B, and receiving a Change Order, Construction Change Directive or Field Change, Contractor will not be entitled to any adjustment in the Contract Sum or the Contract Time as a result of the instruction and waives any claim therefor.
- G. If Contractor is instructed to perform work which it claims constitutes a Change in the Work but which Owner and Architect do not agree constitutes a Change in the Work, Contractor will comply with the instruction. Contractor may submit its claim for adjustment to the Contract Sum, the Contract Time, or both as a dispute pursuant to Section 13 within thirty (30) days after compliance with the instruction. Contractor agrees that if it fails to submit its claim for resolution pursuant to Section 13 within thirty (30) days after compliance with the instruction, then Contractor will not be entitled to any adjustment in the Contract Sum or the Contract Time as a result of the instruction and waives any claim therefor.
- H. Contractor agrees that it is responsible for submitting accurate cost and pricing data to support its Change Order Proposals. Owner will have the right to examine the Contractor's records to verify the accuracy and appropriateness of the pricing data used to price change order proposals.

7.2 CHANGE IN THE WORK RESULTING FROM AN EVENT OR CIRCUMSTANCE

- A. If an event or circumstance other than an instruction from Owner or Architect affects the cost to Contractor of performing the Work or delays Substantial Completion, Contractor may be entitled to an adjustment in the Contract Sum and/or the Contract Time. If the circumstance or event affects the cost to Contractor to perform the Work and is caused by a willful or negligent act or omission of Owner or Architect, the Contract Sum will be adjusted to reflect the reasonable increase or decrease in Contractor's cost to perform the Work resulting from the event or circumstance, subject to the conditions set forth in Section 7.2, Paragraphs B through F. If the event or circumstance delays Substantial Completion and is described in Section 7.3, Paragraph A, the Contract Time will be extended for a period of time commensurate with such delay subject to the conditions set forth in such section. If the circumstance or event delays Substantial Completion and is caused by a willful or negligent act or omission of Owner or Architect, then Contractor will be compensated for costs incident to the delay in accordance with Section 7.3, Paragraph B. Contractor will not be entitled to any adjustment to the Contract Sum or other damages from Owner as a result of any event or circumstance unless the event or circumstance results from a willful or negligent act or omission of Owner or Architect.
- B. If a Change in the Work results from any event or circumstance caused by the willful or negligent act or omission of Owner or Architect, Contractor will give Owner Written Notice of such event or circumstance within twenty-four (24) hours after commencement of the event or circumstance so that Owner can take such action as is necessary to mitigate the effect of the event or circumstance. Contractor will not be entitled to any adjustment in either the Contract Time or the Contract Sum based on any damages or delays resulting from such event or circumstance during a period more than twenty-four (24) hours prior to Contractor giving such Written Notice to Owner.
- C. Contractor will submit in writing any claims for an adjustment in the Contract Time and/or the Contract Sum resulting from an event or circumstance within the time limits set forth below. In the event that Contractor fails to submit its claim in writing within the time limits set forth below, then Contractor agrees it will not be entitled to any adjustment in the Contract Time or the Contract Sum or to any other damages from Owner due to the circumstance or event and waives any claim therefor.
 - 1. Claims for an adjustment in the Contract Time due to Adverse Weather will be made by the tenth (10th) of the month following the month in which the delay occurred.
 - 2. Claims for an adjustment in the Contract Time and/or the Contract Sum due to any other circumstance or event will be submitted within seven (7) days after the occurrence of the circumstance or event.
- D. If Contractor claims that it is entitled to an adjustment in the Contract Sum (including without limitation costs related to a time extension) because of an event or circumstance resulting from the willful or negligent act or omission of Owner or Architect, Contractor will furnish a proposal for a Change Order containing a price breakdown as described in Section 7.1, Paragraph C. Any amount claimed for increased labor costs as a result of the event or circumstance must be supported by a certified payroll. Any claim for rented equipment or additional material costs must be supported by invoices.
- E. If Contractor claims that it is entitled to an adjustment in the Contract Time as a result of an event or circumstance, Contractor will include with its claim copies of daily logs, letters, shipping orders, delivery tickets, Project schedules, and other supporting information necessary to justify Contractor's claim that the event or circumstance delayed Substantial Completion. If Contractor is entitled to an adjustment in the Contract Time as a result of an event or circumstance caused by the willful or negligent act or omission of Owner or Architect, Contractor will be compensated for all costs related to the delay in accordance with Section 7.3, Paragraph B.
- F. Within thirty (30) days after receipt of Contractor's claim, Architect will either deny the claim or recommend approval to Owner. If Owner approves the claim, the adjustment in the Contract Time and/or Contract Sum will be reflected in a Change Order pursuant to Section 7.5 or a Construction Change Directive pursuant to Section 7.6. If Owner or Architect denies Contractor's claim, Contractor may submit its claim as a dispute pursuant to Section 13 within thirty (30) days of receipt of the denial of the claim. If Contractor fails to submit its claim for resolution pursuant to Section 13 within the thirty (30) day time period, then Contractor agrees it is not entitled to any adjustment in the Contract Time and/ or Contract Sum or any other damages as a result of the event or circumstance and waives any claim therefor.

7.3 EXTENSIONS OF TIME

- A. If Substantial Completion of the Project is delayed because of any of the following causes, then the Contract Time will be extended by Change Order for a period of time equal to such delay:
 - 1. Labor strikes or lock-outs;
 - 2. Adverse weather;
 - 3. Unusual delay in transportation;
 - 4. Unforeseen governmental requests or requirements;
 - 5. A Change in the Work resulting from an instruction by Owner or Architect to Contractor subject to the conditions set forth in Section 7.1; or
 - 6. Any other event or circumstance caused by the willful or negligent act or omission of Owner or Architect.
- B. Contractor will not be entitled to any compensation for delay described in Section 7.3, Paragraph A, subparagraphs 1, 2, 3 and 4. For each day of delay in Substantial Completion described in Section 7.3, Paragraph A, subparagraphs 5 and 6, Contractor will be paid liquidated damages in the amount per day set forth in the Supplementary Conditions to compensate Contractor for all damages resulting from any delay including but not limited to damages for general conditions costs, additional job site costs, additional home office overhead costs, disruption costs, acceleration costs, increase in labor costs, increase in subcontract costs, increase in materials costs, and any other costs incident to the delay. Contractor will be entitled to no other compensation relating to the delay.

- C. In no event will any time extension or cost adjustment be given on account of delay which reasonably should have been anticipated by the Contractor or in circumstances where performance of the Work is, was, or would have been, delayed by any other cause for which the Contractor is not entitled to an extension.

7.4 DOCUMENTATION OF CHANGES IN THE WORK

Every Change in the Work will be documented by a Change Order, a Construction Change Directive or a Field Change. If Owner, Architect and Contractor reach agreement regarding the adjustment in the Contract Sum, if any, and the adjustment in the Contract Time, if any, resulting from a Change in the Work, then the parties will execute a Change Order pursuant to Section 7.5. If Owner, Architect and Contractor cannot reach agreement regarding the adjustment in Contract Sum or the adjustment in Contract Time resulting from a Change in the Work, then Owner and Architect will issue a Construction Change Directive pursuant to Section 7.6. Field Changes require the agreement of Architect and Contractor only.

7.5 CHANGE ORDERS

Contractor's signature upon a Change Order is Contractor's acknowledgment that it is not entitled to any additional adjustment in the Contract Sum or the Contract Time or any other damages or compensation as a result of the Change in the Work other than that provided for in the Change Order, irrespective of whether a subsequent claim for additional compensation or time extensions relating to the Change in the Work is described as a change in the requirements of the Contract Documents, a delay, a disruption of the Work, an acceleration of the Work, an impact on the efficiency of performance of the Work, an equitable adjustment, or other claim and irrespective of whether the impact of the Change in the Work is considered singly or in conjunction with the impact of other Changes in the Work.

7.6 CONSTRUCTION CHANGE DIRECTIVES

- A. Contractor will promptly comply with all Construction Change Directives.
- B. Pending final resolution of any adjustment in the Contract Sum or Contract Time relating to a Construction Change Directive, the amounts proposed by Owner in the Construction Change Directive may be included in Contractor's payment requests once the work relating thereto is completed.
- C. If after the work described in the Construction Change Directive is completed, Owner, Architect, and Contractor reach agreement on adjustments in the Contract Sum, Contract Time, or both, such agreement will be reflected in an appropriate Change Order.
- D. If the parties do not reach agreement regarding an adjustment to the Contract Sum, Contract Time, or both relating to the Construction Change Directive within thirty (30) days of the completion of the work described therein, then Contractor may submit its claim for an adjustment pursuant to Section 13 within thirty (30) days of the completion of such work. Contractor agrees that if it fails to submit its claim for resolution pursuant to Section 13 within thirty (30) days of completion of the work described in the Construction Change Directive, then it will not be entitled to an adjustment in Contract Sum or Contract Time resulting from such work except as set forth in the Construction Change Directive and waives any claim therefor.

7.7 FIELD CHANGES

Architect and Contractor will sign a Field Change order listing the Change In The Work and the Contract Sum including markups before Contractor proceeds with the Field Change.

7.8 WAIVER OF CLAIMS

Except as set forth in Section 7, Contractor will not be entitled to any adjustment in the Contract Sum or the Contract Time or for any damages of any kind whatsoever resulting from an instruction from Owner or Architect, any event or circumstance, or any act or omission of Owner or Architect and Contractor expressly waives any and all claims therefor.

SECTION 8 - TIME

8.1 TIME IS OF THE ESSENCE

All time limits stated in the Contract Documents are of the essence. By executing the Agreement, Contractor confirms that the Contract Time is a reasonable period for performing the Work. Contractor will proceed expeditiously with adequate resources and will achieve Substantial Completion within the Contract Time.

8.2 COMMENCEMENT OF THE WORK

Contractor will not commence work on the Project site until the date set forth in the Written Notice to proceed. However, Contractor may enter into subcontracts and secure material for the Project after receipt of the Agreement with Owner's authorized signature. Owner will issue the Written Notice to proceed within forty-five (45) days after Owner receives acceptable bonds and evidence of insurance pursuant to Section 11 unless Owner earlier terminates the Agreement pursuant to Section 14.

8.3 DELAY IN COMPLETION OF THE WORK

- A. For each day after the expiration of the Contract Time that Contractor has not achieved Substantial Completion, Contractor will pay Owner the amount set forth in the Supplementary Conditions as liquidated damages for Owner's loss of use of the Project

and the added administrative expense to Owner to administer the Project during the period of delay. In addition, Contractor will reimburse Owner for any additional Architect's fees, attorney fees, expert fees, consultant fees, copy costs, and other expenses incurred by Owner as a result of the delay. Owner may deduct any liquidated damages or reimbursable expenses from any money due or to become due to Contractor. If the amount of liquidated damages and reimbursable expenses exceeds any amounts due to Contractor, Contractor will pay the difference to Owner within ten (10) days after receipt of a written request from Owner for payment.

- B. At the time Architect certifies that Contractor has achieved Substantial Completion, Architect will identify the remaining items to be completed for final completion of the Work and will establish with Contractor a reasonable time for completion of those items. Architect will set forth the items to be completed and the time established for their completion in a Certificate of Substantial Completion. For each day that Contractor exceeds the time allowed for completion of the items set forth in the Certificate of Substantial Completion, Contractor will pay to Owner as liquidated damages for additional administrative expenses the amount set forth in the Supplementary Conditions. In addition, Contractor will reimburse Owner for any additional Architect's fees, attorney fees, expert fees, consultant fees, copy costs, and other expenses incurred by Owner as a result of the delay in completing such items.

SECTION 9 - PAYMENTS AND COMPLETION

9.1 SCHEDULE OF VALUES

Contractor will submit to Architect a schedule of values which allocates the Contract Sum to various portions of the Work. The schedule of values will be supported by such data to substantiate its accuracy as required by Architect. This schedule, when accepted by Owner and Architect, will be used as a basis for reviewing Contractor's payment requests.

9.2 PAYMENT REQUESTS

- A. Not more than once a month, Contractor will submit a payment request to Architect for Work completed, materials stored on the site, and for materials stored offsite as of the date of the payment request. The amount of the payment request will be based upon the schedule of values and will be equal to the value of the Work completed:
 1. Less retention;
 2. Less all prior amounts paid by Owner to Contractor as part of the Contract Sum; and
 3. Less allowable offsets.

The payment request may include Changes in the Work that have been performed by Contractor and authorized by Owner and/or Architect pursuant to Section 7. If a payment request includes materials stored offsite, Contractor will include with the payment request a list of the materials, the location where they are stored and the written request of Contractor and its performance bond surety that payment be made for such materials.

- B. Contractor warrants and guarantees that upon the receipt of payment for materials and equipment, whether incorporated in the Project or not, title to such materials and equipment will pass to Owner free and clear of all liens, claims, security interests, or encumbrances. Notwithstanding this payment and passage of title, Contractor will remain responsible for all such materials and equipment until actual delivery to the project site, incorporation into the Work, and final acceptance by Owner. Contractor further warrants that no material or equipment covered by a payment request is subject to an agreement under which an interest therein or an encumbrance thereon is retained by the seller or any other person or entity.

9.3 PAYMENT REQUEST CERTIFICATION

- A. Architect will, within seven (7) days after receipt of Contractor's payment request, forward to Owner the payment request certified for such amount as Architect determines is properly due. If Architect certifies less than the full amount of the payment request, Architect will notify Contractor and Owner of Architect's reasons for withholding certification of the full amount requested.
- B. The certification of the payment request will constitute a representation by Architect to Owner based upon Architect's observations at the site and the data comprising the payment request, that the Work has progressed to the point indicated and that, to the best of Architect's knowledge, information, and belief, 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 minor deviations from the Contract Documents correctable prior to completion, and to specific qualifications expressed by Architect. However, the certification of the payment request will not constitute a representation that Architect has:
 1. Conducted exhaustive or continuous on-site inspections to check the quantity or quality of the Work;
 2. Reviewed construction means, methods, techniques, sequences, or procedures;
 3. Reviewed copies of requisitions received from Subcontractors or other data requested by Owner to substantiate Contractor's right to payment; or
 4. Made examination to ascertain how or for what purpose Contractor has used money previously paid on account of the Contract Sum.
- C. In taking action on Contractor's payment request, Owner will be entitled to rely on the accuracy and completeness of the information furnished by Contractor.

9.4 DECISIONS TO WITHHOLD CERTIFICATION AND PAYMENT

- A. Architect may withhold certification of a payment request in whole or in part to the extent reasonably necessary to protect Owner if, in the opinion of Architect, the representations to Owner required by Section 9.3, Paragraph B cannot be accurately made. If

Architect is unable to certify payment in the amount of the payment request, Architect will notify Contractor and Owner as provided in Section 9.3, Paragraph A. If Contractor and Architect cannot agree on a revised amount, Architect will promptly certify a payment request for the amount for which Architect is able to make such representations to Owner. Architect may also decide not to certify payment or, because of subsequently discovered evidence or subsequent observations, may nullify the whole or a part of a payment request previously certified, to such extent as may be necessary in Architect's opinion to protect Owner from loss because of:

1. Defective work not remedied;
 2. Third-party claims filed or reasonable evidence indicating probable filing of such claims;
 3. Failure of Contractor to make payments properly to Subcontractors for labor, materials, equipment, construction or services;
 4. Reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
 5. Damage to Owner or another contractor for which Contractor is responsible;
 6. Reasonable evidence that the Work will not be completed within the Contract Time and that the unpaid balance will not be adequate to cover the cost of completing the Work and damages for the anticipated delay; or
 7. Contractor's persistent failure to carry out the Work in accordance with the Contract Documents.
- B. Owner reserves the right to withhold payments to Contractor, subsequent to Architect's certification of any payment request, in order to protect Owner from loss due to any condition described in Section 9.4, Paragraph A, Subparagraphs 1 through 7. Upon satisfactory resolution of any such conditions, payments so withheld will be made.

9.5 PROGRESS PAYMENTS

- A. Owner will pay Contractor progress payments within the parameters of Section 9.2 within fifteen (15) days after Owner receives the certified payment request from Architect.
- B. Owner will make payments to Contractor by either placing the payments in the mail addressed to Contractor or by electronic transfer at Owner's discretion.
- C. Upon receipt of any payment from Owner, Contractor will pay to each Subcontractor the amount paid to Contractor on account of such Subcontractor's portion of the Work.
- D. Contractor will maintain a copy of each payment request at the Project site for review by the Subcontractors.
- E. No payment made under the Contract Documents, either in whole or in part, will be construed to be an acceptance of defective or improper materials or workmanship.
- F. In addition and notwithstanding the foregoing, Owner will also withhold and retain 10% of payments made to Contractor.
- G. Owner will pay any unpaid retention less any amounts withheld pursuant to Section 9.4 within forty-five (45) days after Contractor achieves Substantial Completion, submits its payment request for retained funds, delivers to the Architect Owner's form entitled "Contractor's Substantial Completion Affidavit and Consent of Surety" fully executed by Contractor and its surety, obtains Waiver and Release documents executed by all subcontractors and suppliers having claim against the retained funds, and Owner receives a certificate of occupancy.

9.6 FINAL PAYMENT

- A. Owner will make full and final payment of the Contract Sum within thirty (30) days of the completion of all of the following requirements:
1. Contractor has submitted its final payment request;
 2. Architect has declared to Owner in writing that the Work is complete;
 3. Contractor has obtained waiver and release upon final payment documents executed by all of the subcontractors performing work and/or providing materials covered by the Contractor's final payment request; and
 4. Contractor has collected and provided to Owner all manufacturers' and other guaranties and warranties, properly signed and endorsed to Owner, that are required by the Contract Documents that extend for a period beyond one year after substantial completion. (Delivery of such guaranties and warranties will not relieve Contractor for any obligation assumed under any other provision of the Contract Documents.)
- B. Acceptance of final payment by Contractor or any Subcontractor will constitute a waiver of claims by the payee except for those claims previously made in writing pursuant to Section 7 and identified by Contractor in its affidavit as still pending.
- C. If the aggregate of previous payments made by Owner exceeds the amount due Contractor, Contractor will reimburse the difference to Owner.

SECTION 10 - PROTECTION OF PERSONS AND PROPERTY

10.1 SAFETY PRECAUTIONS AND PROGRAMS

Contractor will be responsible to Owner for initiating and supervising all safety programs in connection with the performance of the Work.

10.2 SAFETY OF PERSONS AND PROPERTY

- A. Contractor will take reasonable precautions to prevent damage, injury, or loss to:

1. All persons on the site;
 2. The Work and materials and equipment to be incorporated into the Work; and
 3. Other property at the site or adjacent to it.
- B. Contractor will give notices and comply with applicable laws, ordinances, rules, regulations, and other lawful requirements of public authorities bearing on the safety or protection of persons and property. No work will be performed that may pose an undue safety hazard to Contractor, Contractor's employees, or any other person.
- C. Contractor will designate a responsible member of its organization at the site whose duty will be the prevention of accidents. This person will be Contractor's onsite representative unless otherwise designated in writing by Contractor to Owner and Architect.

10.3 EMERGENCIES

In case of an emergency endangering life or threatening the safety of any person or property, Contractor may, without waiting for specific authorization from Architect or Owner, act at its own discretion to safeguard persons or property. Contractor will immediately notify Architect of such emergency action and make a full written report to Architect within five (5) days after the event.

10.4 HAZARDOUS MATERIALS

In the event the Contractor encounters on the site material reasonably believed to be hazardous materials which have not been rendered harmless, the Contractor shall immediately stop Work in the area affected and report the condition to the Owner and Architect in writing. The Work in the affected area shall be resumed in the absence of hazardous materials, or when it has been rendered harmless, by written agreement of the Owner and Contractor.

SECTION 11 - INSURANCE AND BONDS

11.1 CONTRACTOR'S LIABILITY INSURANCE

- A. Contractor will obtain the following insurance and provide evidence thereof as described below prior to commencement of the Work or within ten (10) days after signing the Agreement, whichever is earlier:
1. Workers Compensation Insurance.
 2. Employers Liability Insurance with minimum limits of the greater of \$500,000 E.L. each accident, \$500,000 E. L. disease- each employee, \$500,000 E.L. disease-policy limit or as required by the law of the state in which the Project is located.
 3. Commercial General Liability Insurance – ISO Form CG 00 01 (12/07) or equivalent Occurrence policy which will provide primary coverage to the additional insureds (the Owner and the Architect) in the event of any Occurrence, Claim, or Suit with:
 - a. Limits of the greater of Contractor's actual coverage amounts or the following:
 - 1) \$2,000,000 General Aggregate;
 - 2) \$2,000,000 Products - Comp/Ops Aggregate;
 - 3) \$1,000,000 Personal and Advertising Liability;
 - 4) \$1,000,000 Each Occurrence;
 - 5) \$50,000 Fire Damage to Rented Premises (Each Occurrence).
 - b. Endorsements attached to the General Liability policy including the following or their equivalent:
 - 1) ISO Form CG 25 03 (05/09), Amendment of Limits of Insurance (Designated Project or Premises), describing the Agreement and specifying limits as shown above.
 - 2) ISO Form CG 20 10 (07/04), Additional Insured -- Owners, Lessees, Or Contractors (Form B), naming Owner and Architect as additional insureds.
 4. Automobile Liability Insurance, with:
 - a. Combined Single Limit each accident in the amount of \$1,000,000 or Contractor's actual coverage, whichever is greater; and
 - b. Coverage applying to "Any Auto."
- B. Contractor will provide evidence of such insurance to Owner as follows:
1. Deliver to Owner a Certificate of Liability Insurance, on ACORD 25 (2010/05) Form, or equivalent:
 - a. Listing Owner and its consultants as the Certificate Holders and Additional Insured on the general liability and any excess liability policies;
 - b. Attaching the ISO or equivalent endorsements set forth above to the Certificate of Liability Insurance;
 - c. Identifying the Project;
 - d. Listing the insurance companies providing coverage (All companies listed must be rated in A.M. Best Company Key Rating Guide-Property-Casualty and each company must have a rating of B+ Class VII or better. Companies which are not rated are not acceptable); and
 - e. Bearing the name, address and telephone number of the producer and signed by an authorized representative of the producer. The signature may be original, stamped, or electronic.
- C. Contractor will maintain, from commencement of the Work, Insurance coverage required herein as follows:
1. Commercial General Liability Insurance through expiration of warranty period specified in Section 12.2, Paragraph B. including completion of any warranty repairs; and
 2. All other insurance through Final Payment.
- D. Owner reserves the right to reject any insurance company, policy, endorsement, or certificate of insurance with or without cause.

- E. Owner may, in writing and at its sole discretion, modify the insurance requirements.
- F. The cost of insurance as required above will be the obligation of Contractor. Contractor will be responsible for payment of all deductible amounts under all insurance.
- G. Owner will provide builders risk insurance for the cost of the Project. The policy will be written on an all risk basis with coverage for perils of wind, flood, earthquake, and terrorism, with exclusions standard for the insurance industry. The policy will be subject to a \$5,000 deductible per occurrence which will be the responsibility of Contractor and will not be a reimbursable expense. Owner will provide a copy of the terms and conditions of the builders risk policy to Contractor upon Contractor's request. Contractor will comply with terms, conditions, and deadlines of the builders risk policy. The terms, conditions, and deadlines of the builders risk policy shall govern coverage. In addition, when there is a loss which may be covered by the builders risk insurance policy, Contractor will comply with the following:
 1. Contractor will report the loss immediately to builders risk commercial insurer by calling 1-866-537-7475 and shall make such further written submissions as required and otherwise comply with all requirements of the builders risk policy.
 2. Contractor will report the loss immediately to the Owner.
 3. Contractor will immediately notify its general liability insurance carrier of the loss.
 4. Contractor will take all necessary and appropriate actions to protect the property and individuals from further loss, harm, and injury. In the event there are damages resulting from fire or water, restoration shall be performed only by a certified restoration contractor.
 5. To the extent possible, Contractor will preserve and not disturb the evidence of the loss until after the builders risk commercial insurer and all interested parties and their insurance carriers have had the opportunity to view and investigate the site and loss.
 6. Contractor will cooperate with Owner and the builders risk commercial insurer in the investigation, documentation, and settlement of loss claims, including without limitation promptly responding to all requests for information and documentation from the builders risk commercial insurer and/or Owner.

11.2 PERFORMANCE BOND AND LABOR AND MATERIAL PAYMENT BOND

- A. Prior to commencement of the Work or within ten (10) days after signing the Agreement, whichever is earlier, Contractor will furnish to Owner a performance bond and a labor and material payment bond each in an amount equal to one hundred percent (100%) of the Contract Sum as security for all obligations arising under the Contract Documents. Such bonds will:
 1. Be written on Form AIA Document A312 (1984).
 2. Be issued by a surety company or companies licensed in the state in which the Project is located and holding valid certificates of authority under Sections 9304 to 9308, Title 31, of the United States Code as acceptable sureties or reinsurance companies on federal bonds.
 3. Have a penal sum obligation not exceeding the authorization shown in the current revision of Circular #570 as issued by the United States Treasury Department, i.e. "Treasury List".
 4. Be accompanied by a certified copy of the power of attorney stating the authority of the attorney-in-fact executing the bonds on behalf of the surety.
- B. Owner reserves the right to reject any surety company, performance bond, or labor and material payment bond with or without cause.
- C. The cost of the bonds as required above will be the obligation of Contractor.

SECTION 12 - UNCOVERING AND CORRECTION OF WORK

12.1 UNCOVERING OF WORK

Contractor will notify Architect at least twenty-four (24) hours in advance of performing work that would cover up work or otherwise make it difficult to perform inspections required by the Specifications or by applicable governing authorities. Should any such work be covered without proper notification having been given to Architect, Contractor will uncover that work for inspection at its own expense.

12.2 CORRECTION OF WORK

- A. Contractor will promptly correct any portion of the Work that is rejected by Architect or which fails to conform to the requirements of the Contract Documents, whether observed before or after Substantial Completion and whether or not fabricated, installed, or completed. Contractor will bear the cost of correcting such rejected Work, including additional testing and inspection costs, compensation for Architect's services, and any other expenses made necessary thereby.
- B. Contractor will remedy any defects due to faulty materials, equipment, or workmanship which appear within a period of one (1) year from the date of Substantial Completion or within such longer period of time as may be prescribed by law or by the terms of any applicable special warranty required by the Contract Documents. Contractor will pay all costs of correcting faulty work, including without limitation additional Architect's fees, attorney fees, expert fees, consultant fees, copy costs, and other expenses when incurred.
- C. Nothing in the Contract Documents will be construed to establish a period of limitation within which Owner may enforce the obligation of Contractor to comply with the Contract Documents. The one-year period specified above has no relationship to the time within which compliance with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish Contractor's liability with respect to Contractor's obligations.

12.3 ACCEPTANCE OF NONCONFORMING WORK

- A. If Owner prefers to accept any portion of the Work not in conformance with the Contract Documents, Owner may do so instead of requiring removal and correction of the nonconforming Work. In that event, the Contract Sum will be reduced by an amount agreed upon by the parties that reflects the difference in value to Owner between the Work as specified and the nonconforming Work. Such adjustment may consider increased maintenance costs, early replacement costs, increased inefficiency of use, and the like and will be effective whether or not final payment has been made. Such adjustment will be reflected in a Change Order pursuant to Section 7.5.
- B. Temporary or trial usage by Owner or Architect of mechanical devices, machinery, apparatus, equipment, or other work or materials supplied under the Contract Documents prior to written acceptance by Architect, will not constitute Owner's acceptance.

SECTION 13 - RESOLUTION OF DISPUTES

13.1 SUBMITTAL OF DISPUTE

In the event there is any dispute arising under this Agreement which cannot be resolved by agreement between the parties, either party may submit the dispute with all documentation upon which it relies to the Director of Architecture, Engineering, and Construction, Meetinghouse Facilities Department, 50 East North Temple, Salt Lake City, Utah 84150, who will convene a dispute resolution conference within thirty (30) days. The dispute resolution conference will constitute settlement negotiations and any settlement proposal made pursuant to the conference will not be admissible as evidence of liability. In the event that the parties do not resolve their dispute pursuant to the dispute resolution conference, either party may commence legal action to resolve the dispute. Any such action must be commenced within six (6) months from the first day of the dispute resolution conference or be time barred. Submission of the dispute to the Director as outlined above is a condition precedent to the right to commence legal action to resolve any dispute. In the event that either party commences legal action to adjudicate any dispute without first submitting the dispute to the Director, the other party will be entitled to obtain an order dismissing the litigation without prejudice and awarding such other party any costs and attorney fees incurred by that party in obtaining the dismissal, including without limitation copy costs, and expert and consultant fees and expenses.

13.2 CONTRACTOR TO PROCEED WITH DILIGENCE

Pending final resolution of a dispute hereunder, Contractor will proceed diligently with the performance of its obligations under this Agreement.

SECTION 14 - TERMINATION

14.1 TERMINATION BY CONTRACTOR

In the event Owner materially breaches any term of the Contract Documents, Contractor will promptly give Written Notice of the breach to Owner. If Owner fails to cure the breach within ten (10) days of the Written Notice, Contractor may terminate the Agreement by giving Written Notice to Owner and recover from Owner the percentage of the Contract Sum represented by the Work completed on the Project site as of the date of termination together with any out of pocket loss Contractor has sustained with respect to materials and equipment as a result of the termination prior to completion of the Work, less any offsets. Contractor will not be entitled to unearned profits or any other compensation or damages as a result of the termination and hereby waives any claim therefor. Contractor will provide to Owner all warranty, as built, inspection, and other close out documents as well as materials that Contractor has in its possession or control at the time of termination. Without limitation, Contractor's indemnities and obligations under section 3.14 as well as all warranties in the specifications relative to Work provided through the date of termination survive a termination hereunder.

14.2 TERMINATION BY OWNER FOR CAUSE

Should Contractor fail to provide Owner with the bonds and certificates of insurance required by Section 11 within the time specified therein, make a general assignment for the benefit of its creditors, fail to apply enough properly skilled workmen or specified materials to properly prosecute the Work in accordance with Contractor's schedule, or otherwise materially breach any provision of the Contract Documents, then Owner may, without any prejudice to any other right or remedy, give Contractor Written Notice thereof. If Contractor fails to cure its default within ten (10) days, Owner may terminate the Agreement by giving Written Notice to Contractor. In such case, Owner may, in Owner's sole discretion, take legal assignment of subcontracts and other contractual rights of Contractor and/or take possession of the premises and all materials, tools, equipment, and appliances thereon, and finish the Work by whatever method Owner deems expedient. Contractor will not be entitled to receive any further payment until the Work is finished. If the unpaid balance of the Contract Sum exceeds the expense of finishing the Work, including compensation for additional administrative, architectural, consultant, and legal services (including without limitation attorney fees, expert fees, copy costs, and other expenses), such excess will be paid to Contractor. If such expense exceeds the unpaid balance, Contractor will pay the difference to Owner. Contractor will provide to Owner all warranty, as built, inspection, and other close out documents as well as materials that Contractor has in its possession or control at the time of termination. Without limitation, Contractor's indemnities and obligations under section 3.14 as well as all warranties in the specifications relative to Work provided through the date of termination survive a termination hereunder.

14.3 TERMINATION BY OWNER FOR CONVENIENCE

Notwithstanding any other provision contained in the Contract Documents, Owner may, without cause and in its absolute discretion, terminate the Agreement at any time. In the event of such termination, Contractor will be entitled to recover from Owner the

percentage of the Contract Sum equal to the percentage of the Work which Architect determines has been completed on the Project site as of the date of termination together with any out of pocket loss Contractor has sustained with respect to materials and equipment as a result of the termination prior to completion of the Work, less any offsets. Contractor will not be entitled to unearned profits or any other compensation as a result of the termination and hereby waives any claim therefor. Contractor will provide to Owner all warranty, as built, inspection, and other close out documents as well as materials that Contractor has in its possession or control at the time of termination. Owner may, in Owner's sole discretion, take legal assignment of subcontracts and other contractual rights of Contractor. Without limitation, Contractor's indemnities and obligations under section 3.14 as well as all warranties in the specifications relative to Work provided through the date of termination survive a termination hereunder.

SECTION 15 - MISCELLANEOUS PROVISIONS

15.1 GOVERNING LAW

The parties acknowledge that the Contract Documents have substantial connections to the State of Utah. The Contract Documents will be deemed to have been made, executed, and delivered in Salt Lake City, Utah. To the maximum extent permitted by law, (i) the Contract Documents and all matters related to their creation and performance will be governed by and enforced in accordance with the laws of the State of Utah, excluding conflicts of law rules; and (ii) all disputes arising from or related to the Contract Documents will be decided only in a state or federal court located in Salt Lake City, Utah and not in any other court or state. Toward that end, the parties hereby consent to the jurisdiction of the state and federal courts located in Salt Lake City, Utah and waive any other venue to which they might be entitled by virtue of domicile, habitual residence, place of business, or otherwise.

15.2 NO WAIVER

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

15.3 RULE OF CONSTRUCTION

Owner and Contractor agree that the Contract Documents will be deemed to have been drafted by both Owner and Contractor and will not be construed against either Owner or Contractor because of authorship.

15.4 ENFORCEMENT

In the event either party commences legal action to enforce or rescind any provision of the Contract Documents, the prevailing party will be entitled to recover its attorney fees and costs, including without limitation all copy costs and expert and consultant fees and expenses, incurred in that action and on all appeals, from the other party.

15.5 TESTS AND INSPECTIONS

- A. Owner and Architect have the right to have tests made when they deem it necessary. Tests conducted by Owner or Architect will be paid for by Owner. Should a test reveal a failure of the Work to meet Contract Document requirements, the cost of the test as well as subsequent tests related to the failure necessary to determine compliance with the Contract Documents will be paid for by Owner, with the cost thereof deducted from the Contract Sum by Modification.
- B. Tests will be made in accordance with recognized standards by a competent, independent testing laboratory. Materials found defective or not in conformity with Contract Document requirements will be promptly replaced or repaired at the expense of Contractor.
- C. Owner and Architect have the right to obtain samples of materials to be used in the Work and to test samples for determining whether they meet Contract Document requirements. Samples required for testing will be furnished by Contractor and selected as directed by Architect. Samples may be required from the sample's source, point of manufacture, point of delivery, or point of installation at Architect's discretion. Samples not required as a Submittal in the Specifications will be paid for by Owner. Should tests reveal a failure of the Sample to meet the Contract Document requirements, Contractor will provide other Samples that comply with the requirements of the Contract Documents.

END OF DOCUMENT

SUPPLEMENTARY CONDITIONS
FIXED SUM (U.S.)

ITEM 1 - GENERAL

1. Conditions of the Agreement and General Conditions apply to each Division of the Specifications.
2. Provisions contained in Division 01 apply to all Divisions of the Specifications.

ITEM 2 - LIQUIDATED DAMAGE AMOUNTS:

1. The amount of liquidated damages to the benefit of the Contractor for delays under General Conditions Section 7.3, Paragraph B is \$350.00 per day.
2. The amount of liquidated damages to be paid to the Owner for delays in Substantial Completion under General Conditions Section 8.3, Paragraph A is \$350.00 per day.
3. The amount of liquidated damages to be paid to the Owner for delays in completing work itemized on the Substantial Completion Certificate under General Conditions Section 8.3, Paragraph B is \$350.00 per day.

ITEM 3 - PERMITS

1. Delete Section 3.6, Paragraph B of the General Conditions and replace with the following:
 - A. Contractor will obtain and pay for the building permit, and all other permits, governmental fees, and inspections necessary for the proper execution and completion of the Work. Do not include these fees in the Bid Amount. The Owner will reimburse the Contractor for the payment of these permits and fees. The reimbursement of these permits and fees will not be part of and will be processed separately from the project's Contract Sum.

ITEM 4 - MISCELLANEOUS CHANGES IN GENERAL CONDITIONS

1. FOR PROJECTS EXCEEDING \$5 MILLION – CONTRACTOR TO PROVIDE BUILDER'S RISK INSURANCE (AND NOT OWNER)

Replace Section 11.1 Contractor's Liability Insurance of the General Conditions with the following:

11.1 CONTRACTOR'S LIABILITY INSURANCE

- A. Contractor will obtain the following insurance and provide evidence thereof as described below prior to commencement of the Work or within ten (10) days after signing the Agreement, whichever is earlier:
 1. Workers Compensation Insurance.
 2. Employers Liability Insurance with minimum limits of the greater of: \$500,000 E.L. each accident, \$500,000 E. L. disease-each employee, \$500,000 E.L. disease-policy limit; or as required by the law of the state in which the Project is located.
 3. Commercial General Liability Insurance – ISO Form CG 00 01 (12/07) or equivalent Occurrence policy which will provide primary coverage to the additional insureds (the

Owner and the Architect) in the event of any Occurrence, Claim, or Suit with:

a. Limits of the greater of: Contractor's actual coverage amounts or the following:

- 1) \$2,000,000 General Aggregate;
- 2) \$2,000,000 Products - Comp/Ops Aggregate;
- 3) \$1,000,000 Personal and Advertising Injury;
- 4) \$1,000,000 Each Occurrence;
- 5) \$50,000 Damage to Rented Premises.

b. Endorsements attached to the General Liability policy including the following or their equivalent:

- 1) ISO Form CG 25 03 (05/09), Designated Construction Project(s) General Aggregate Limit, describing the project and specifying that limits apply to each project of the contractor.
- 2) ISO Form CG 20 10 (07/04), Additional Insured – Owners, Lessees or Contractors – Scheduled Person or Organization, naming Owner and Architect as additional insureds.

4. Automobile Liability Insurance, with:

- a. Combined Single Limit each accident in the amount of \$1,000,000 or Contractor's actual coverage, whichever is greater; and
- b. Coverage applying to "Any Auto" or equivalent to all owned autos, hired autos, and non-owned autos.

5. Builder's Risk Insurance Policy – ISO Form CP 00 20 (10/12), Builders Risk Coverage (or equivalent form) and ISO Form CP 10 30 (10/12) Causes of Loss – Special Form, and ISO Form CP 11 20 (06/07) Builders Risk – Collapse During Construction (or equivalent form) with Limits of Insurance in the amount of the Contract Sum.

- a. Policy will cover materials stored at temporary storage locations and materials in transit.
- b. Include Owner and Subcontractors as additional insureds.
- c. Policy will be subject to a deductible of not less than \$5,000 per occurrence which will be the responsibility of Contractor and will not be included in the Cost of the Work or be a reimbursable expense.

B. Contractor will provide evidence of such insurance to Owner as follows:

1. Deliver to Owner a Certificate of Insurance on ACORD 25 (2010/05) or equivalent:

- a. Listing Owner as the Certificate Holder and Owner and Architect as Additional Insureds on general liability and any excess liability policies;
- b. Attaching the endorsements set forth above for additional insured on general liability (CG 20 10 07/04) and Designated Construction Project Aggregate Limit (CG 25 03 05/09).
- c. Identifying the Project.
- d. Listing the insurance companies providing coverage. All companies must be rated in A.M. Best Company's Key Rating Guide – Property-Casualty, current edition, at a rating B+ Class VII or better. Companies that are not rated are not acceptable.
- e. Bearing the name, address, and telephone number of the producer and signed by an

authorized representative of the producer. The signature may be original, stamped, or electronic. A faxed or digital copy is also acceptable.

2. Deliver to Owner a Certificate of Insurance on ACORD 27, Evidence of Property Insurance, for the Builders Risk Insurance Policy attaching the endorsement giving evidence that the Owner and all Subcontractors are listed as additional insureds on the Builders Risk Policy.
- C. Contractor will maintain, from commencement of the Work, Insurance coverage required herein as follows:
1. Commercial General Liability Insurance through expiration of warranty period specified in Section 12.2, Paragraph B. including completion of any warranty repairs;
 2. Builders' Risk Insurance through Substantial Completion; and
 3. All other insurance through final payment.
- D. In the event of a loss, or upon request by Owner, Contractor will provide Owner with a copy of required insurance policies above.
- E. Owner reserves the right to reject any insurance company, policy, endorsement, or certificate of insurance with or without cause.
- F. Owner may, in writing and at its sole discretion, modify the insurance requirements.

ITEM 5 - STATE SPECIFIC SUPPLEMENTARY CONDITIONS

Utah

RETENTION APPLIED TO CONTRACTOR PAYMENTS FOR PROJECTS IN UTAH:

Replace section 9.5.F of the General Conditions with the following:

- F. In addition and notwithstanding the foregoing, Owner may also withhold and retain 5% of payments made to Contractor. These retention funds will be held in an interest bearing account.

PAYMENT OF RETAINED FUNDS IN UTAH:

Replace section 9.5 G of the General Conditions with the following:

- G. After Contractor achieves Substantial Completion and submits its payment request for retained funds and delivers to the Architect Owner's form entitled "Contractor's Substantial Completion Affidavit and Consent of Surety" fully executed by Contractor and its surety, if any, and provides statutory Conditional Waiver and Release documents executed by all subcontractors and suppliers having claim against the retained funds, Owner will pay any unpaid retention less any amounts withheld pursuant to Section 9.4 within forty-five (45) days from the later of (a) the date Owner received Contractor's payment request for retained funds and fully executed Contractor's Substantial Completion Affidavit and Consent of Surety, (b) the date a certificate of occupancy is issued; (c) the date that a building inspector having authority to issue its own certificate of occupancy does not issue that certificate but permits occupancy.

UTAH STATE SALES TAX:

Add the following to the General Conditions:

1. Contractors should be exempt on purchases of material installed or converted into real property to be used by the Owner. The Contractor will furnish each vendor with a completed Exemption Certificate Form TC-721. The certificate will be prepared by the Contractor for each vendor in order to obtain the exemption.
2. The Owner's tax exempt number is 11871701-002-STC.

UTAH NOTICE OF INTENT TO OBTAIN FINAL COMPLETION:

Add the following to the General Conditions:

- A. Contractor will file with the State Construction Registry, on its own behalf and/or on behalf of Owner, a notice of intent to obtain final completion at least 45 days before the day on which the Owner or Contractor files or could file a notice of completion under Utah Code Ann. Section 38-1a-506 if:
 1. The completion of performance time under the original contract for construction work is greater than 120 days;
 2. The total original construction contract price exceeds \$500,000; and
 3. The original contractor or owner has not obtained a payment bond in accordance with Utah Code Ann. Section 14-2-1.

UTAH NOTICE OF COMPLETION:

Add the following to the General Conditions:

- A. Within five (5) calendar days of final completion of the Project and in compliance with Section 38-1a-507 Utah Code Annotated, Contractor will file with the State Construction Registry, and copy to Owner, a notice of completion which will include, without limitation, the following:
 1. The name, address, telephone number, and email address of the person filing the notice of completion;
 2. The name of the county in which the Project and/or Project site is located;
 3. The date on which final completion is alleged to have occurred;
 4. The method used to determine final completion; and
 5. One of the following:
 - a. The tax parcel identification number of each parcel included in the Project and/or Project site;
 - b. The entry number of a preliminary notice on the same project that includes the tax parcel identification number of each parcel included in the Project and/or Project site; or
 - c. The entry number of the building permit issued for the Project.
- B. Notwithstanding any other provision of the Contract Documents to the contrary, Contractor and Owner agree that any breach or failure to comply with this Section by the Contractor will constitute a breach of contract and the Contractor will be liable for any direct, indirect, or consequential damages to the Owner flowing from this breach.

UTAH PROGRESS PAYMENTS AND FINAL PAYMENT:

Replace Section 9.5.A of the General Conditions with the following:

9.5 PROGRESS PAYMENTS

- A. Owner will pay Contractor progress payments within the parameters of Section 9.2 within fifteen (15) days after:
1. Contractor has submitted a progress payment request;
 2. Contractor has obtained Conditional Waiver and Release Upon Progress Payment documents (in content complying with Utah Code § 38-1a-802) executed by each of the subcontractors performing work and/or providing materials covered by the Contractor's progress payment request; and
 3. Owner receives the certified payment request from Architect.

Replace Section 9.6.A.3 of the General Conditions with the following:

9.6 FINAL PAYMENT

3. Contractor has obtained Waiver and Release Upon Final Payment documents (in content complying with Utah Code § 38-1a-802) executed by each of the subcontractors performing work and/or providing materials covered by the Contractor's final payment request;

END OF DOCUMENT

4884-7961-0114

**SECTION 01 1000
SUMMARY**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Summary of Work.
- B. Work restrictions.
- C. Owner-furnished materials.
- D. Management of multiple contracts.

1.02 PROJECT

- A. Project Name: Tooele UT Deseret Peak Sr Seminary.
- B. Church Project Number: 501-3450.
- C. Owner's Name: The Church of Jesus Christ of Latter-day Saints.
- D. Architect's Name: BHD Architects.
- E. The Project consists of the construction of a custom 5-classroom seminary and associated site improvements.

1.03 WORK COVERED BY CONTRACT DOCUMENTS

- A. Provisions contained in Division 01 apply to Sections of Divisions 02 through 49 of Specifications. Instructions contained in Specifications are directed to Contractor. Unless specifically provided otherwise, obligations set forth in Contract Documents are obligations of Contractor
- B. Contractor shall furnish total labor, materials, equipment, and services necessary to perform The Work in accordance with Contract Documents.

1.04 CONTRACT DESCRIPTION

- A. Contract Type: A single prime contract based on a Stipulated Price unless directed differently by Owner's representative.

1.05 WORK BY OWNER

- A. Owner will furnish and install some portions of The Work with its own forces. Contractor will be provided with schedule of when these items are to be performed.
 - 1. General:
 - a. Complete work necessary to accommodate work to be performed by Owner before scheduled date for performance of such work. Contractor will be back charged for actual expenses incurred by Owner for failure to timely complete such work.
 - b. Store and protect completed work provided by Owner until date of Substantial Completion.
- B. Owner will furnish and install the following after Substantial Completion:
 - 1. Interior and Exterior Door Cylinders and Cores.
 - 2. HVAC Test and Balance.
 - 3. Phone and Computer Systems.
 - 4. Furniture and Equipment.
- C. Owner will furnish the following to be installed by the Contractor:
 - 1. Interior Signage.
 - 2. Exterior Building Seminary Signs.
 - 3. Exterior Building Address Sign.
 - 4. Exterior Post-Mounted Sign.
 - 5. Artwork.
 - 6. Network Equipment:
 - a. Internet Firewall.

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- b. Network Switch.
- c. Wireless Access Points.
- 7. Collaboration Room Appliances.

1.06 WORK BY CONTRACTOR

- A. Coordination:
 - 1. Coordinate sequence of activities to accommodate required quality assurance and quality control services with minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
- B. Scheduling:
 - 1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- C. Review 'Contractor Notice of Owner Furnished Materials' notice listing Owner-furnished products to be delivered for Project:
 - 1. Review due (delivery) dates and vendor lead times for each item and coordinate with construction schedule. Immediately report recommended changes to Owner's Purchasing Coordinator listed in 'Contractor Notice of Owner Furnished Materials'. Contact vendors directly if changes to delivery dates become necessary during construction.
 - 2. Report problems in coordinating due (delivery) dates with construction schedule to Architect and Owner's Purchasing Coordinator.
- D. Receive, unload, store and properly protect Owner-furnished materials and products.
 - 1. Provide labor and equipment necessary to receive, unload, and store materials and products.
 - 2. Count number of pieces received and note any discrepancies on Delivery Receipt before driver leaves:
 - 3. Include Project Name and Project Number on Delivery Receipt.
 - 4. Check for visible evidence of damage such as holes, tears, or crushed portions of cartons and note on Delivery Receipt before driver leaves:
 - a. If you are unsure if carton is damaged, take photo of cartons and share it with Owner's Purchasing Coordinator.
- E. Within forty-eight (48) hours of delivery:
 - 1. Open and inspect each piece of freight delivered. Take picture of any concealed damage not reported at time of delivery and report it to Owner's Purchasing Coordinator.
 - 2. Compare 'Contractor Notice of Owner Furnished Materials' with packing slips. Note discrepancies in number, size, color, model numbers, etc.
 - 3. Deliver copy of Delivery Receipt (bill of lading) on which you have noted any loss or damage to Owner's Purchasing Coordinator. Include in your submission any report of concealed damage, discrepancies or photos.
- F. Failure to strictly follow above procedures will result in Contractor's assumption of all financial responsibility for this shipment. All replacement and reorders must be made through Owner's Purchasing Coordinator and must allow Owner's vendor sufficient lead time to produce and ship new product.
- G. When above procedures are strictly followed, shortages and damaged items will be replaced by Owner at Owner's cost.

1.07 OWNER OCCUPANCY

- A. Owner intends to occupy the Project upon Substantial Completion.
- B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
- C. Schedule the Work to accommodate Owner occupancy.

1.08 CONTRACTOR USE OF SITE AND PREMISES

- A. Construction Operations:
 - 1. Locate and conduct construction activities in ways that will limit disturbance to site.

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- B. Contractor will ensure that Contractor, its employees, subcontractors, and their employees comply with following requirements:
1. Do not use or consume alcohol or cannabis, or illegal use drugs, on the Project Site or enter on or perform any Work on the Project Site while under their influence.
 2. Do not smoke or vape anything on the Project Site. Do not use tobacco in any form on the Project Site.
 3. Do not perform Work on the Project Site on Sundays except for emergency work.
 4. Refrain from using profanity or being discourteous or uncivil to others on the Project Site or while performing Work under this Agreement.
 5. Do not view or allow pornographic or other indecent materials on the Project Site.
 6. Do not play obnoxious and/or loud music on the Project Site. Do not play any music within existing facilities.
 7. Refrain from wearing immodest, offensive, or obnoxious clothing, while on the Project Site.
 8. Do not bring weapons on the Project Site.
- C. Existing building spaces may not be used for storage.
- D. Do not load or permit any part of the structure to be loaded with a weight that will endanger its safety. Questions of structural loading as part of construction means and methods shall be addressed by a licensed structural engineer engaged by Contractor, subject to the review by Architect.

1.09 MULTIPLE CONTRACT SUMMARY

- A. Owner may issue separate contracts for operations scheduled to precede and be substantially completed before beginning of The Work under this Contract.
1. Contractor will be given written notice from such contractors of any revisions to scheduled completion of their work at least 30 days in advance. Owner will reimburse Contractor for expenses incurred by Contractor by failure to be properly notified.
- B. Owner has issued or will issue separate contracts for operations scheduled to be completed between Notice to Proceed and Substantial Completion.
1. General:
 - a. Schedule performance of work covered by such separate contracts in Contractor's Construction Schedule so as to avoid delays in Substantial Completion. Give written notice to such contractors and to Owner of any revisions to scheduled delivery and work dates at least 90 days in advance.
 - b. Complete work necessary to accommodate items provided under such separate contracts before scheduled date for performance of such work. Contractor will be back charged for actual expenses incurred by Owner for failure to timely complete such work including, but not limited to, cost of crews during downtime or for call backs and costs to correct substrate deficiencies.
 - c. Store and protect completed work provided under separate contracts until date of Substantial Completion.
 2. Separate contracts issued by Owner:
 - a. Sheet carpeting, walk-off tiles, carpet base, and rubber base.
 - b. Soap dispensers, paper towel dispensers, and toilet tissue dispensers.
 - c. Testing and Inspection. See Section 01 4000 "Quality Requirements" for testing and inspection, and testing laboratory services for materials, products, and construction methods.
 - d. HVAC test and balance.
 - e. Display boards (writable walls).
 - f. Internet service provider modem.
- C. Owner has issued or will issue separate contracts for operations normally scheduled to follow Substantial Completion.
1. General:

- a. Give written notice to such contractors and to Owner of any revisions of scheduled date of Substantial Completion at least 90 days in advance. Contractor will be back charged for actual expenses incurred by Owner for failure to accurately report date of Substantial Completion.
- b. Complete work necessary to accommodate items provided under such separate contracts before Substantial Completion. Contractor will be back charged for actual expenses incurred by Owner for failure to complete such work before Substantial Completion.

1.10 MULTIPLE CONTRACT COORDINATION

- A. Contractor shall be responsible for accurately maintaining and reporting schedule of The Work from Notice to Proceed to date of Substantial Completion.
- B. Contractor shall be responsible for providing Temporary Facilities And Controls for those who perform work on Project from Notice to Proceed to date of Substantial Completion.
- C. Contractor shall be responsible for providing Construction Waste Management And Disposal services for those who perform work on Project from Notice to Proceed to date of Substantial Completion.
- D. Contractor shall be responsible for Final Cleaning for entire Project.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

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**SECTION 01 2000
PRICE AND PAYMENT PROCEDURES**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Procedures for preparation and submittal of applications for progress payments.
- B. Procedures for preparation and submittal of application for final payment.

1.02 SCHEDULE OF VALUES

- A. Submit schedule of values on Owner's standard form to Architect 20 days minimum before submission of Initial Payment Request as a necessary condition before payment will be processed. Coordinate preparation of schedule of values with preparation of Contractor's Construction Schedule. Correlate line items in Schedule of Values with other required administrative schedules and forms, including:
 - 1. Contractor's Construction Schedule.
 - 2. Payment Request form.
 - 3. Schedule of Allowances.
 - 4. Schedule of Alternates.
- B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Architect for approval.
- C. Forms filled out by hand will not be accepted.

1.03 APPLICATIONS FOR PROGRESS PAYMENTS

- A. Payment Period: Submit at intervals stipulated in the Agreement.
- B. Use Payment Request forms provided by Owner.
- C. Provide following submittals before or with submittal of Initial Payment Request:
 - 1. List of Subcontractors.
 - 2. Initial progress report.
 - 3. Contractor's Construction Schedule.
 - 4. Submittal Schedule.
- D. Each Payment Request will be consistent with previous requests and payments certified by Architect and paid for by Owner.
- E. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.
- F. Forms filled out by hand will not be accepted.
- G. Execute certification by signature of authorized officer.
- H. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed.
- I. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.
- J. Submit copy of each Application for Payment.
- K. Construction progress schedule, revised and current as specified in Section 01 3216.

1.04 APPLICATION FOR FINAL PAYMENT

- A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.
- B. Provide Affidavit of Contractor and Consent of Surety with Payment Request following Substantial Completion.

PART 2 PRODUCTS - NOT USED**PART 3 EXECUTION - NOT USED**

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END OF SECTION

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**SECTION 01 3000
ADMINISTRATIVE REQUIREMENTS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General administrative requirements.
- B. Preconstruction meeting.
- C. Progress meetings.
- D. Pre-Installation Conferences
- E. Submittals for review, information, and project closeout.
- F. Submittal procedures.

1.02 GENERAL ADMINISTRATIVE REQUIREMENTS

- A. Comply with requirements of Section 01 7000 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.
- B. Project designation for this Project is Tooele UT Deseret Peak Sr Seminary. This Project designation will be included on documents generated for Project by Contractor and Subcontractors, or be present on a cover letter accompanying such documents.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRECONSTRUCTION MEETING

- A. Architect will schedule a meeting after Notice of Award.
- B. Architect will record minutes and distribute copies within three working days after meeting to participants and those affected by decisions made.

3.02 PROGRESS MEETINGS

- A. Architect will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- B. Progress meetings will be open to Owner, Architect, Subcontractors, and anyone invited by Owner, Architect, and Contractor.
- C. Architect will record minutes and distribute copies within three working days after meeting to participants and those affected by decisions made.

3.03 PRE-INSTALLATION CONFERENCES

- A. Attend pre-installation conferences specified in Contract Documents.
 - 1. If possible, schedule these conferences on same day as regularly scheduled Progress Meetings. If this is not possible, coordinate scheduling with Architect.
 - 2. Request input from attendees in preparing agenda.
- B. See individual specification sections for information to include in Pre-Installation Conferences.
- C. Architect will record minutes and distribute copies within three working days after meeting to participants and those affected by decisions made.

3.04 SUBMITTAL SCHEDULE

- A. Submit to Architect for review a schedule for submittals in tabular format, listing items specified to be furnished for review to Architect including product data, shop drawings, samples, and Informational Submittals.
 - 1. Submit at the same time as the preliminary schedule or 20 days after receipt of Notice to Proceed.
 - 2. Coordinate with Contractor's construction schedule.

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3. Format schedule to allow tracking of status of submittals throughout duration of construction.
4. Enclose the following information for each item:
 - a. Scheduled date for first submittal.
 - b. Related Section number.
 - c. Submittal category.
 - d. Name of Subcontractor.
 - e. Description of part of the Work covered.
 - f. Scheduled date for resubmittal.
 - g. Scheduled date for Architect's final release or approval.
5. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.
 - a. For assemblies, equipment, systems comprised of multiple components and/or requiring detailed coordination with other work, allow for additional time to make corrections or revisions to initial submittals, and time for their review.
 - b. Print and distribute copies to Architect and Owner and post copy in field office. When revisions are made, distribute to same parties and post in same location.
 - c. Revise schedule monthly. Send copy of revised schedule to Owner and Architect and post copy in field office.

3.05 SUBMITTALS FOR REVIEW

- A. When the following are specified in individual sections, submit them for review:
 1. Product data.
 2. Shop drawings.
 3. Samples for selection.
 4. Samples for verification.
- B. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.
- C. Samples will be reviewed for aesthetic, color, or finish selection.
- D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 7800 - Closeout Submittals.

3.06 SUBMITTALS FOR INFORMATION

- A. When the following are specified in individual sections, submit them for information:
 1. Design data.
 2. Certificates.
 3. Test reports.
 4. Inspection reports.
 5. Manufacturer's instructions.
 6. Manufacturer's field reports.
 7. Field engineering daily reports.
 8. Special Procedure Submittals: Describe submittals intended to document special procedures. An example would be construction staging or phasing for remodeling an existing facility while keeping it in operation. While the Contractor would normally be responsible for managing this, submittal of his plan as documentation could be specified.
 9. Qualification Statements: Describe submittals intended to document qualification of entities employed by Contractor.
 10. Other types indicated.
- B. Submit for Architect's knowledge as contract administrator or for Owner.

3.07 SUBMITTALS FOR PROJECT CLOSEOUT

- A. Submit Correction Punch List for Substantial Completion.

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- B. Submit Final Correction Punch List for Substantial Completion.
- C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 7800 - Closeout Submittals:
 - 1. Project record documents.
 - 2. Operation and maintenance data.
 - 3. Warranties.
 - 4. Bonds.
 - 5. Project Manual: Complete Project Manual including Addenda and Modifications as defined in General Conditions.
 - 6. Record Documentation: Describe submittal of record documentation specific to the Section.
 - 7. Software: Describe submittal system software and programming software specific to the Section.
- D. Final Property Survey.
- E. Submit for Owner's benefit during and after project completion.

3.08 MAINTENANCE MATERIAL SUBMITTALS

- A. This title groups maintenance material required submittals specific to the Section. Items may be provided at completion of Work or submitted with section 01 7800 - Closeout Submittals:
 - 1. Spare Parts: Describe spare parts necessary for Owner's use in facility operation and maintenance. 'Parts' are generally understood to be items such as filters, motor drive belts, lamps, and other similar manufactured items that require only simple replacement.
 - 2. Extra Stock Materials: Describe extra stock materials to be provided for Owner's use in facility operation and maintenance. Extra stock materials are generally understood to be items such as ceiling tiles, flooring, paint etc.
 - 3. Tools:
 - a. Describe tools to be provided for Owner's use in facility operation and maintenance. Tools are generally understood to be wrenches, gauges, circuit setters, etc, required for proper operation or maintenance of a system.

3.09 NUMBER OF COPIES OF SUBMITTALS

- A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.

3.10 SUBMITTAL PROCEDURES

- A. General Requirements:
 - 1. Identification:
 - a. Place permanent label or title block on each submittal for identification. Include name of entity that prepared each submittal on label or title block.
 - 1) Provide space approximately 4 by 5 inches on label or beside title block on Shop Drawings to record Contractor's review and approval markings and action taken.
 - 2) Include 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) Number and title of appropriate Specification Section.
 - (i) Drawing number and detail references, as appropriate.
 - 2. Use a single transmittal for related items.
 - 3. Submit separate packages of submittals for review and submittals for information, when included in the same specification section.

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4. Transmit using approved form.
 - a. Use Contractor's form, subject to prior approval by Architect.
 5. Sequentially identify each item. For revised submittals use original number and a sequential "R" suffix.
 6. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
 7. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
 - a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
 8. Deliver each submittal on date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project.
 - a. Deliver submittals to Architect at business address.
 - b. Send submittals in electronic format via email to Architect.
 9. Schedule submittals to expedite the Project, and coordinate submission of related items.
 - a. For each submittal for review, allow 21 days excluding delivery time to and from the Contractor.
 - b. For sequential reviews involving Architect's consultants, Owner, or another affected party, allow an additional 10 days.
 - c. For sequential reviews involving approval from authorities having jurisdiction (AHJ), in addition to Architect's approval, allow an additional 30 days.
 10. No extension of Contract Time will be authorized because of failure to transmit submittals to Architect in sufficient time before work is to be performed to allow processing.
- B. Product Data Procedures:
1. Mark each copy of each set of submittals to show choices and options used on Project. Where printed Product Data includes information on products that are not required for Project, mark copies to indicate information relating to Project.
 2. Certify that proposed product complies with requirements of Contract Documents. List any deviations from those requirements on form or separate sheet.
 3. Submit only information required by individual specification sections.
 4. Collect required information into a single submittal.
 5. Submit concurrently with related shop drawing submittal.
 6. Do not submit (Material) Safety Data Sheets for materials or products.
- C. Shop Drawing Procedures:
1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
 2. Do not reproduce Contract Documents to create shop drawings.
 3. 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 36 by 48 inches. Highlight, encircle, or otherwise show deviations from Contract Documents. Include following information as a minimum:
 - a. Dimensions.
 - b. Identification of products and materials included.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 4. Review and designate (stamp) approval of shop drawings. Unless otherwise specified, submit to Architect six copies of shop drawings required by Contract Documents. Shop drawings not required by Contract Documents, but requested by Contractor or supplied by Subcontractor, need not be submitted to Architect for review.
- D. Samples Procedures:

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1. Transmit related items together as single package.
2. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.
3. Include with transmittal high-resolution image files of samples to facilitate electronic review and approval. Provide separate submittal page for each item image.
4. Submit full-size, fully fabricated Samples cured and finished as specified and physically identical with material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture, and pattern.
 - a. Mount, display, or package Samples to ease review of qualities specified. Prepare Samples to match samples provided by Architect, if applicable. Include following:
 - 1) Generic description of Sample.
 - 2) Sample source.
 - 3) Product name or name of manufacturer.
 - 4) Compliance with recognized standards.
 - 5) Availability and delivery time.
5. Submit Samples for review of kind, color, pattern, and texture, for final check of these characteristics with other elements, and for a comparison of these characteristics between final submittal and actual component as delivered and installed.
 - a. Where variations in color, pattern, texture or other characteristics are inherent in material or product represented, submit set of three samples minimum that show approximate limits of variations.
 - b. Refer to other specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation and similar construction characteristics.
 - c. Refer to other Sections for Samples to be returned to Contractor for incorporation into The Work. Such Samples shall be undamaged at time of use. On transmittal, indicate special requests regarding disposition of Sample submittals.
6. Where Samples are for selection of color, pattern, texture, or similar characteristics from a range of standard choices, submit full set of choices for material or product. Preliminary submittals will be reviewed and returned with Architect's mark indicating selection and other action.
7. Except for Samples illustrating assembly details, workmanship, fabrication techniques, connections, operation, and similar characteristics, submit three sets. One will be returned marked with action taken.
8. Samples, as accepted and returned by Architect, will be used for quality comparisons throughout course of construction.
 - a. Unless noncompliance with Contract Documents is observed, submittal may serve as final submittal.
 - b. Sample sets may be used to obtain final acceptance of construction associated with each set.

END OF SECTION

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**SECTION 01 3216
CONSTRUCTION PROGRESS SCHEDULE**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Preliminary schedule.
- B. Construction progress schedule, bar chart type.
- C. Construction progress schedule, with network analysis diagrams and reports if required by Owner.
- D. Daily Construction Reports.

1.02 SUBMITTALS

- A. Within 10 days after date of Agreement, submit preliminary schedule defining planned operations for the first 60 days of Work, with a general outline for remainder of Work.
- B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.
- C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
 - 1. Include written certification that major contractors have reviewed and accepted proposed schedule.
- D. Within 10 days after joint review, submit complete schedule.
- E. Submit updated schedule with each Application for Payment.

1.03 SCHEDULE FORMAT

- A. Provide separate time bar for each construction activity listed on Owner's payment request form.
- B. Listings: In chronological order according to the start date for each activity. Identify each activity with the applicable specification section number.
- C. Sheet Size: Multiples of 8-1/2 x 11 inches.
- D. Scale and Spacing: To allow for notations and revisions.

PART 2 PRODUCTS - NOT USED**PART 3 EXECUTION****3.01 PRELIMINARY SCHEDULE**

- A. Prepare preliminary schedule in the form of a horizontal bar chart.

3.02 CONTENT

- A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.
- B. Provide separate time bar for each construction activity listed on Owner's payment request form.
- C. Identify each item by specification section number.
- D. Identify work of separate stages and other logically grouped activities.
- E. Provide sub-schedules to define critical portions of the entire schedule.
- F. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.
- G. Indicate delivery dates for owner-furnished products.
- H. Coordinate content with schedule of values specified in Section 01 2000 - Price and Payment Procedures.
- I. Provide legend for symbols and abbreviations used.

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3.03 ACCELERATION OF WORK

- A. Complete The Work in accordance with Construction Schedule. If Contractor falls behind schedule, take such actions as are necessary, at no additional expense to Owner, to bring progress of The Work back in accordance with schedule.
- B. Owner may request proposal for completion of The Work at date earlier than expiration of Contract Time:
 - 1. Promptly provide requested proposal showing cost of such acceleration of The Work. Consult with Owner and Architect regarding possible options to decrease cost of such acceleration.
 - 2. If Owner determines to order acceleration of The Work, change in Contract Sum and Contract Time resulting from acceleration will be included in a Change Order.

3.04 BAR CHARTS

- A. Provide separate time bar for each construction activity listed on Owner's payment request form.
- B. Include a separate bar for each major portion of Work or operation.
- C. Identify the first work day of each week.
- D. Project Management Software Programs:
 - 1. Any software project management program capable of Bar Chart Scheduling for projects of equal size and complexity is approved by Contractor and approved by Owner's Project Manager.

3.05 NETWORK ANALYSIS IF REQUIRED BY OWNER

- A. Prepare network analysis diagrams and supporting mathematical analyses using the Critical Path Method.
- B. Illustrate order and interdependence of activities and sequence of work; how start of a given activity depends on completion of preceding activities, and how completion of the activity may restrain start of subsequent activities.
- C. Mathematical Analysis: Tabulate each activity of detailed network diagrams, using calendar dates, and identify for each activity:
 - 1. Preceding and following event numbers.
 - 2. Activity description.
 - 3. Estimated duration of activity, in maximum 15 day intervals.
 - 4. Earliest start date.
 - 5. Earliest finish date.
 - 6. Actual start date.
 - 7. Actual finish date.
 - 8. Latest start date.
 - 9. Latest finish date.
 - 10. Total and free float; float time shall accrue to Owner and to Owner's benefit.
 - 11. Monetary value of activity, keyed to Schedule of Values.
 - 12. Percentage of activity completed.
 - 13. Responsibility.
- D. Analysis Program: Capable of compiling monetary value of completed and partially completed activities, accepting revised completion dates, and recomputation of all dates and float.
- E. Required Reports: List activities in sorts or groups:
 - 1. By preceding work item or event number from lowest to highest.
 - 2. By amount of float, then in order of early start.
 - 3. By responsibility in order of earliest possible start date.
 - 4. In order of latest allowable start dates.
 - 5. In order of latest allowable finish dates.
 - 6. Contractor's periodic payment request sorted by Schedule of Values listings.

7. Listing of basic input data that generates the report.
8. Listing of activities on the critical path.

3.06 REVIEW AND EVALUATION OF SCHEDULE

- A. Participate in joint review and evaluation of schedule with Architect at each submittal.
- B. Evaluate project status to determine work behind schedule and work ahead of schedule.
- C. After review, revise as necessary as result of review, and resubmit within 10 days.

3.07 UPDATING SCHEDULE

- A. Update schedule monthly.
- B. Maintain schedules to record actual start and finish dates of completed activities.
- C. Indicate progress of each activity to date of revision, with projected completion date of each activity.
- D. Annotate diagrams to graphically depict current status of Work.
- E. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.
- F. Indicate changes required to maintain Date of Substantial Completion.
- G. Submit reports required to support recommended changes.
- H. Provide narrative report to define problem areas, anticipated delays, and impact on the schedule. Report corrective action taken or proposed and its effect.

3.08 DISTRIBUTION OF SCHEDULE

- A. Distribute copies of updated schedules to Contractor's project site file, to subcontractors, suppliers, Architect, Owner, and other concerned parties.
- B. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

3.09 DAILY CONSTRUCTION REPORTS

- A. Prepare daily reports utilizing means and methods as defined by the Owner.
- B. Prepare daily reports of operations at Project including at least the following information:
 1. Approximate count of personnel at site.
 2. High and low temperatures, general weather conditions.
 3. Materials, equipment, or Owner-furnished items arriving at or leaving site.
 4. Accidents and unusual events.
 5. Site or structure damage by water, frost, wind, or other causes.
 6. Stoppages, delays, shortages, losses.
 7. Any tests made and their result if known.
 8. Meter readings and similar recordings.
 9. Emergency procedures.
 10. Orders and requests of governing authorities.
 11. Services connected, disconnected.
 12. Equipment or system tests and start-ups.
 13. Brief summary of work accomplished that day.
 14. Signature of person preparing report.
- C. Submit daily reports to Architect at least weekly unless directed to submit reports on owner provided project management software.
- D. Maintain copies of daily reports at field office.

END OF SECTION

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**SECTION 01 4000
QUALITY REQUIREMENTS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Submittals.
- B. Quality assurance.
- C. Qualifications.
- D. Testing and inspection agencies and services.
- E. Contractor's construction-related professional design services.
- F. Contractor's design-related professional design services.
- G. Control of installation.
- H. Mock-ups.
- I. Tolerances.
- J. Manufacturers' field services.
- K. Defect Assessment.

1.02 REFERENCE STANDARDS

- A. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection 2021.

1.03 CONTRACTOR'S CONSTRUCTION-RELATED PROFESSIONAL DESIGN SERVICES

- A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.
- B. Provide such engineering design services as may be necessary to plan and safely conduct certain construction operations, pertaining to, but not limited to the following:
 - 1. Temporary sheeting, shoring, or supports.
 - 2. Temporary scaffolding.
 - 3. Temporary bracing.
 - 4. Temporary falsework for support of spanning or arched structures.
 - 5. Temporary foundation underpinning.
 - 6. Temporary stairs or steps required for construction access only.
 - 7. Temporary hoist(s) and rigging.
 - 8. Investigation of soil conditions and design of temporary foundations to support construction equipment.

1.04 CONTRACTOR'S DESIGN-RELATED PROFESSIONAL DESIGN SERVICES

- A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.
- B. Base design on performance and/or design criteria indicated in individual specification sections.
 - 1. Submit a Request for Interpretation to Architect if the criteria indicated are not sufficient to perform required design services.

1.05 SUBMITTALS

- A. General: Additional submittal requirements are specified in Individual Sections in Division 01 through Division 50.
- B. Certificates:
 - 1. Testing Agency will submit certified written report of each inspection, test, or similar service.
- C. Tests and Evaluation Reports:

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1. Testing Agency or Agencies will prepare logs, test reports, and certificates applicable to specific tests and inspections and deliver copies (or electronic record) distributed as follows:
 - a. 1 copy to Owner's Representative.
 - b. 1 copy to Architect.
 - c. 1 copy to Consulting Engineers (Engineer of Record).
 - d. 1 copy to General Contractor.
 - e. 1 copy to Authorities Having Jurisdiction (if required).
 2. Other tests, certificates, and similar documents will be obtained by Contractor and delivered to Owner's Representative and Architect in such time as not to delay progress of the Work or final payment therefore.
 3. Submittal Format:
 - a. Schedule of Tests and Inspections: Prepare in tabular form and include following:
 - 1) Specification Section number and title.
 - 2) Description of test and inspection.
 - 3) Identification of applicable standards.
 - 4) Identification of test and inspection methods.
 - 5) Number of tests and inspections required.
 - 6) Time schedule or time span for tests and inspections.
 - 7) Entity responsible for performing tests and inspections.
 - 8) Requirements for obtaining samples.
 - b. Certified written reports of each inspection, test, or similar service will include, but not be limited:
 - 1) Date of issue.
 - 2) Project title and number.
 - 3) Name, address, and telephone number of Testing Agency.
 - 4) Dates and locations of samples and tests or inspections.
 - 5) Names of individuals making tests and inspections.
 - 6) Description of the Work and test and inspection method.
 - 7) Identification of product and Specification Section.
 - 8) Complete test or inspection data.
 - 9) Test and inspection results and an interpretation of test results.
 - 10) Record of temperature and weather conditions at time of sample taking and testing and inspecting.
 - 11) Comments or professional opinion on whether tested or inspected Work complies with Contract Document requirements.
 - 12) Name and signature of laboratory inspector.
 - 13) Recommendations on retesting and re-inspecting.
- D. Source Quality Control Submittals:
1. Testing Agency will submit following prior to commencing the Work:
 - a. Qualifications of Testing Agency management and personnel designated to project.
 - b. Testing Agency 'Written Practice for Quality Assurance'.
 - c. Qualification records for Inspector and non-destructive testing technicians designated for project.
 - d. Testing Agency non-destructive testing procedures, equipment calibration records, and personnel training records.
 - e. Testing Agency Quality Control Plan for monitoring and control of testing operations.
 - f. Welding Inspection Procedures (Structural Steel testing).
 - g. Bolting Inspection Procedures (Structural Steel testing).
 - h. Shear Connector Stud Inspection Procedures (Structural Steel testing).
 - i. Seismic Connections Inspection Procedures (Structural Steel testing).
- E. Testing and Inspection Reports:

1. Conduct and interpret tests and inspections and state in each report whether tested and inspected the Work complies with or deviates from requirements.
2. Laboratory Reports: Testing Agency will furnish reports of materials and construction as required, including:
 - a. Description of method of test.
 - b. Identification of sample and portion of the Work tested.
 - 1) Description of location in the Work of sample.
 - 2) Time and date when sample was obtained.
 - 3) Weather and climatic conditions at time when sample was obtained.
 - c. Evaluation of results of tests including recommendations for action.
3. Inspection Reports:
 - a. Testing Agency will furnish 'Inspection at Site' reports for each site visit documenting activities, observations, and inspections.
 - b. Include notation of weather and climatic conditions, time and date conditions and status of the Work, actions taken, and recommendations or evaluation of the Work.
4. Reporting Testing and Inspection (Conforming Work):
 - a. Submit testing and inspection reports as required within twenty four (24) hours of test or inspection having been performed.
5. Reporting Testing and Inspection Defective Work (Non-Conforming Work):
 - a. Testing Agency, upon determination of irregularities, deficiencies observed or test failure(s) observed in the Work during performance of its services of test or inspection having been performed, will:
 - 1) Verbally notify results to Architect, Contractor, and Owner's Representative within one hour of test or inspection having been performed (if Defective Work (Non-Conforming Work) is incorporated into project).
 - 2) Submit written inspection report and test results as required within twenty four (24) hours of test or inspection having been performed.
 - b. Prepare non-compliance log to track non-compliant testing or inspections.
6. Final Report:
 - a. Submit final report of tests and inspections at Substantial Completion, which identify unresolved deficiencies.

1.06 QUALIFICATIONS

- A. Qualifications paragraphs in this Article establish minimum qualification levels required; individual Specification Sections specify additional requirements:
 1. Fabricator / Supplier / Installer Qualifications: Firm experienced in producing products similar to those indicated for this Project and with record of successful in-service performance, as well as sufficient production capacity to produce required units.
 - a. Approved:
 - 1) Where heading 'Approved Suppliers / Distributors / Installers / Applicators / Fabricators' is used to identify list of specified suppliers / distributors / installers / applicators / fabricators, use only listed suppliers / installers / fabricators.
 - 2) No substitutions will be allowed.
 - b. Acceptable Suppliers / Installers:
 - 1) Where heading 'Acceptable Suppliers / Installers / Fabricators' is used, qualifications as specified in Quality Assurance in Part 1 of individual sections will be used to determine requirements of those that will be acceptable to be used on Project. Lists for acceptable installers can include additional installers that may be approved before bidding or by addendum.
 2. Factory-Authorized Service Representative Qualifications:
 - a. Authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
 3. Installer Qualifications:

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- a. Firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- 4. Manufacturer Qualifications:
 - a. Firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- 5. Manufacturer's Field Services Qualifications:
 - a. Experienced authorized representative of manufacturer to inspect field-assembled components and equipment installation, including service connections.
- 6. Professional Engineer Qualifications:
 - a. Professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of kind indicated. Engineering services are defined as those performed for installations of system, assembly, or products that are similar to those indicated for this Project in material, design, and extent.
- 7. Specialists:
 - a. Certain sections of Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations.
 - b. Specialists shall satisfy qualification requirements indicated and shall be engaged for activities indicated.
 - c. Requirement for specialists shall not supersede building codes and regulations governing the Work.
- 8. Testing Agency Qualifications:
 - a. Independent Testing Agency with experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E329; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
 - 1) Testing Laboratory:
 - (a) AASHTO Materials Reference Laboratory (AMRL) Accreditation Program.
 - (b) Cement and Concrete Reference Laboratory (CCRL).
 - (c) Nationally Recognized Testing Laboratory (NRTL): Nationally recognized testing laboratory according to 29 CFR 1910.7.
 - (d) National Voluntary Laboratory (NVLAP): Testing Agency accredited according to National Institute of Standards and Technology (NIST) Technology Administration, U. S. Department of Commerce Accreditation Program.

1.07 TESTING AND INSPECTION AGENCIES AND SERVICES

- A. Testing and inspecting services are used to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with Contract Document requirements.
 - 1. Specific quality assurance and quality control requirements for individual construction activities are specified in Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality control procedures that facilitate compliance with Contract Document requirements.
 - 3. Requirements for Contractor to provide quality assurance and quality control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
- B. As indicated in individual specification sections, Owner or Contractor shall employ and pay for services of an independent testing agency to perform specified testing and inspection.
- C. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

PART 2 PRODUCTS - NOT USED**PART 3 EXECUTION****3.01 QUALITY ASSURANCE**

- A. Activities, actions, and procedures performed before and during execution of the Work to verify compliance and guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Owner or Owner's designated representative(s) will perform quality assurance to verify compliance with Contract Documents.

3.02 MOCK-UPS

- A. Before installing portions of the Work where mock-ups are required, construct mock-ups in location and size indicated for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects and workmanship.
- B. Accepted mock-ups establish the standard of quality the Architect will use to judge the Work.
- C. Demonstrate proposed range of aesthetic effects and workmanship.
- D. Notify Architect seven (7) working days in advance of dates and times when mock-ups will be constructed.
- E. Provide supervisory personnel who will oversee mock-up construction. Provide workers that will be employed during the construction at Project.
- F. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
- G. Obtain Architect's approval of mock-ups before starting work, fabrication, or construction.
 - 1. Architect will issue written comments within seven (7) working days of initial review and each subsequent follow up review of each mock-up.
 - 2. Make corrections as necessary until Architect's approval is issued.
- H. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock-up and clear area when directed to do so by Architect.

3.03 QUALITY CONTROL

- A. Quality Control Services:
 - 1. Quality Control will be sole responsibility of Contractor.
 - a. Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements performed by Contractor:
 - 1) They do not include inspections, tests or related actions performed by Architect, Owner, governing authorities or independent agencies hired by Owner or Architect.
 - 2) Quality assurance performed by Owner will be used to validate Quality Control performed by Contractor.
 - b. Where services are indicated as Contractor's responsibility, engage a qualified Testing Agency to perform these quality control services.
 - 1) Contractor shall not employ same testing entity engaged by Owner, without Owner's written approval.

3.04 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.

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- C. Adjust products to appropriate dimensions; position before securing products in place.

3.05 TESTING AND INSPECTION

- A. See individual specification sections for testing and inspection required.
- B. Activities performed by Owner's Quality Assurance Testing Agency include, but are not limited to following:
1. Individual Sections in Division 01 through Division 49:
 - a. Pre-Installation Conference agenda review items for:
 - 1) Schedule requirements.
 - 2) Testing and inspection requirements:
 - 3) Requirements and frequency of testing and inspections.
 - 4) Mock-up or sample requirements.
 - 5) Submittals requirements.
 - b. Quality Assurance personal qualifications.
 - 1) Qualification documentation including certificates if required.
 - c. Non-Conforming Work:
 - 1) Prepare non-compliance log to track non-compliant testing or inspections.
 2. Weekly Activities:
 - a. Summarize and track any non-compliance issues.
 - b. Provide summary report of previous week's performed Work.
 - c. Visit contractors periodically to find out if they have any concerns with Quality Assurance inspectors and check on any schedule changes.
 - d. Visit Owner's Representatives periodically to find out if they have any concerns with how project is progressing.
- C. Testing Agency Duties:
1. Test samples of mixes submitted by Contractor.
 2. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
 3. Perform specified sampling and testing of products in accordance with specified standards.
 4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 5. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
 6. Perform additional tests and inspections required by Architect.
 7. Attend preconstruction meetings and progress meetings.
 8. Submit reports of all tests/inspections specified.
- D. Limits on Testing/Inspection Agency Authority:
1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 2. Agency may not approve or accept any portion of the Work.
 3. Agency may not assume any duties of Contractor.
 4. Agency has no authority to stop the Work.
- E. Contractor Responsibilities:
1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
 2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
 3. Provide incidental labor and facilities:
 - a. To provide access to Work to be tested/inspected.
 - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
 - c. To facilitate tests/inspections.

- d. To provide storage and curing of test samples.
- 4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
- 5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- 6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- F. Architect Duties:
 - 1. Notify Owner's Representative before each test and/or inspection.
- G. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.
- H. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

3.06 MANUFACTURERS' FIELD SERVICES

- A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance equipment as applicable, and to initiate instructions when necessary.
- B. Submit qualifications of observer to Architect 30 days in advance of required observations.
 - 1. Observer subject to approval of Architect.
 - 2. Observer subject to approval of Owner.
- C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.07 DEFECT ASSESSMENT

- A. Replace Work or portions of the Work not complying with specified requirements.
- B. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
 - 2. Comply with Contract Document requirements for Section 01 7000 - Execution and Closeout Requirements for cutting and patching.
- C. Protect construction exposed by or for Quality Assurance and Quality Control activities.
- D. Repair and protection are Contractor's responsibility, regardless of assignment of responsibility for Quality Assurance and Quality Control Services.

END OF SECTION

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**SECTION 01 4219
REFERENCE STANDARDS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements relating to referenced standards.

1.02 QUALITY ASSURANCE

- A. For products or workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Comply with the reference standard of date of issue specified in this section, except where a specific date is established by applicable code.
- C. Obtain copies of standards when required by Contract Documents.
- D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Date of Substantial Completion.
- E. Should specified reference standards conflict with Contract Documents, request clarification from the Architect before proceeding.
- F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of the Architect shall be altered by Contract Documents by mention or inference otherwise in any reference document.
- G. Minimum Quantity or Quality Levels:
1. Quantity or quality level shown or specified shall be minimum provided or performed.
 2. Actual installation may comply exactly with minimum quantity or quality specified, or it may exceed minimum within reasonable limits.
 3. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for context of requirements.
- H. Coordination:
1. Coordinate sequence of activities to accommodate required quality assurance and quality control services with minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
- I. Scheduling:
1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.03 INDUSTRY STANDARDS

- A. Except where Contract Documents specify otherwise, construction industry standards will apply and are made a part of Contract Documents by reference.
- B. Where compliance with two or more standards is specified and standards apparently establish different or conflicting requirements for minimum quantities or quality levels, refer to Architect for decision before proceeding. Quantity or quality level shown or specified will be minimum provided or performed. Actual installation may comply exactly with minimum quantity or quality specified, or it may exceed minimum within reasonable limits. In complying with these requirements, indicated numeric values are minimum or maximum, as appropriate for context of requirements. Refer uncertainties to Architect for decision before proceeding.
- C. Each entity engaged in construction on Project is required to be familiar with industry standards applicable to that entity's construction activity. Copies of applicable standards are not bound with Contract Documents. Where copies of standards are needed for performance of a required construction activity, Contractor will obtain copies directly from publication source.
- D. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in

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Thomson Gale's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."

1.04 GOVERNING REGULATIONS

- A. Governing Regulations / Authorities:
 1. Contact authorities having jurisdiction directly for information and decisions having a bearing on the Work.
 2. Obtain copies of regulations required to be retained at Project Site, available for reference by parties who have a reasonable need for such reference.

1.05 ABMA -- AMERICAN BEARING MANUFACTURERS ASSOCIATION, INC.

- A. ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings 2015.

1.06 AHRI -- AIR-CONDITIONING, HEATING, AND REFRIGERATION INSTITUTE

- A. AHRI 410 - Forced-Circulation Air-Cooling and Air-Heating Coils 2001, with Addenda (2011).
- B. AHRI 430 (I-P) - Performance Rating of Central Station Air-handling Unit Supply Fans 2020.
- C. AHRI 610 (I-P) - Performance Rating Of Central System Humidifiers for Residential Applications 2014.
- D. AHRI 851 (SI) - Performance Rating of Commercial and Industrial Air Filter Equipment 2013.

1.07 AISC -- AMERICAN INSTITUTE OF STEEL CONSTRUCTION, INC.

1.08 AITC -- AMERICAN INSTITUTE OF TIMBER CONSTRUCTION

1.09 ALI -- AMERICAN LADDER INSTITUTE

- A. ALI A14.3 - Ladders - Fixed - Safety Requirements 2008.

1.10 AMCA -- AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL, INC.

- 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 2020.
- 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. AMCA 500-D - Laboratory Methods of Testing Dampers for Rating 2018.
- H. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating 2015.

1.11 ASHRAE -- AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS, INC.

- A. ASHRAE Std 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size 2017, with Errata (2020).
- B. ASHRAE Std 62.1 - Ventilation for Acceptable Indoor Air Quality Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- C. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. ASHRAE Std 103 - Methods of Testing for Annual Fuel Utilization Efficiency of Residential Central Furnaces and Boilers 2017, with Errata (2019).

1.12 ASSE -- AMERICAN SOCIETY OF SANITARY ENGINEERING

1.13 ASTM A SERIES -- ASTM INTERNATIONAL

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- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.

1.14 ASTM B SERIES -- ASTM INTERNATIONAL

- A. ASTM B177/B177M - Standard Guide for Engineering Chromium Electroplating 2011 (Reapproved 2021).
- B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate 2014.
- C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel 2019.

1.15 ASTM C SERIES -- ASTM INTERNATIONAL

- A. ASTM C1184 - Standard Specification for Structural Silicone Sealants 2018, with Editorial Revision.

1.16 ASTM D SERIES -- ASTM INTERNATIONAL

- A. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications 2019.
- B. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position 2018.
- C. ASTM D882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting 2018.
- D. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials 2020.

1.17 ASTM E SERIES -- ASTM INTERNATIONAL

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2021a.
- B. ASTM E2273 - Standard Test Method for Determining the Drainage Efficiency of Exterior Insulation and Finish Systems (EIFS) Clad Wall Assemblies 2018.
- C. ASTM E2486/E2486M - Standard Test Method for Impact Resistance of Class PB and PI Exterior Insulation and Finish Systems (EIFS) 2013 (Reapproved 2018).

1.18 AWI/AWMAC/WI -- JOINT PUBLICATION OF ARCHITECTURAL WOODWORK INSTITUTE/ARCHITECTURAL WOODWORK MANUFACTURERS ASSOCIATION OF CANADA/WOODWORK INSTITUTE

1.19 BIA -- BRICK INDUSTRY ASSOCIATION

1.20 HPVA -- HARDWOOD PLYWOOD VENEER ASSOCIATION

1.21 ICC-ES -- ICC EVALUATION SERVICE, INC.

- A. ICC-ES AC235 - Acceptance Criteria for EIFS Clad Drainage Wall Assemblies 2009, with Editorial Revision (2012).

1.22 ISO -- INTERNATIONAL STANDARDS ORGANIZATION

1.23 MFMA -- MAPLE FLOORING MANUFACTURERS ASSOCIATION

1.24 MFMA -- METAL FRAMING MANUFACTURERS ASSOCIATION

- A. MFMA-4 - Metal Framing Standards Publication 2004.

1.25 MPI -- MASTER PAINTERS INSTITUTE (MASTER PAINTERS AND DECORATORS ASSOCIATION)

- A. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association Current Edition.
- B. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual Current Edition.

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1.26 MSS -- MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY, INC.

- A. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation 2018, with Amendment (2019).

1.27 NAAMM -- THE NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS

- A. NAAMM AMP 510 - Metal Stairs Manual 1992.

1.28 NEMA -- NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION

- A. NEMA MG 1 - Motors and Generators 2018.

1.29 NFPA -- NATIONAL FIRE PROTECTION ASSOCIATION

- A. NFPA 13 - Standard for the Installation of Sprinkler Systems Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- B. NFPA 54 - National Fuel Gas Code 2021.
- C. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems 2021.
- E. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems 2021.
- F. NFPA 211 - Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances 2019.
- G. NFPA 1963 - Standard for Fire Hose Connections 2019.

1.30 NSF -- NSF INTERNATIONAL (THE PUBLIC HEALTH AND SAFETY ORGANIZATION)**1.31 RCSC -- RESEARCH COUNCIL ON STRUCTURAL CONNECTIONS****1.32 RIS -- REDWOOD INSPECTION SERVICE****1.33 SMACNA -- SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION, INC.**

- A. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible 2020.

1.34 TMS -- THE MASONRY SOCIETY**1.35 TPI -- TRUSS PLATE INSTITUTE****1.36 UL -- UNDERWRITERS LABORATORIES INC.**

- A. UL (DIR) - Online Certifications Directory Current Edition.
- B. UL 405 - Standard for Safety Fire Department Connection Devices Current Edition, Including All Revisions.
- C. UL 705 - Power Ventilators Current Edition, Including All Revisions.
- D. UL 900 - Standard for Air Filter Units Current Edition, Including All Revisions.

END OF SECTION

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**SECTION 01 4546
DUCT TESTING, ADJUSTING, AND BALANCING**

PART 1 GENERAL

1.01 SUMMARY

- A. Includes But Is Not Limited To:
 - 1. Test, balance, and adjust air duct systems services provided by Owner as described in Contract Documents.
- B. Related Requirements:
 - 1. Division 01: 'General Requirements':
 - a. Section 01 1000 - Summary: Owner will provide test, balance, and adjust air duct systems. PART 3 of this Section establishes requirements for field tests of 'Testing Agency'.
 - b. Section 01 4000 - Quality Requirements: for testing and inspection, and testing laboratory services for materials, products, and construction methods.
 - 2. Division 23:
 - a. Completing installation and start-up of mechanical systems, and changing sheaves, belts, and dampers as required for correct balance.
 - b. Maintain HVAC system and equipment in full operation each working day of testing, balancing, and adjusting.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Contractor to assist Testing Agency in testing and balancing of mechanical system.
 - 2. Assisting Testing Agency in testing and balancing of mechanical system.
- B. Scheduling:
 - 1. Contractor to schedule this work in cooperation with other Sections involved and to comply with completion date for test, balance, and adjust air duct systems as described in Contract Documents.
 - 2. Contact Testing Agency and coordinate (Owner's Representative to provide 'Testing Agency' contact information):
 - a. One inspection when 60 percent of ductwork is installed.
 - b. One inspection when 90 percent of equipment and ductwork is installed.
 - 3. Contact Testing Agency and coordinate date(s) for test and balance work when following is completed:
 - a. HVAC and exhaust systems including installation of specialties, devices, and new filters.
 - b. Proper function of control system components including electrical interlocks, damper sequences, air and water reset, and fire and freeze stats has been verified.
 - c. Automatic temperature controls have been calibrated and set for design operating conditions.
 - d. Verification of proper thermostat calibration and setting of control components such as static pressure controllers and other devices that may need set points changed during process of balancing system.
 - 4. If, in opinion of Testing Agency, systems are not ready for test and balance, reschedule as required.

1.03 SUBMITTALS

- A. Informational Submittals:
 - 1. Test and Evaluation Reports:
 - a. Preliminary Report(s):
 - 1) Copy to be given to Owner's Representative.
 - b. Final Report:
 - 1) Copy to be given to Owner's Representative.

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B. Closeout Submittals:

1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Record Documentation:
 - 1) Testing and Inspection Reports:
 - (a) Testing Agency Testing and Evaluation Final Report of testing, balancing, and adjusting air duct systems. Bind approved copy of Testing and Evaluation Report in Operations And Maintenance Manual for Division 23.

1.04 QUALITY ASSURANCE

A. Qualifications:

1. Approved Testing Agency. Section 01 4000 applies, but is not limited to following:
 - a. Testing Agency shall specialize in testing and balancing of heating, ventilating, and cooling systems to balance, adjust, and test air moving equipment, air distribution, and exhaust systems.
 - b. Testing Agency shall provide proof of having successfully completed at least five years of specialized experience in air and hydronic system balancing.
 - c. Testing Agency shall provide testing under direct supervision of qualified heating and ventilating engineer.
 - d. Neither Architect's engineering consultant nor anyone performing work on this Project under other Sections of Division 23 shall be permitted to do this work.

PART 2 PRODUCTS: NOT USED

PART 3 EXECUTION

3.01 OWNER-FURNISHED TESTING AND INSPECTION

- A. Owner to provide Testing and Inspection for testing, balancing, and adjusting air duct systems:
1. See Section 01 1000: Multiple contracts for administrative and procedural requirements for Testing and Inspection services.

3.02 FIELD QUALITY CONTROL

A. Field Tests

1. Air System Testing, Adjusting, And Balance:
 - a. Inspections and site visits. (For paragraph a thru c, note deficiencies, if any, that needs to be corrected and report this to Owner's Representative, Architect, and Mechanical Engineer):
 - 1) One inspection when ductwork installation is 60 percent complete.
 - 2) One inspection when ductwork is installation is 90 percent complete.
 - 3) One inspection when potable hot and cold water system is 90 percent complete.
 - 4) Site visit for test and balance. Before commencing test and balance, perform an inspection to verify 100 percent completion of system. Confirm completion of work, correction of previously noted deficiencies, and look for new deficiencies not noted in previous inspections. If the work is complete, then proceed with test and balance. If the work is not complete and ready for test and balance, inform Contractor and submit an invoice to Owner's Representative for compensation for travel time, expenses, and time on site. Report deficiencies or incomplete work to Owner's Representative, Architect, and Mechanical Engineer.
 - 5) Additional site visits (beyond those set forth above) to complete the work after issues are resolved may be needed and will be paid for separately from compensation for services set forth in this Agreement, pursuant to hourly rates and conditions set forth in Attachment "A".
 - b. Checklist for Inspections and site visits:
 - 1) Pre-Startup Inspection - use for inspections and site visits a thru d in paragraph 1 above. All pertinent items shall be checked, including but not limited to following:
 - (a) Removal of shipping blocks and stops.

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- (b) Vibration isolators' alignment and adjustment.
 - (c) Flexible connections properly installed and aligned.
 - (d) Safety controls, safety valves and high or low limits in operation.
 - (e) All systems properly filled.
 - (f) Filters in place and seal provided around edges.
 - (g) Filters and strainers are clean.
 - (h) Fire damper installation and operation, and access door installation.
 - (i) Installation of all gauges on equipment.
 - (j) Control system is operating.
 - (k) All dampers, valves, and operators are properly installed and operating.
 - (l) All ductwork is installed and sealed.
 - (m) Voltage to unit matches nameplate voltage.
- 2) First Run Inspection - use for inspections and site visits d and e in paragraph 1 above. Recheck items in Pre-Startup list, and check for following items:
- (a) Excessive vibration or noise.
 - (b) Loose components.
 - (c) Initial control settings.
 - (d) Motor amperages.
 - (e) Heat buildup in motors.
 - (f) Control system is calibrated and functioning as required.
- 3) System Operation Inspection - use for inspections and site visits d and e in paragraph 1 above. Observe mechanical systems under operation for sufficient amount of time to ensure proper operation in all running modes. Check following items periodically.
- (a) Filters and strainers.
 - (b) Filters and strainers.
 - (c) Check for system leaks at seals and valves.
- c. Performance Requirements:
- 1) Testing and balancing in complete accordance with Associated Air Balance Council (AABC) Standards for Field Measurement & Instructions.
 - 2) Noise level in chapel and / or cultural hall shall not exceed NC 35 with all HVAC equipment operating in full or second stage cooling mode.
- d. Site tests: Air Test and Balancing Procedure:
- 1) Instruments used by Consultant shall be accurately calibrated and maintained in good working order.
 - 2) All supply air and return air fans in all HVAC zone systems, energy recovery ventilators, and exhaust fans in building shall be operating when final setup of all units is performed.
 - 3) Perform tests at high and low speeds of multi-speed systems and single speed systems.
 - 4) Perform following testing and balancing functions in accordance with Associated Air Balance Council National Standards.
 - (a) Fan Speeds - Air handling units (with variable pitch pulleys and sheaves): Test and adjust fan RPM to achieve design CFM requirements.
 - (b) Fan Speeds - Furnaces (with direct drive motors): Set fan speed to lowest possible setting that will achieve design CFM requirements. Adjust down from Contractor setting, if necessary. Adjust low voltage fan speed jumpers (provided and installed by installing contractor) as necessary to achieve design cooling air flow at lowest possible setting. An exception to this would be when furnace is variable speed blower for dehumidification applications.
 - (c) Current And Voltage: Measure and record motor current and voltage.
 - (d) Pitot-Tube Traverse Method:

- (1) Make measurements in duct where velocity is uniform, 7-1/2 duct diameters downstream and 2 duct diameters minimum upstream from any turbulence, i.e., elbow, damper, take-off, etc.
 - (2) Perform pitot-tube traverse of outdoor ventilation air duct serving each piece of air moving equipment.
 - (3) Where single outdoor ventilation air trunk duct serves multiple pieces of equipment, perform pitot-tube traverse of duct branch serving each piece of equipment as well as pitot-tube traverse of total air flow in trunk with all pieces of equipment operating.
 - (e) Where pitot-tube traverse is not possible or if pitot-tube traverse is unreliable, flow hood measurement over exterior intake louver or grille is acceptable for measuring outdoor ventilation air.
 - (f) Use proportionate method of air balance leaving fan at lowest possible speed and at least one branch balance damper fully open.
- 5) Static Pressure: Test and record system static pressures, including suction and discharge static pressure of each fan.
 - 6) Air Temperature: Take dry bulb air temperatures on entering and leaving side of each cooling coil. Dry bulb temperatures shall be taken on entering and leaving side of each heating unit.
 - 7) Zone Ducts: Adjust zone ducts to within design CFM requirements. At least one zone balancing damper shall be completely open.
 - 8) Branch Ducts: Adjust branch ducts to within design CFM requirements. Multi-diffuser branch ducts shall have at least one outlet or inlet volume damper completely open.
 - 9) Tolerances: Test and balance all fans, zone ducts, registers, diffusers etc. to + or - 10 percent of design CFM.
 - 10) Identification: Identify location and area of each grille, diffuser, register, and terminal box. Record on air outlet data sheets.
 - 11) Description: Record size, type, and manufacturer of each diffuser, grille, and register on air outlet data sheets.
 - 12) Drafts: Adjust diffusers, grilles, and registers to minimize drafts. For high sidewall supply air diffusers install horizontal blade core to direct air flow upward 15 degree and set adjustable vertical blades to spread air flow horizontally and evenly in fan pattern.
 - 13) Permanently mark all outside air, supply air, and return air damper positions after balancing has been completed.
 - 14) Smoke testing: Smoke testing, or some other approved means, may be required to determine leak locations if air balance report indicates that any system's CFM total is less than 90 percent of design CFM. Prior to test, verify that system's duct joints have been sealed as specified and that air moving device in question is supplying required design system air flow. Mechanical Engineer will approve test method required. If smoke test is selected, use following procedure. Provide necessary precautions to protect those performing or observing test from being exposed to smoke.
 - (a) Use zinc chloride smoke candles, titanium tetrachloride ampules or sticks, or other devices acceptable to Mechanical engineer to generate smoke.
 - (b) Close openings in duct except for one opening at farthest end of duct run.
 - (c) Circulate smoke at pressurized condition of 1/2 inch (13 mm) minimum water gauge static pressure.
 - (d) Report findings to mechanical engineer in writing.
- e. Air System Test and Evaluation Report:
- 1) Record test data on AABC standard forms or facsimile.
 - 2) Preliminary Report: Provide and deliver four copies of complete data for evaluation and approval to Owner.

- 3) Final report: Provide and deliver complete four copies of final report to Owner prior to project Substantial Completion date.
- 4) Complete with logs, data, and records as required herein. Print logs, data, and records on white bond paper bound together in report form.
- 5) Certified accurate and complete by Consultant's certified test and balance engineer.
- 6) Contain following general data in format selected by Consultant:
 - (a) Project Number.
 - (b) Project Title.
 - (c) Project Location.
 - (d) Project Architect and Mechanical Engineer.
 - (e) Consultant and Certified Engineer.
 - (f) Contractor and mechanical sub-contractor.
 - (g) Dates tests were performed.
 - (h) Certification Document.
 - (i) Report Forms similar to AABC Standard format.
- 7) Report shall include following:
 - (a) Instrumentation List including type, model, manufacturer, serial number, and calibration dates.
 - (b) HVAC zone identification to include reduced ductwork floor plan from project documents with outlets and inlets numbered to match written test and balance report. This page may be oversized but it should fold up neatly within standard 8 1/2 x 11 report paper size.
 - (c) Record following for each piece of air handling equipment:
 - (1) Manufacturer, model number, and serial number.
 - (2) Design and manufacture rated data.
 - (3) Actual CFM.
 - (4) Suction and discharge static pressure of each fan.
 - (5) Outdoor-ventilation-air and return-air total CFM.
 - (6) Final RPM of each motor or speed tap.
 - (7) Actual operating current and voltage of each fan motor.
 - (8) Fan and motor sheave manufacturer, model, size, number of grooves and center distance.
 - (9) Belt size and quantity.

3.03 PREPARATION

- A. Heating, ventilating, and cooling systems and equipment shall be in full operation and continue in operation during each working day of testing and balancing.

END OF SECTION

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**SECTION 01 5000
TEMPORARY FACILITIES AND CONTROLS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Safety.
- B. Temporary utilities.
- C. Temporary sanitary facilities.
- D. Temporary Controls: Barriers, enclosures, and fencing.
- E. Temporary erosion and sediment control.
- F. Temporary tree and plant protection.
- G. Security requirements.
- H. Waste removal facilities and services.
- I. Field offices.

1.02 RELATED REQUIREMENTS

- A. Section 01 5100 - Temporary Utilities.

1.03 REFERENCE STANDARDS

- A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards current edition.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Protection of Existing Improvements: Protect streets, private roads, and sidewalks, including overhead protection where required. Repair damage to existing improvements caused by construction activities.
- B. Protection of Adjacent Property: Provide necessary protection for adjacent property and lateral support thereof.
- C. Proprietary Camera Services: In its absolute discretion, and with or without notice to Contractor, Owner may provide from time to time, but is not obligated to provide, one or more cameras on or about Project site and/or signage or notices of the same:
 - 1. If provided by Owner, such camera(s) and/or signage and notices are solely for Owner's benefit and convenience and shall not be for benefit of Contractor, Subcontractor(s) or for any third person.
 - 2. Owner shall have no liability, obligation, or responsibility to Contractor, Subcontractors, or any third person relative to such camera(s), signage, or notices, or absence of camera(s), signage, or notices, including without limitation, installation, maintenance, operation, repair, testing, functionality, capacity, recording, monitoring, posting, etc., of the same (hereafter 'Proprietary Camera Services').
 - 3. Contractor, with Owner's prior consent (which shall not be unreasonably withheld), may relocate such camera(s), signage, or notices as necessary to not unreasonably, materially and physically interfere with work at Project Site.
 - 4. Contractor's obligations under Contract Documents, including but not limited to, Contractor's obligation for security of Project Site, are not modified by Owner's opportunity to provide, actually providing, or not providing Proprietary Camera Services and/or signage or notices regarding the same.
 - 5. This Specification Section does not preclude Contractor from providing its own camera(s), signage, or notices pursuant to terms and conditions of this Agreement. Neither does this Section reduce, expand or modify any other right or obligation of Owner pursuant to terms of this Agreement.
- D. Prepare schedule indicating dates for implementation and termination of each temporary facility.

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- E. Keep temporary facilities clean and neat in appearance. Operate in safe and efficient manner. Take necessary fire prevention measures. Do not overload facilities, or allow them to interfere with progress of The Work. Do not allow hazardous, dangerous or unsanitary conditions, or public nuisances to develop or persist on Project site.
- F. Maintain facilities in good operating condition until removal.
- G. Remove each temporary facility when need has ended, or when replaced by authorized use of permanent facility, or by Substantial Completion. Complete permanent construction that may have been delayed because of interference with temporary facility. Repair damaged work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
 - 1. Materials and facilities that make up temporary facilities are property of Contractor.
 - 2. By Substantial Completion, clean and renovate permanent facilities used during construction period.

1.05 SAFETY REQUIREMENTS

- A. Meet regulations of 29 CFR 1926 OSHA, 'Construction Industry Regulations'.
- B. Owner's Safety Requirements:
 - 1. Personal Protection:
 - a. Contractor shall ensure:
 - 1) Positive means of fall protection, such as guardrails system, safety net system, personal fall arrest system, etc., is provided to employees whenever exposed to a fall 6 feet (1.80 m) or more above a lower level.
 - 2) Personnel working on Project shall wear hard hats and safety glasses as required by regulation and hazard.
 - 3) Personnel working on Project shall wear long or short sleeve shirts, long pants, and hard-toed boots or other sturdy shoes appropriate to type and phase of work being performed.
 - 2. Contractor Tools and Equipment:
 - a. Contractor shall ensure:
 - 1) Tools and equipment are in good working condition, well maintained, and have necessary guards in place.
 - 2) Ground Fault Circuit Interrupters (GFCI) is utilized on power cords and tools.
 - 3) Scaffolding and man lifts are in good working condition, erected and maintained as required by governmental regulations.
 - 4) Ladders are in good condition, well maintained, used as specified by Manufacturer, and secured as required.
 - 3. Miscellaneous:
 - a. Contractor shall ensure:
 - 1) Protection is provided on protruding rebar and other similar objects.
 - 2) General Contractor Superintendent has completed the OSHA 10-hour construction outreach training course or equivalent.
 - 3) Implementation and administration of safety program on Project.
 - 4) Material Safety Data Sheets (MSDS) are provided for substances or materials for which an MSDS is required by governmental regulations before bringing on site.
 - 5) Consistent safety training is provided to employees on Project.
 - 6) Implement and coordinate Lockout / Tagout procedures with Owner's Representative as required.
 - b. Report accidents involving injury to employees on Project that require off-site medical treatment to Owner's designated representative.
 - 4. Hot Work Permit:
 - a. Permit shall document that fire prevention and protection requirements in 29 CFR 1926.352, 'Fire Prevention' have been implemented prior to beginning hot work operations.

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- 1) Required for doing hot work involving open flames or producing heat or sparks such as:
 - (a) Brazing.
 - (b) Cutting.
 - (c) Grinding.
 - (d) Soldering.
 - (e) Thawing pipe.
 - (f) Torch applied roofing.
 - (g) Welding.

1.06 TEMPORARY UTILITIES - SEE SECTION 01 5100

1.07 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
- B. Maintain in clean and sanitary condition.

1.08 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.
- C. Provide protection for plants designated to remain. Replace damaged plants.
- D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.
- E. Secure building at the end of each workday.
- F. Maintain exterior building security until Substantial Completion.

1.09 FENCING

- A. Before construction begins, install a fence sufficient in height and structure to protect the site and preclude access except through lockable entrance gates. Locate where shown on Drawings. If not shown on Drawings, enclose entire site or portion sufficient to accommodate construction operations.

1.10 EXTERIOR ENCLOSURES

- A. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.11 INTERIOR ENCLOSURES

- A. Provide temporary partitions and ceilings as indicated to separate work areas from Owner-occupied areas, to prevent penetration of dust and moisture into Owner-occupied areas, and to prevent damage to existing materials and equipment.

1.12 SCAFFOLDING, PLATFORMS, STAIRS, ETC

- A. Furnish and maintain equipment such as temporary stairs, ladders, ramps, platforms, scaffolds, hoists, runways, derricks, chutes, and elevators as required for proper execution of The Work.
- B. Apparatus, equipment, and construction shall meet requirements of applicable laws and safety regulations.

1.13 TEMPORARY EROSION AND SEDIMENT CONTROL

- A. Take precautions necessary to prevent erosion and transportation of soil downstream, to adjacent properties, and into on-site or off-site drainage systems.

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- B. Develop, install, and maintain an erosion control plan if required by law.
- C. Repair and correct damage caused by erosion.

1.14 TEMPORARY ENVIRONMENTAL CONTROLS

- A. Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations, and reduce possibility that air, waterways, and subsoil might be contaminated or polluted, or that other undesirable effects might result:
 - 1. Avoid use of tools and equipment that produce harmful noise.
 - 2. Restrict use of noise making tools and equipment to hours that will minimize complaints from persons or firms near site.
- B. Provide protection against weather (rain, winds, storms, frost, or heat) to maintain all work, materials, apparatus, and fixtures free from injury or damage.
- C. Protect excavation, trenches, and building from damage from rainwater, spring water, ground water, backing up of drains or sewers, and all other water:
 - 1. For temporary drainage and dewatering facilities and operations not directly associated with construction activities included under individual Sections, comply with requirements of applicable local regulations. Where feasible, use permanent facilities.
 - 2. If sewers are not available or cannot be used, provide drainage ditches, dry wells, stabilization ponds, and similar facilities. Filter out excessive amounts of soil, construction debris, chemicals, oils and similar contaminants that might clog sewers or pollute waterways before discharge.
- D. Comply with governing ordinances relating to weed control and removal.

1.15 TEMPORARY TREE AND PLANT PROTECTION

- A. Protection:
 - 1. Before commencing site work, build and maintain protective fencing around existing trees and vegetation as shown on the drawings.
 - 2. Individual trees will have protective fencing built beyond drip line.
 - 3. Build protective fencing around groups of trees and other vegetation as indicated on Drawings.
 - 4. Keep areas within protective fencing undisturbed and do not use for any purpose.
- B. Maintenance:
 - 1. Maintain existing tree, shrubs, and vegetation as indicated in Contract Documents:
 - a. Remove and replace vegetation that dies or is damaged beyond repair due to construction.
 - b. Damage to any tree, shrub, or vegetation that has been indicated to remain and be protected, will have a cost associated with it. This includes branches, trunk and root systems:
 - 1) Trees: \$5,000.00.
 - 2) Shrubs: \$ 100.00.
 - 3) Vegetation: \$ 50.00.
- C. Pruning:
 - 1. Provide a qualified Tree Service Firm if pruning is required:
 - a. Coordinate with authorities having jurisdiction.
 - b. Coordinate with Owner and Architect on site before pruning is to begin.

1.16 WASTE REMOVAL

- A. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.

1.17 FIELD OFFICES

- A. Office: Weathertight, with lighting, electrical outlets, heating, cooling and ventilating equipment, and equipped with sturdy furniture, drawing display table, locking door, lights, computer with internet access, and a printer. Provide an operable fire extinguisher in facility.

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- B. Provide hardhats for Owner's Representatives for site visits.
- C. Provide space for Project meetings, with table and chairs to accommodate at least 6 persons.
- D. If Owner agrees to permit removal of temporary office before Substantial Completion, Contractor may use a room as an office after temporary office is removed. Equip room as specified above and restore to "like-new" condition before Substantial Completion.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

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**SECTION 01 5100
TEMPORARY UTILITIES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Temporary Utilities: Provision of electricity, lighting, heat, ventilation, and water.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Where necessary, engage appropriate local utility companies to install temporary service or connect to existing service. Where utility company provides only part of service, provide remainder with matching, compatible materials and equipment. Comply with utility company's recommendations.
1. Comply with industry standards and applicable laws and regulations of authorities having jurisdiction.
 2. Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.
 3. Arrange with utility company and existing users for time when service can be interrupted, where necessary, to make connections for temporary services.
 4. Provide adequate capacity at each stage of construction. Before temporary utility availability, provide trucked-in services.
 5. Obtain construction easements necessary to bring temporary and/or permanent utilities to site.
 6. Use qualified personnel for installation and maintenance of temporary facilities. Locate temporary utilities where they will serve Project adequately and result in minimum interference with the Work of Owner or other Contractors on Project Site. Relocate and modify temporary utilities as required.
 7. Pay cost and use charges for temporary and permanent utilities until Substantial Completion has been granted by Owner.
- B. Prepare schedule indicating dates for implementation and termination of each temporary utility. At earliest feasible time, change over from use of temporary service to use of permanent service.
- C. Keep temporary utilities clean and neat in appearance. Operate in safe and efficient manner. Take necessary fire prevention measures. Do not overload utilities, or allow them to interfere with progress of The Work. Do not allow hazardous, dangerous or unsanitary conditions, or public nuisances to develop or persist on Project site.
- D. Limit availability of temporary utilities to essential and intended uses to reduce waste and abuse.
- E. Maintain temporary utilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements.
1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on 24-hour day basis where required to achieve indicated results and to avoid possibility of damage.
 2. Prevent water filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.
- F. Remove each temporary utility and control when need has ended, or when replaced by permanent utility, but not later than Substantial Completion. Complete permanent construction that may have been delayed because of interference with temporary utility. Repair damaged work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
- G. Materials and facilities that make up temporary utilities are property of Contractor.
1. By Substantial Completion, clean and renovate permanent utilities used during construction period, including but not limited to:
 - a. Replace air filters and clean inside of ductwork and housings.
 - b. Replace significantly worn parts and parts subjected to unusual operating conditions.

- c. Replace lamps that are burned out or noticeably dimmed by substantial hours of use.

1.03 TEMPORARY ELECTRICITY

- A. Cost: By Contractor.
- B. Provided weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period.

1.04 TEMPORARY FIRE PROTECTION

- A. Cost: By Contractor.
- B. Install and maintain temporary fire protection facilities of types needed to protect against predictable and controllable fire losses. At a minimum, provide and maintain in working order two Standard UL Labeled ABC all-purpose 10 lb fire extinguishers. Do not incorporate these extinguishers into final Project.
 1. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher.
 2. Store combustible materials in containers in fire-safe locations.
 3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways, and other access routes for fighting fires.
 4. Provide supervision of welding operations, combustion type temporary heating units, and similar sources of fire ignition.
 5. At earliest feasible date in each area of Project, complete installation of permanent fire protection facility, including connected services, and place into operation and use. Instruct key personnel on use of facilities.

1.05 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

- A. Install and operate temporary lighting that will provide adequate illumination for construction operations and traffic conditions.
- B. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.
- C. Maintain lighting and provide routine repairs.
- D. Permanent building lighting may be utilized during construction.

1.06 TEMPORARY HEATING AND COOLING

- A. Cost of Energy: By Contractor.
- B. Install and operate temporary heating, cooling, and ventilating units including fuel, temporary piping, fittings, wiring, and connections necessary to provide environmental conditions specified for various portions of the Work. Coordinate ventilation requirements to produce ambient conditions required and reduce consumption of energy.
- C. Repair damage to building and contents caused by cold, heat, dampness, and/or heating, cooling, and ventilating equipment. Select equipment that will not have harmful effect on completed installations or on elements being installed.
- D. Provide heating and cooling devices and heat as needed to maintain specified conditions for construction operations.
 1. Operate equipment according to equipment manufacturer's instructions.
 2. Provide fresh air ventilation required by equipment manufacturer.
 3. Keep temperature of fuel containers stabilized.
 4. Secure fuel containers from overturning.
 5. Operate equipment away from combustible materials.
- E. Maintain minimum ambient temperature of between 50 and 80 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.
- F. Existing facilities shall not be used.

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- G. Prior to operation of permanent equipment for temporary heating purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.
- H. Do not operate system when work causing air-borne dust is occurring or when dust caused by such work is present without installation of temporary filtering system approved by Architect.
- I. Operate system at no cost to Owner, including cost of fuel.
- J. Assume all responsibility and risk for operation of system.
- K. Return permanent mechanical equipment to 'like-new' condition for Substantial Completion Inspection.

1.07 TEMPORARY WATER SERVICE

- A. Cost of Water Used: By Contractor.
- B. Connect to existing water source.
 - 1. Exercise measures to conserve water.
 - 2. Provide separate metering and reimburse Owner for cost of water used.
- C. Extend branch piping with outlets located so water is available by hoses with threaded connections. Provide temporary pipe insulation to prevent freezing.

1.08 TEMPORARY TELEPHONES

- A. Contractor will, at a non-reimbursable cost and expense, provide temporary telephone service for all personnel engaged in construction activities, throughout construction period.
- B. Contractor will pay for Local calls. Party making call will pay for long-distance and toll calls.
- C. At each telephone, post list of important telephone numbers.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

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**SECTION 01 6000
PRODUCT REQUIREMENTS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General product requirements.
- B. Re-use of existing products.
- C. Transportation, handling, storage and protection.
- D. Product option requirements.
- E. Substitution limitations.

1.02 SUBMITTALS

- A. As indicated in technical sections in accordance with Section 01 3000.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

- A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.
- B. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.
- C. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.

2.02 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by Contract Documents.
- B. Provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for complete installation and for intended use and effect.
- C. Provide interchangeable components of the same manufacturer for components being replaced.
- D. Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on surfaces of products that will be exposed to view in occupied spaces or on building exterior.
 - 1. Locate required product labels and stamps on concealed surface or, where required for observation after installation, on accessible surface that is not conspicuous.
 - 2. Provide permanent nameplates on items of service-connected or power-operated equipment. Locate on easily accessible surface that is inconspicuous in occupied spaces. Nameplate will contain following information and other essential operating data:
 - a. Name of product and manufacturer.
 - b. Model and serial number.
 - c. Capacity.
 - d. Speed.
 - e. Ratings.

2.03 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
- B. Where Specifications require compliance with performance requirements, provide products that comply with these requirements and are recommended by manufacturer for application described. General overall performance of product is implied where product is specified for specific application. Manufacturer's recommendations may be contained in published product literature, or by manufacturer's certification of performance.

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- C. Where specifications only require compliance with an imposed code, standard, or regulation, select product that complies with standards, codes or regulations specified.
- D. Where Specifications require matching an established Sample, Architect's decision will be final on whether proposed product matches satisfactorily. Where no product available within specified category matches satisfactorily nor complies with other specified requirements, refer to Architect.
- E. Where specified product requirements include phrase "...as selected from manufacturer's standard colors, patterns, textures..." or similar phrase, select product and manufacturer that comply with other specified requirements. Architect will select color, pattern, and texture from product line selected.
- F. Remove and replace products and materials not specified in Contract Documents but installed in the Work with specified products and materials at no additional cost to Owner and for no increase in Contract time.
- G. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.
- H. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

- A. Product selection is governed by Contract Documents and governing regulations, not by previous Project experience. Procedures governing product selection include:
 - 1. Substitutions and Equal Products:
 - a. Substitutions for specified products and systems, as defined in the Uniform Commercial Code, are not acceptable. However, equal products may be approved upon compliance with Contract Document requirements.
 - b. Approved Products / Manufacturers / Suppliers / Distributors / Fabricators / Installers:
 - 2. Acceptable Products / Manufacturers / Suppliers / Installers:
 - a. Use 'Equal Product Approval Request Form' to request approval of equal products, manufacturers, or suppliers before bidding or before installation, as noted in individual Sections.
 - 3. Quality / Performance Standard Products / Manufacturers:
 - a. Products / manufacturers used shall conform to Contract Document requirements.
 - 4. Comparable Product Requests:
 - a. Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles:
 - 1) Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
 - 2) Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
 - (a) Form of Approval: As specified in Division 01 Section "Submittal Procedures."
 - (b) Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.
 - 3) Submit five copies of each required submittal unless otherwise required. Architect will return three copies marked with action taken and with corrections or modifications required.

- 4) Submit electronic files: PDF. Architect will return a PDF copy marked with action taken and with corrections or modifications required.

3.02 TRANSPORTATION AND HANDLING

- A. Package products for shipment in manner to prevent damage or theft; for equipment, package to avoid loss of factory calibration.
- B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.
- C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
- D. Schedule delivery to reduce long-term storage at site and to prevent overcrowding of construction spaces.
- E. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
- F. Transport and handle products in accordance with manufacturer's instructions.
- G. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- H. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- I. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.
- J. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.03 STORAGE AND PROTECTION

- A. Provide protection of stored materials and products against theft, casualty, or deterioration.
- B. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 01 7419.
- C. Store and protect products in accordance with manufacturers' instructions.
- D. Store with seals and labels intact and legible.
- E. Arrange storage of materials and products to allow for visual inspection for the purpose of determination of quantities, amounts, and unit counts. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.
- F. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.
- G. Store heavy materials away from Project structure so supporting construction will not be endangered.
- H. For exterior storage of fabricated products, place on sloped supports above ground.
- I. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
- J. Comply with manufacturer's warranty conditions, if any.
- K. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- L. Prevent contact with material that may cause corrosion, discoloration, or staining.
- M. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

3.04 NON-CONFORMING WORK

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- A. Non-conforming work as covered in General Conditions applies, but is not limited, to use of non-specified products or manufacturers.

END OF SECTION

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**SECTION 01 6400
OWNER-FURNISHED PRODUCTS**

PART 1 GENERAL

1.01 SUMMARY

- A. Administrative and procedural requirements for Owner-Furnished Products. Install items furnished by Owner or receive and store in safe condition items purchased directly by Owner according to requirements of Contract Documents.
- B. Owner will supply the following to be installed by the Contractor:
 - 1. Interior Signage.
 - 2. Exterior Building Seminary Signs.
 - 3. Exterior Building Address Sign.
 - 4. Exterior Post-Mounted Sign.
 - 5. Artwork.
 - 6. Network Equipment:
 - a. Internet Firewall.
 - b. Network Switch.
 - c. Wireless Access Points.
 - 7. Collaboration Room Appliances.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. General:
 - 1. Review 'Contractor Notice of Owner-Furnished Materials' notice listing Owner-furnished products to be delivered for Project:
 - a. Review due (delivery) dates and vendor lead times for each item and coordinate with construction schedule. Immediately report recommended changes to Owner's Purchasing Coordinator listed in 'Contractor Notice of Owner Furnished Materials'. Contact vendors directly if changes to delivery dates become necessary during construction.
 - b. Report problems in coordinating due (delivery) dates with construction schedule to Architect and Owner's Purchasing Coordinator.
 - 2. Receive unload, store and protect Owner-furnished materials and products.
 - a. Provide labor and equipment necessary to receive, unload, and store materials and products.
 - b. Count number of pieces received and note any discrepancies on Delivery Receipt before driver leaves:
 - 1) Compare 'Contractor Notice of Owner Furnished Materials' notice' with packing slips.
 - 2) Note discrepancies in number, size, color, model numbers, etc. on Delivery Receipt.
 - c. Include Project Name and Project Number on Delivery Receipt.
 - d. Check for visible evidence of damage such as holes, tears, or crushed portions of cartons and note on Delivery Receipt before driver leaves:
 - 1) Include Project Name and Project Number on Delivery Receipt.
 - 2) If you are unsure if carton is damaged, take photo of cartons and share it with Owner's Purchasing Coordinator.
 - e. Properly store and protect all deliveries of Owner Furnished materials and Products.
 - 3. Within forty-eight (48) hours of delivery:
 - a. Open and inspect each piece of freight delivered. Take picture of any concealed damage not reported at time of delivery and report it to Owner's Purchasing Coordinator.
 - b. Compare 'Contractor Notice of Owner Furnished Materials' with packing slips. Note discrepancies in number, size, color, model numbers, etc.

- c. Deliver copy of Delivery Receipt (bill of lading) on which you have noted any loss or damage to Owner's Purchasing Coordinator. Include in your submission any report of concealed damage, discrepancies or photos.
- 4. Failure to strictly follow above procedures will result in your assumption of all financial responsibility for this shipment. All replacement and reorders must be made through Owner's Purchasing Coordinator and must allow Owner's vendor sufficient lead time to produce and ship new product.
- 5. When above procedures are strictly followed, shortages and damaged items will be replaced by Owner at Owner's cost.

PART 1 PRODUCTS NOT USED

PART 1 EXECUTION NOT USED

END OF SECTION

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**SECTION 01 7000
EXECUTION AND CLOSEOUT REQUIREMENTS**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Examination, preparation, and general installation procedures.
- B. Surveying for laying out the work.
- C. Cleaning and protection.
- D. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

- A. Section 01 7800 - Closeout Submittals: Project record documents, operation and maintenance data, warranties, and bonds.

1.03 QUALIFICATIONS

- A. For surveying work, employ a land surveyor registered in the State in which the Project is located and acceptable to Architect. Submit evidence of surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate. Employ only individual(s) trained and experienced in collecting and recording accurate data relevant to ongoing construction activities,

1.04 PROJECT CONDITIONS

- A. Use of explosives is not permitted.
- B. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- C. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.
- D. Perform dewatering activities, as required, for the duration of the project.
- E. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- F. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
 - 1. Provide dust-proof enclosures to prevent entry of dust generated outdoors.
 - 2. Provide dust-proof barriers between construction areas and areas continuing to be occupied by Owner.
- G. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
 - 1. Minimize amount of bare soil exposed at one time.
 - 2. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
 - 3. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
 - 4. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.
- H. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
 - 1. At All Times: Excessively noisy tools and operations will not be tolerated inside the building at any time of day; excessively noisy includes jackhammers.
 - 2. Outdoors: Limit conduct of especially noisy exterior work to within hours and limits allowed by city noise regulations.
 - 3. Indoors: Limit conduct of especially noisy interior work to within hours and limits allowed by city noise regulations.

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- I. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.
- J. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.
- K. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
- C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or mis-fabrication.
- E. Verify that utility services are available, of the correct characteristics, and in the correct locations.
- F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

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

3.03 LAYING OUT THE WORK

- A. Verify locations of survey control points prior to starting work.
- B. Promptly notify Architect of any discrepancies discovered.
- C. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- D. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- E. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.
- F. Utilize recognized engineering survey practices.

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- G. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
 1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
 2. Grid or axis for structures.
 3. Building foundation, column locations, and ground floor elevations.
- H. Periodically verify layouts by same means.
- I. Maintain a complete and accurate log of control and survey work as it progresses.

3.04 GENERAL INSTALLATION REQUIREMENTS

- A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations to extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents. Notify Architect of conflicts between Manufacturer's installation instructions and Contract Document requirements.
- B. Provide attachment and connection devices and methods necessary for securing Work. Secure work true to line and level. Anchor each product securely in place, accurately located, and aligned with other Work. Allow for expansion and building movement.
- C. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- D. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- E. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- F. Visual Effects: Provide uniform joint widths in exposed work. Arrange joints in exposed work to obtain best visual effect. Refer questionable choices to Architect for final decision.
- G. Install each component during weather conditions and Project status that will ensure best possible results. Isolate each part of completed construction from incompatible material as necessary to prevent deterioration.
- H. Coordinate temporary enclosures with required inspections and tests, to reduce necessity of uncovering completed construction for that purpose.
- I. Mounting Heights: Where mounting heights are not shown, install individual components at standard mounting heights recognized within the industry or local codes for that application. Refer questionable mounting height decisions to Architect for final decision.

3.05 CUTTING AND PATCHING

- A. Whenever possible, execute the work by methods that avoid cutting or patching.
- B. Perform whatever cutting and patching is necessary to:
 1. Complete the work.
 2. Fit products together to integrate with other work.
 3. Provide openings for penetration of mechanical, electrical, and other services.
 4. Match work that has been cut to adjacent work.
 5. Repair areas adjacent to cuts to required condition.
 6. Repair new work damaged by subsequent work.
 7. Remove samples of installed work for testing when requested.
 8. Remove and replace defective and non-complying work.
- C. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
- D. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

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- E. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- F. Restore work with new products in accordance with requirements of Contract Documents.
- G. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- H. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 8400, to full thickness of the penetrated element.
- I. Patching:
 1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
 2. Match color, texture, and appearance.
 3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.06 PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- D. Keep site and adjoining streets reasonably clean. If necessary, sprinkle rubbish and debris with water to suppress dust.
- E. During handling and installation, protect construction in progress and adjoining materials in place. Apply protective covering where required to ensure protection from soiling, damage, or deterioration until Substantial Completion.
- F. Clean and maintain completed construction as frequently as necessary throughout construction period. Adjust and lubricate operable components to ensure ability to operate without damaging effects.
- G. Supervise construction activities to ensure that no part of construction completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during construction period.
- H. Before and during application of painting materials, clear area where such work is in progress of debris, rubbish, and building materials that may cause dust. Sweep floors and vacuum as required and take all possible steps to keep area dust free.
- I. Clean exposed surfaces and protect as necessary to avoid damage and deterioration.
- J. Place extra materials of value remaining after completion of associated work have become Owner's property as directed by Owner or Architect.
- K. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.07 PROTECTION OF INSTALLED WORK

- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

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- E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- G. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.08 ADJUSTING

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

3.09 FINAL CLEANING

- A. Execute final cleaning after Substantial Completion but before making final application for payment.
 - 1. Clean areas to be occupied by Owner prior to final completion before Owner occupancy.
- B. Use cleaning materials that are nonhazardous.
- C. Comply with individual manufacturer's cleaning instructions.
- D. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
- E. Clean each surface or unit to condition expected in normal, commercial building cleaning and maintenance program, including but not limited to:
 - 1. Interior Cleaning:
 - a. Exercising care not to scratch glass.
 - b. Remove marks, stains, fingerprints and dirt.
 - c. Clean and polish woodwork and finish hardware.
 - d. Clean plumbing fixtures and tile work. Remove spots, soil or paint.
 - e. Clean surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean light fixtures and lamps.
 - f. Clean other fixtures and equipment and remove stains, paint, dirt, and dust.
 - g. Remove temporary floor protection and clean floors.
 - 2. Exterior Cleaning:
 - a. Exercising care not to scratch glass.
 - b. Remove marks, stains, and dirt from exterior surfaces.
 - c. Clean and polish finish hardware.
 - d. Remove temporary protection systems.
 - e. Clean dirt, mud, and other foreign material from paving and sidewalks.
 - f. Clean drop inlets, through-curb drains, and other drainage structures.
 - g. Remove trash, debris, and foreign material from landscaped areas.
- F. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
- G. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- H. Clean filters of operating equipment.
- I. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, drainage systems.
- J. Clean site; sweep paved areas, rake clean landscaped surfaces.
- K. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.10 CLOSEOUT PROCEDURES

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- A. Closeout process consists of three specific project closeout inspections. Contractor shall plan sufficient time in construction schedule to allow for required inspections before expiration of Contract Time.
- B. Contractor shall conduct his own inspections of The Work and shall not request closeout inspections until The Work of the contract is reasonably complete and correction of obvious defects or omissions are complete or imminent.
- C. Date of Substantial Completion shall not occur until completion of construction work, unless agreed to by Architect and included on Certificate of Substantial Completion.
- D. Make submittals that are required by governing or other authorities.
 - 1. Provide copies to Architect and Owner.
- E. Preliminary Closeout Review:
 - 1. When Architect, Owner and Contractor agree that project is ready for closeout, Pre-Substantial Inspection shall be scheduled. Preparation of floor substrate to receive carpeting and any work which could conceivably damage or stain carpet must be completed, as carpet installation will be scheduled immediately following this inspection.
 - 2. Prior to this inspection, completed test and evaluation reports for HVAC system and font, where one occurs, are to be provided to Project Manager, Architect, and applicable consultants.
 - 3. Architect and his appropriate consultants, together with Contractor and mechanical, plumbing, fire protection, and electrical sub-contractors shall conduct a space by space and exterior inspection to review materials and workmanship and to demonstrate that systems and equipment are operational.
 - a. Punch list of items requiring completion and correction will be created.
 - b. Time frame for completion of punch list items will be established, and date for Substantial Completion Inspection shall be set.
- F. Substantial Completion Inspection:
 - 1. When Architect, Owner and Contractor agree that project is ready for Substantial Completion, an inspection is held. Punch list created at Pre-Substantial Inspection is to be substantially complete.
 - 2. Prior to this inspection, Contractor shall discontinue or change over and remove temporary facilities from the site, along with construction tools, mock-ups and similar elements.
 - 3. Architect, Owner and Contractor review completion of punch list items. When Owner and Architect confirm that Contractor has achieved Substantial Completion of The Work, Owner, Architect and Contractor will execute Certificate of Substantial Completion that contains:
 - a. Date of Substantial Completion.
 - b. Punch List Work not yet completed, including seasonal and long lead items.
 - c. Amount to be withheld for completion of Punch List Work.
 - d. Time period for completion of Punch List Work.
 - e. Amount of liquidated damages set forth in Supplementary Conditions to be assessed if Contractor fails to complete Punch List Work within time set forth in Certificate.
 - 4. Contractor shall present Closeout Submittals to Architect and place tools, spare parts, extra stock, and similar items required by Contract Documents in locations as directed by Facilities Manager.
- G. Final Acceptance Meeting:
 - 1. When punch list items except for any seasonal items or long lead items which will not prohibit occupancy are completed, Final Acceptance Meeting is held.
 - 2. Owner, Architect and Contractor execute Owner's Project Closeout - Final Acceptance form, and verify:
 - a. All seasonal and long lead items not prohibiting occupancy, if any, are identified, with committed to completion date and amount to be withheld until completion.

- b. Owner’s maintenance personnel have been instructed on all system operation and maintenance as required by the Contract Documents.
- c. Final cleaning requirements have been completed.
- 3. If applicable, once any seasonal and long lead items are completed, Closeout Inspection is held where Owner and Architect verify that The Work has been satisfactorily completed, and Owner, Architect and Contractor execute Closeout portion of the Project Closeout - Final Acceptance form.
- 4. When Owner and Architect confirm that The Work is satisfactorily completed, Architect will authorize final payment.

3.11 MAINTENANCE

- A. Provide service and maintenance of components indicated in specification sections.
- B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.
- C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.
- D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.
- E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION

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**SECTION 01 7419
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL**

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

- A. Owner requires that this project generate the least amount of trash and waste possible.
- B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.
- C. Methods of trash/waste disposal that are not acceptable are:
 - 1. Burning on the project site.
 - 2. Burying on the project site.
 - 3. Dumping or burying on other property, public or private.
 - 4. Other illegal dumping or burying.
- D. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 DEFINITIONS

- A. Asphalt Pavement, Brick, and Concrete (ABC) Rubble: Rubble that contains only weathered (cured) asphalt pavement, clay bricks and attached mortar normally used in construction, or concrete that may contain rebar. The rubble shall not be mixed with, or contaminated by, another waste or debris.
- B. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.
- C. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.
- D. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- E. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.
- F. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

PART 3 EXECUTION

2.01 WASTE MANAGEMENT PLAN IMPLEMENTATION

- A. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.
- B. Meetings: Discuss trash/waste management goals and issues at project meetings.
 - 1. Prebid meeting.
 - 2. Preconstruction meeting.
 - 3. Regular job-site meetings.
- C. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
 - 1. Provide containers as required.
 - 2. Provide adequate space for pick-up and delivery and convenience to subcontractors.
 - 3. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.

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- D. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.
- E. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.

END OF SECTION

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**SECTION 01 7800
CLOSEOUT SUBMITTALS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Project Record Documents.
- B. Operation and Maintenance Data.
- C. Warranties and bonds.
- D. Maintenance materials.

1.02 RELATED REQUIREMENTS

- A. Section 01 3000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
- B. Individual Product Sections: Specific requirements for operation and maintenance data.
- C. Individual Product Sections: Warranties required for specific products or Work.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

- A. Do not use record documents for construction purposes:
 - 1. Protect from deterioration and loss in secure, fire-resistive location.
 - 2. Provide access to record documents for Architect's reference during normal working hours.
- B. Maintain clean, undamaged set of Drawings:
 - 1. Mark set to show actual installation where installation varies from the Work as originally shown.
 - 2. Give particular attention to concealed elements that would be difficult to measure and record at a later date.
 - 3. Mark record sets with red erasable pencil. Use other colors to distinguish between variations in separate categories of the Work.
 - 4. Mark new information that is important to Owner, but was not shown on Drawings.
 - 5. Note related Change Order numbers where applicable.
- C. As Built Record Drawings:
 - 1. As required in agreement with the Owner:
 - a. Architect will provide two full-size sets of prints of the As Built Record Drawings to the Facilities Management Office, printed from the updated AutoCAD drawing files or updated Revit model files, as specified by Owner, that have been modified to show actual dimensions and location of equipment, material, utility lines, and other work as actually constructed, based upon information provided by Contractor. Architect will submit updated As Built Record Drawings in PDF (ISO32000 format) to Owner.
 - b. Architect will submit following:
 - 1) Updated AutoCAD as built record drawing files with associated plot style tables or Revit as built record model files, as specified by Owner.
 - 2) Revit Model O&M lifecycle requirements to be tracked by Facility Manager.
- D. Project Record Photographs:
 - 1. With a digital camera that has a flash and a resolution of at least 12 megapixels, take photographs of the following:
 - a. Site utilities and irrigation system before being buried.
 - b. All items that are difficult to observe or locate after they are covered up with later stages of construction.
 - c. All walls and ceilings immediately prior to installing insulation.

2. Unless obvious, provide location information in the photographs. Place a small white marker board in the photograph with the room number and orientation (Room 103, west wall).
 3. Organize and name the digital files with a filing and naming system that will allow easy access to the digital photographs.
- E. Maintain on site one set of the following record documents; record actual revisions to the Work:
1. Drawings.
 2. Specifications.
 3. Addenda.
 4. Change Orders and other modifications to the Contract.
 5. Reviewed shop drawings, product data, and samples.
 6. Manufacturer's instruction for assembly, installation, and adjusting.
- F. Ensure entries are complete and accurate, enabling future reference by Owner.
- G. Store record documents separate from documents used for construction.
- H. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
1. Manufacturer's name and product model and number.
 2. Product substitutions or alternates utilized.
 3. Changes made by Addenda and modifications.

3.02 OPERATION AND MAINTENANCE DATA

- A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
- B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
- D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.
- E. General:
1. Include closeout submittal documentation as required by Contract Documentation.
 2. Include workmanship bonds, final certifications, equipment check-out sheets, and similar documents.
 3. Releases enabling Owner unrestricted use of The Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 4. Include Project photographs, damage or settlement survey, and similar record information required by Contract Documents.
 5. Submittal Format:
 - a. Digital copies unless otherwise noted, required for each individual specification section that include 'Closeout Submittals'.
 - b. Include only closeout submittals as defined in individual specification section as required in Contract Documents.
- F. Project Manual:
1. Copy of complete Project Manual including Addenda, Modifications as defined in General Conditions, and other interpretations issued during construction:
 - a. Mark these documents to show variations in actual Work performed in comparison with text of specifications and Modifications.
 - b. Show substitutions, selection of options, and similar information, particularly on elements that are concealed or cannot otherwise be readily discerned later by direct observation.

- G. Maintenance Contracts:
 - 1. Digital format only.
- H. Operations and Maintenance Data:
 - 1. Digital format only:
 - a. Cleaning instructions.
 - b. Maintenance instructions.
 - c. Operations instructions.
 - d. Equipment list.
 - e. Parts list.
- I. Warranty Documentation:
 - 1. Digital format of final, executed warranties.
- J. Record Documentation:
 - 1. Digital format only.
 - a. Certificate of Occupancy
 - b. Certifications.
 - c. Color and pattern selections
 - d. Design Data.
 - e. Geotechnical Evaluation Reports (soils reports).
 - f. Manufacture Reports.
 - g. Manufacturer's literature or cut sheets.
 - h. Shop Drawings.
 - i. Source Quality Control.
 - j. Special Procedures.
 - k. Project Record Photographs.
- K. Testing and Inspection Agency Reports.
 - 1. Testing and Inspection Reports.
- L. Software:
 - 1. Audio and Video System software, programming and set-files.
- M. Irrigation Plan.
 - 1. Colored to show a different color for each irrigation valve and its lines/heads.
 - 2. Laminated and un-laminated reduced sized hard copies.
 - 3. Digital copy in PDF format.
- N. Landscape Management Plan (LMP):
 - 1. Irrigation Section:
 - a. Submittal Format: Digital format and hard copy of each.
 - b. Documentation required by sections under 32 8000 Heading: 'Irrigation'.
 - 2. Landscaping Section:
 - a. Submittal Format: Digital format and hard copy of each.
 - b. Documentation required by sections under 32 9000 Heading: 'Planting'.
- O. Project digital record photographs in JPG format.

3.03 WARRANTIES AND BONDS

- A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.
- B. Verify that documents are in proper form, contain full information, and are notarized.
- C. Co-execute submittals when required.
- D. Retain warranties and bonds until time specified for submittal.

- E. Include originals of each in operation and maintenance manuals, indexed separately on Table of Contents.
- F. Manual: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable plastic covers.
- G. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.
- H. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.
- I. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

3.04 MAINTENANCE MATERIAL SUBMITTALS

- A. Submit item(s) required by Section 01 3000 - Administrative Requirements and as defined in individual specification sections if required in Contract Documents. Items may be provided at completion of Work or with Closeout Submittals.

END OF SECTION

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**SECTION 03 3000
CAST-IN-PLACE CONCRETE**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete formwork.
- B. Concrete anchors
- C. Concrete foundation walls.
- D. Concrete reinforcement.
- E. Joint devices associated with concrete work.
- F. Miscellaneous concrete elements, including equipment pads, equipment pits, light pole bases, flagpole bases, thrust blocks, and manholes.
- G. Concrete curing.

1.02 RELATED REQUIREMENTS

- A. Section 03 3511 - Concrete Floor Finishes: Densifiers, hardeners, applied coatings, and polishing.
- B. Section 03 3517 - Concrete Sealer Finishing
- C. Section 03 4500-Precast Concrete Specialties
- D. Section 07 9200 - Joint Sealants: Products and installation for sealants and joint fillers for saw cut joints and isolation joints in slabs.
- E. Section 31 0500 for field applied termiticide and mildewcide for concrete surfaces.
- F. Section 32 1313-Concrete Paving: Concrete paving, sidewalks, curbs and gutters.
- G. Section 33 1416 - Site Water Utility Distribution Piping for installation of sleeves for piping penetrating interior concrete slabs on grade.

1.03 REFERENCE STANDARDS

- A. ACI 117 - Specifications for Tolerances for Concrete Construction and Materials 2010 (Reapproved 2015).
- B. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete 1991 (Reapproved 2009).
- C. ACI 301 - Specifications for Structural Concrete 2016.
- D. ACI 302.1R - Guide to Concrete Floor and Slab Construction 2015.
- E. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete 2000 (Reapproved 2009).
- F. ACI 305R - Guide to Hot Weather Concreting 2010.
- G. ACI 306R - Guide to Cold Weather Concreting 2016.
- H. ACI 308R - Guide to External Curing of Concrete 2016.
- I. ACI 318 - Building Code Requirements for Structural Concrete and Commentary 2014 (Errata 2018).
- J. ACI 347R - Guide to Formwork for Concrete 2014, with Errata (2017).
- K. ANSI/NFSI B101.1 - Test Method For Measuring Wet SCOF Of Common Hard-Surface Floor Materials 2009.
- L. ANSI/NFSI B101.3 - Test Method For Measuring Wet DCOF Of Common Hard-Surface Floor Materials 2012.
- M. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold Finished 2018.

- N. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength 2021.
- O. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts 2021a.
- P. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement 2020.
- Q. ASTM A775/A775M - Standard Specification for Epoxy-Coated Steel Reinforcing Bars 2017.
- R. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement 2019, with Editorial Revision (2020).
- S. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete 2018a.
- T. ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation 2017.
- U. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete 2012.
- V. ASTM C33/C33M - Standard Specification for Concrete Aggregates 2018.
- W. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens 2020.
- X. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete 2020.
- Y. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete 2020.
- Z. ASTM C150/C150M - Standard Specification for Portland Cement 2020.
- AA. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete 2016.
- BB. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method 2016.
- CC. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete 2019.
- DD. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete 2019.
- EE. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing 2017.
- FF. ASTM C779/C779M - Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces 2019.
- GG. ASTM C827/C827M - Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures 2016.
- HH. ASTM C1059/C1059M - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete 2013.
- II. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink) 2017.
- JJ. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures 2020.
- KK. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete 2019.
- LL. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete 2012.
- MM. ASTM D471 - Standard Test Method for Rubber Property--Effect of Liquids 2016a.
- NN. ASTM D523 - Standard Test Method for Specular Gloss 2014 (Reapproved 2018).
- OO. ASTM D8139 - Standard Specification for Semi-Rigid, Closed-Cell Polypropylene Foam, Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction 2017.

- PP. ASTM D994/D994M - Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type) 2011 (Reapproved 2016).
- QQ. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types) 2018.
- RR. ASTM D1752 - Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction 2018.
- SS. ASTM D2103 - Standard Specification for Polyethylene Film and Sheeting 2015.
- TT. ASTM D3963/D3963M - Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Steel Reinforcing Bars 2015.
- UU. ASTM D5767 - Standard Test Method for Instrumental Measurement of Distinctness-of-Image (DOI) Gloss of Coated Surfaces 2018.
- VV. ASTM E154/E154M - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover 2008a, with Editorial Revision (2013).
- WW. ASTM E1155 - Standard Test Method for Determining F(F) Floor Flatness and F(L) Floor Levelness Numbers 2014.
- XX. ASTM E1155M - Standard Test Method for Determining F(F) Floor Flatness and F(L) Floor Levelness Numbers (Metric) 2014.
- YY. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs 2018a.
- ZZ. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs 2017.
- AAA. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection 2020.
- BBB. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials 2016.
- CCC. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength 2018.
- DDD. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength 2021.
- EEE. COE CRD-C 48 - Method of Test for Water Permeability of Concrete 1992.
- FFF. COE CRD-C 513 - COE Specifications for Rubber Waterstops 1974.
- GGG. COE CRD-C 621 - Handbook for Concrete and Cement Standard Specification for Packaged, Dry 1997.
- HHH. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements 2015.
- III. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements 2016.
- JJJ. ICC-ES AC380 - Acceptance Criteria for Termite Physical Barrier Systems 2014, with Editorial Revision (2017).
- KKK. ICRI 310.2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair 2013.
- LLL. NSF 61 - Drinking Water System Components - Health Effects 2019.
- MMM. NSF 372 - Drinking Water System Components - Lead Content 2016.

1.04 SUBMITTALS

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- A. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
 - 1. For curing compounds, provide data on method of removal in the event of incompatibility with floor covering adhesives.
 - 2. For chemical-resistant waterstops, provide data on ASTM D471 test results.
 - 3. Printed application instructions for form release agents.
- B. Mix Design: Submit proposed concrete mix design.
 - 1. Indicate proposed mix design complies with requirements of ACI 301, Section 4 - Concrete Mixtures.
 - 2. Indicate proposed mix design complies with requirements of ACI 318, Chapter 5 - Concrete Quality, Mixing and Placing.
- C. Shop Drawings:
 - 1. Show dimensioned locations of anchor bolts for hold-down anchors and columns.
 - 2. Show reinforcement and all necessary bending diagrams and reinforcing steel list, and construction joint locations.
 - 3. Provide bar schedules and bending details.
 - 4. Show all formwork for concrete surfaces which are to remain exposed in the finished work.
 - 5. Joint layout plan for control and expansion joints for sidewalks, curbs, and gutters for written approval before starting work on this Section.
- D. Samples: Submit samples of underslab vapor retarder to be used.
- E. Ready-Mix Supplier:
 - 1. Require mix plant to furnish delivery ticket for each batch of concrete. Keep delivery tickets at job-site for use of Owner or its representatives. Tickets shall show following:
 - a. Name of ready-mix batch plant.
 - b. Serial number of ticket.
 - c. Date and truck number.
 - d. Name of Contractor.
 - e. Name and location of Project.
 - f. Specific class or designation of concrete conforming to that used in Contract Documents.
 - g. Amount of concrete.
 - h. Amount and type of cement.
 - i. Total water content allowed by mix design.
 - j. Amount of water added at plant.
 - k. Sizes and weights of sand and aggregate.
 - l. Time loaded.
 - m. Type, name, manufacturer, and amount of admixtures used.
 - 2. Provide certificates with supporting testing reports verifying compliance with Contract Document requirements and that materials provided are from single source for following:
 - a. Cement.
 - b. Aggregate.
 - c. Fly Ash.
- F. Test Reports: Submit report for each test or series of tests specified.
- G. Test Reports: Submit termite-resistant sheet manufacturer's summary of independent laboratory and field testing for effectiveness in subterranean termite exclusion.
- H. Manufacturer's Installation Instructions: For concrete accessories and form release agents, indicate installation procedures and interface required with adjacent construction.
- I. Manufacturer's Reports:
 - 1. Provide Manufacturer's performance and testing data for following:
 - a. Each admixture used.

- J. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.
- K. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Record Documentation:
 - 1) Pour Reports:
 - (a) Provide report that records following information:
 - (1) Date and time of start of pour, Date and time of end of pour, and Date and time of end of finishing procedures.
 - (2) Temperature at start of pour, Temperature at end of Pour, and Maximum temperature during performance of finishing procedures.
 - (3) Wind speed at start of pour, Wind speed at end of pour, and Maximum wind speed during performance of finishing procedures.
 - (4) Humidity at start of pour, Humidity at end of pour, and High and low humidity during performance of finishing procedures.
 - (5) Cloud cover at start of pour, Cloud cover at end of pour, and High and low cloud cover during performance of finishing procedures.
 - (6) Screeding method and equipment used.
 - (7) Saw cut method and equipment used.
 - 2) Testing and Inspection Reports:
 - (a) Testing Agency Testing and Inspecting Reports of concrete.
 - 3) Warranty. Submit rapid concrete drying or MVRA manufacturer warranties for concrete moisture vapor emission induced flooring failure and adhesion; ensure both have been completed in project's name and registered with manufacturer.
 - (a) Provide warranty to cover cost of flooring failures due to moisture migration from slabs for life of concrete. Include cost of repair or removal of failed flooring, placement of topical moisture remediation system, and replacement of flooring with comparable flooring system.
 - (b) Provide stand-alone adhesion warranty matching duration of flooring adhesive or primer manufacturer's material defect warranty.
- L. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 DEFINITIONS

- A. Cold Weather, as referred to in this Section, is four (4) hours with ambient temperature below 40 deg F in twenty-four (24) hour period.
- B. Floor Flatness (FF): Rate of change in elevation of floor over 12 inches section.
- C. Floor Levelness (FL): Measures difference in elevation between two points which are 10 feet apart.
- D. Hot Weather, as referred to in this Section, is ambient air temperature above 100 deg F or ambient air temperature above 90 deg F with wind velocity 8 mph or greater.

1.06 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI 301 and ACI 318.
 - 1. Maintain one copy of each document on site.
- B. Qualifications: Requirements of Section 01 4000 applies, but is not limited to following:
 - 1. Installers and Installation Supervisor:
 - a. ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
 - b. Certification for National Ready Mixed Concrete Association (NRMCA).
 - 2. Ready-Mix Supplier:
 - a. Comply with ASTM C94/C94M requirements and be certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities".

3. Testing Agencies:
 - a. Independent agency qualified according to ASTM C1077 and ASTM E329.
 - 1) Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technicians, Grade I according to ACI CP-1 or equivalent certification program.
 - 2) Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be ACI-certified Concrete Laboratory Testing Technician - Grade II.
- C. Testing and Inspection:
 1. Owner is responsible for Quality Assurance. Quality assurance performed by Owner will be used to validate Quality Control performed by Contractor.
 2. Owner will provide Testing and Inspection on concrete:
 - a. Owner will employ testing agencies to perform testing and inspection on concrete as specified in Field Quality Control in Part 3 of this specification:
 - 1) Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform the Work in strict accordance with requirements of Contract Documents and perform contractor testing and inspection.
- D. Follow recommendations of ACI 305R when concreting during hot weather.
- E. Follow recommendations of ACI 306R when concreting during cold weather.
- F. For slabs required to include moisture vapor reducing admixture (MVRA), do not proceed with placement unless manufacturer's representative is present for every day of placement.
- G. MANDATORY Pre-Installation Conference:
 1. Agenda items, review following:
 - a. Review Section 01 4000 for Testing and Inspection administrative requirements and responsibilities and Field Quality Control tests and inspections required of this section.
 - 1) Review requirements and frequency of testing and inspections.
 - b. Set up concrete placement pour card system and verify that all relevant trades have signed off prior to concrete placement.
 - c. Obtaining trade sign-offs on each pour card will be responsibility of General Contactor's foreman or whoever is in charge of ordering concrete.
 - d. Pour cards will be turned in to Quality Assurance representative after the work has been completed so that they can be reviewed and filed.
 - e. Review installation scheduling, coordination, placement of building concrete, and placement of items installed in and under concrete.
 - f. Review installation scheduling, coordination and placement of site concrete and of items installed in concrete.
 - g. Review "Verification of Conditions" requirements.
 - h. Review requirements for preparation of subgrade and aggregate base requirements.
 - i. Review formwork requirements.
 - j. Review approved mix design requirements, mix designs and use of admixtures.
 - k. Review reinforcing bar submittals.
 - l. Review installation schedule and placement of reinforcing bars.
 - m. Review placement, finishing, and curing of concrete, including cold and hot weather requirements.
 - n. Review joint layout plan for control and expansion joints, fillers for sidewalks, curbs, and gutters:
 - 1) Review jointing requirements.
 - 2) Joint layout for concrete paving is specified in Section 32 1313.
 - o. Review smooth rubbed concrete finish procedures and requirements (applied immediately after removing concrete formwork while concrete is "green").

- p. Review layout plan, scheduling, coordination, and placement requirements of detectable warning panels.
 - q. Review concrete slab tolerances and corrective measures if tolerances not met.
 - r. Review safety issues.
- H. Scheduling:
- 1. Notify Testing Agency and Architect twenty-four (24) hours minimum before placing concrete.
 - 2. Schedule pre-installation conference prior to placing of footings, installation of foundation forms and reinforcing steel, and installation of anchors, dowels, inserts, and block outs in foundation walls and slabs.

1.07 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Slabs with Moisture Vapor Reducing Admixture (MVRA): Provide warranty to cover cost of flooring failures due to moisture migration from slabs for ten years.
 - 1. Include cost of repair or removal of failed flooring, placement of topical moisture remediation system, and replacement of flooring with comparable flooring system.
- C. Moisture Emission-Reducing Curing and Sealing Compound, Membrane-Forming: Provide warranty to cover cost of flooring delamination failures for 10 years.
 - 1. Include cost of repair or removal of failed flooring, remediation with a moisture vapor impermeable surface coating, and replacement of flooring with comparable flooring system.
- D. Moisture Emission-Reducing Curing and Sealing Compound, Penetrating: Provide non-prorated warranty to cover cost of flooring delamination failures for 20 years.
 - 1. Include cost of repair or removal of failed flooring, remediation with a moisture vapor impermeable surface coating, and replacement of flooring with comparable flooring system.
- E. Termite-Resistant Vapor Barrier Sheet: Provide five year manufacturer's limited warranty.

PART 2 PRODUCTS

2.01 CONCRETE FORMWORK

- A. Formwork Design and Construction: Comply with guidelines of ACI 347R to provide formwork that will produce concrete complying with tolerances of ACI 117.
- B. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.
 - 1. Form Facing for Exposed Finish Concrete: Contractor's choice of materials that will provide smooth, stain-free final appearance.
 - 2. Form Facing for Exposed Finish Concrete: Steel.
 - 3. Earth Cuts: Do not use earth cuts as forms for vertical surfaces. Natural rock formations that maintain a stable vertical edge may be used as side forms.
 - a. Vertical earth cuts may be used for footings provided the footing width and length are 6" wider and longer than scheduled.
 - 4. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings.
 - 5. Form Ties: Cone snap type that will leave no metal within 1-1/2 inches of concrete surface.

2.02 CONCRETE ANCHORS

- A. General:
 - 1. Use hot-dipped galvanized or stainless steel with matching nuts and washers in exterior and moist interior applications unless indicated otherwise on Contract Drawings.

- a. Install hot-dipped or stainless steel anchor bolts to attach wood sill plates to foundation with 1/4 inch by 3 inch x 3 inch minimum adjustable plate washers and standard cut washers between wood sill plates and nuts.
 - b. Nut: Conform to requirements of ASTM A563, Grade A, Hex.
 - c. Conform to requirements of ASTM F3125/F3125M for chemical, physical and mechanical requirements for quenched and tempered bolts manufactured from steel and alloy steel.
2. Threaded rod for adhesive anchors and cast-in anchors:
 - a. Conform to requirements of ASTM A307, Grade A or ASTM F1554 Grade 36 unless indicated otherwise on Contract Drawings.
 3. Cast-In-Place Anchor Bolts:
 - a. J-Bolts:
 - 1) Non-headed type threaded 2 inches minimum conforming to requirements of ASTM F1554, Grade A.
 - 2) Anchor hook to project 2 inches minimum including bolt diameter.
 - b. Headed Bolts:
 - 1) Headed type threaded 2 inches minimum conforming to requirements of ASTM F1554, Grade A.
 4. Headed Concrete Anchor Studs:
 - a. Composed of low carbon steel meeting requirements of ASTM A108.
 - b. Tensile Strength: 61,000 psi minimum.
 - c. Yield Strength: 49,000 psi minimum.
 5. Deformed Bar Anchors:
 - a. Manufactured in accordance with requirements of ASTM A1064/A1064M.
 - b. Tensile Strength: 80,000 psi minimum.
 - c. Yield Strength: 70,000 psi minimum.
 6. Reinforcing Bars:
 - a. Composed of deformed carbon steel meeting requirements of ASTM A615/A615M, Grade 60 (field bent bars may be Grade 40)
 7. Adhesive Anchors:
 - a. Products shall have current ESR conforming to current ICC Acceptance Criteria ICC-ES AC308 for concrete.
 - b. Rod diameter and embedment length as indicated on Contract Drawings.
 - c. Acceptable Products:
 - 1) HIT-RE 500V3 with SafeSet Epoxy Adhesive by Hilti Fastening Systems, Tulsa, OK www.us.hilti.com.
 - 2) Pure 110+ by Powers Fasteners Inc., Brewster NY www.powers.com.
 - 3) SET-XP Epoxy by Simpson Strong-Tie Co., Pleasanton, CA www.simpsonanchors.com.
 - 4) Equal as approved by Architect before installation. See Section 01 6000.
 8. Expansion Anchors:
 - a. Products shall have current ESR conforming to current ICC Acceptance Criteria ICC-ES AC193 for concrete.
 - b. Acceptable Products:
 - 1) KWIK Bolt TZ Expansion Anchor by Hilti Fastening Systems, Tulsa, OK www.us.hilti.com.
 - 2) Power-Stud +SD2 by Powers Fasteners Inc., Brewster NY www.powers.com.
 - 3) Strong-Bolt by Simpson Strong-Tie Co., Pleasanton, CA www.simpsonanchors.com.
 - 4) Equal as approved by Architect before installation. See Section 01 6000.
 9. Screw Anchors:
 - a. Provide anchors with length identification markings conforming to ICC Acceptance Criteria ICC-ES AC193 for concrete.
 - b. Type Two Acceptable Products:

- 1) KWIK HUS-EZ by Hilti Fastening Systems, Tulsa, OK www.us.hilti.com.
- 2) Wedge-Bolt+ by Powers Fasteners Inc., Brewster NY www.powers.com.
- 3) Titen HD by Simpson Strong Tie Co, Pleasanton, CA
www.simpsonanchors.com.
- 4) Equals as approved by Architect through shop drawing submittal before installation. See Section 01 6000.

2.03 REINFORCEMENT MATERIALS

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi), except dowels that are to be field bent, Grade 40 minimum.
 1. Type: Deformed billet-steel bars.
 2. Finish: Unfinished, unless otherwise indicated.
 3. Bars shall be free of heavy rust scales and flakes, or other bond-reducing coatings.
- B. Epoxy Coated Reinforcement Steel Bars:
 1. Bars shall have grade identification marks and conform to ASTM A615/A615M with coating conforming to ASTM A775/A775M and comply with requirements of ACI 318.21.2.5:
 - a. Bar supports shall be completely coated with epoxy or vinyl, compatible with both concrete and epoxy coating on bars. Coating shall be at least 1/8 inch thick at tips.
 - b. Tie wire shall be nylon coated.
 2. Actual yield strength based on mill tests does not exceed specified yield strength by more than 18,000 psi and Ratio of actual ultimate stress (at breaking point) to actual tensile yield stress shall not be less than 1.25.
 - a. Grade 60 minimum, except dowels that are to be field bent, Grade 40 minimum.
 3. Bars shall be deformed type.
 4. Bars shall be free of heavy rust scales and flakes, or other bond-reducing coatings.
- C. Steel Welded Wire Reinforcement (WWR): Galvanized, plain type, ASTM A1064/A1064M.
 1. Form: Coiled Rolls.
 2. WWR Style: 6 x 6 - W1.4 x W1.4..
- D. Reinforcement Accessories:
 1. Tie Wire: Annealed, minimum 16 gauge, 0.0508 inch.
 2. Bar Supports:
 - a. Concrete masonry units or bricks are not acceptable.
 - b. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs which are plastic protected (CRSI, Class 1) or stainless steel protected (CRSI, Class 2).
 - c. Acceptable Products:
 - 1) Concrete 'dobies' or blocks wired to reinforcing.
 - 2) Manufactured chairs with 4 sq inch bearing surface on sub-grade, or other feature to prevent chair from being pushed into sub-grade or damaging vapor retarder under slabs on grade.
 3. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
 4. Provide stainless steel, galvanized, plastic, or plastic coated steel components for placement within 1-1/2 inches of weathering surfaces.

2.04 CONCRETE MATERIALS

- A. Performance:
 1. Design Criteria: Conform to requirements of ASTM C94/C94M unless specified otherwise:
 2. Capacities:
 - a. For testing purposes, following concrete strengths are required:
 - 1) At 7 days: 70 percent minimum of 28 day strengths.
 - 2) At 28 days: 100 percent minimum of 28 day strengths.

- B. Cement: ASTM C150/C150M, Type I - Normal Portland type.
1. Acquire cement for entire project from same source.
- C. Concrete mix design: Submit mix designs to meet following requirements:
1. Mix Type B:
 - a. For unexposed interior concrete slabs on grade and as otherwise required by the contract drawings.
 - b. 3500 psi (24.13 MPa) minimum at twenty-eight (28) days.
 - c. Water / Cementitious Material: 0.45 maximum by weight.
 2. Mix Type E:
 - a. For exterior concrete exposed to freeze/thaw cycles and deicing salts or where soils are "corrosive" and as otherwise required by the contract drawings.
 - b. 4500 psi (31.03 MPa) minimum at twenty-eight (28) days.
 - c. Water / Cementitious Material: 0.40 maximum by weight.
 - d. Use twenty-five (25) percent Class F fly ash as part of cementitious material.
 - e. Mix Type E should be used for all exterior concrete exposed to freeze/thaw cycles and deicing salts, unless dictated otherwise by site conditions.
 - f. For concrete paving, use mix design based upon use of 1-1/2 inches coarse aggregate (about 15 percent).
 3. Air Entrainment: Six (6) percent, plus or minus 1-1/2 percent for exterior concrete and foundation walls exposed to freeze/thaw cycles.
 4. Do not add water any time during mixing cycle above amount required to meet specified water / cement ratio. No reduction in amount of cementitious material is allowed.
- D. Slump:
1. 4 inch (100 mm) slump maximum before addition of high range water reducer.
 2. 8 inch (200 mm) slump maximum with use of high range water reducer.
 3. Slump not required for Mix Type G.
- E. General:
1. Submit a letter on quarry's letterhead that certifies all aggregate for concrete complies with the requirements of this section. Material certificates which are submitted shall be signed by both the materials producer and the contractor, certifying that materials comply with or exceed requirements specified herein to the Architect, Civil and Structural Engineering Consultant and the Independent Testing Laboratory for review and approval.
 2. Aggregates for all concrete shall come from a quarry that is DOT approved and meets or exceeds durability Class I aggregate. The quarry shall submit a letter to Engineer that certifies that all aggregate complies with DOT requirements for durability. Aggregate not meeting DOT durability requirements shall not be used.
- F. Fine and Coarse Aggregates: ASTM C33/C33M.
1. Acquire aggregates for entire project from same source.
- G. Fly Ash: ASTM C618, Class C or F.
1. Not to exceed twenty-five (25) percent of weight of cementitious materials.
- H. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

2.05 ADMIXTURES

- A. No admixture shall contain calcium chloride nor shall calcium chloride be used as an admixture. All chemical admixtures used shall be from same manufacturer and compatible with each other.
1. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.
- B. Mix design shall show proposed admixtures, amount, usage instructions, and justification for proposed use. Do not use any admixtures without Architect's written approval.
1. Chemical accelerator or retarder may be used if necessary to meet environmental conditions and construction schedules.
- C. Alkali-Silica Reactivity Inhibiting Admixture:

1. Specially formulated lithium nitrate admixture for prevention of alkali-silica reactivity (ASR) in concrete. Admixture must have test data indicating conformance to ASTM C1293.
 2. Manufacturer: As approved by Architect before use. See Section 01 6000.
- D. Viscosity Modifying Admixture (VMA):
1. Liquid admixture used to optimize viscosity of Self-Consolidating Concrete (SCC). Subject to compliance with requirements, provide following at dosage rates per manufacturer's recommendations.
 2. Manufacturer: As approved by Architect before use. See Section 01 6000.
- E. Air Entraining Admixture: ASTM C260/C260M.
1. Manufacturer: As approved by Architect before use. See Section 01 6000.
- F. High Range Water Reducing Admixture: ASTM C494/C494 Type F.
1. Manufacturer: As approved by Architect before use. See Section 01 6000.
- G. High Range Water Reducing and Retarding Admixture (Superplasticizer): ASTM C494/C494M Type G.
1. Manufacturer: As approved by Architect before use. See Section 01 6000.
- H. Water Reducing Admixture: ASTM C494/C494M Type A.
1. Manufacturer: As approved by Architect before use. See Section 01 6000.
- I. Water Reducing and Accelerating Admixture: ASTM C494/C494 Type E.
1. Manufacturer: As approved by Architect before use. See Section 01 6000.
- J. Water Reducing and Retarding Admixture: ASTM C494/C494M Type D
1. Manufacturer: As approved by Architect before use. See Section 01 6000.
- K. Accelerating Admixture: ASTM C494/C494M Type C.
1. Manufacturer: As approved by Architect before use. See Section 01 6000.
- L. Retarding Admixture: ASTM C494/C494M Type B.
1. Manufacturer: As approved by Architect before use. See Section 01 6000.
- M. Shrinkage Reducing Admixture: ASTM C494/C494M Type S.
1. Manufacturer: As approved by Architect before use. See Section 01 6000.
- N. Non-Chloride, Non-Corrosive Accelerating Admixture: ASTM C494/C494M Type C or E.
1. Manufacturer: As approved by Architect before use. See Section 01 6000.
- O. Corrosion Inhibiting Admixture: ASTM C494/C494M Type C and ASTM C1582/C1582M.
1. Liquid admixture to inhibit corrosion of steel reinforcement in concrete by introducing proper amount of anodic inhibitor. Admixture shall contain thirty (30) percent calcium nitrite solution and shall be used where called for in specifications or on drawings.
 2. Manufacturer: As approved by Architect before use. See Section 01 6000.
- P. Moisture Vapor Reduction Admixture (MVRA):
1. Liquid, inorganic admixture free of volatile organic compounds (VOCs) and formulated to close capillary systems formed during curing to reduce moisture vapor emission and transmission with no adverse effect on concrete properties or finish flooring.
 2. Manufacturer: As approved by Architect before use. See Section 01 6000.
- Q. Waterproofing Admixture:
1. Admixture formulated to reduce permeability to liquid water, with no adverse effect on concrete properties.
 2. Admixture Composition: Crystalline, functioning by growth of crystals in capillary pores.
 3. Admixture Composition: Hydrophobic polymer waterproofing and corrosion inhibitor, functioning by closing concrete pores and chemical bonding.
 4. Permeability of Cured Concrete: No measurable leakage when tested in accordance with COE CRD-C 48 at 200 psi; provide test reports.

5. Potable Water Contact Approval: National Science Foundation (NSF) certification for use on structures holding potable water, based on testing in accordance with NSF 61 and NSF 372.
 6. Manufacturer: As approved by Architect before use. See Section 01 6000.
- R. Rapid Drying Admixture in Interior Concrete Slabs on Grade:
1. Admixture specifically designed to promote rapid drying of concrete.
 2. Manufacturer: As approved by Architect before use. See Section 01 6000.

2.06 ACCESSORY MATERIALS

- A. Underslab Vapor Retarder:
1. Sheet Material: ASTM E1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. Single ply polyethylene is prohibited.
 2. Thickness: 15 mil minimum
 3. Water Vapor Permeance: ASTM E96, Metah A, Perm 0.01
 4. Puncture Resistance: ASTM D1709
 5. Installation: Comply with ASTM E1643
 6. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.
 7. Manufacturer: As approved by Architect before use. See Section 01 6000.
- B. Non-Shrink Cementitious Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
1. Grout: Comply with ASTM C1107/C1107M.
 2. Meet following requirements:
 - a. ASTM C1107/C1107M, Type B or Type C.
 - b. Corps and Engineers CRD C-621.
 - c. Compressive strength of 6000 psi (41 MPa) minimum.
 3. Manufacturers: As approved by Architect before use. See Section 01 6000.
- C. Non-Shrink Epoxy Grout: Moisture-insensitive, two-part; consisting of epoxy resin, non-metallic aggregate, and activator (use on expansion joints of interior slabs on grade of Welfare Services Projects):
1. Composition: High solids content material exhibiting positive expansion when tested in accordance with ASTM C827/C827M.
 2. 100 percent solids, two-component, moisture-insensitive, semi-rigid epoxy for use as joint filler for saw cut and tooled interior joints.
 3. Self leveling consistency.
 4. Shore A Hardness: 75 to 80.
 5. Meet following minimum criteria:
 - a. Tensile Strength: 600 psi (4.2 MPa).
 - b. Ultimate Elongation: 35 percent.
 6. Manufacturers: As approved by Architect before use. See Section 01 6000.
- D. Semi-Rigid Joint Filler (control joints of interior concrete slabs on grade in warehouse areas of Welfare Services Projects):

2.07 BONDING AND JOINTING PRODUCTS

- A. Bonding Agents:
1. Manufacturers: As approved by Architect before use. See Section 01 6000.
- B. Latex Bonding Agent: Non-redispersable acrylic latex, complying with ASTM C1059/C1059M, Type II.
1. Manufacturers: As approved by Architect before use. See Section 01 6000.
- C. Slab Isolation Joint Filler: 1/2 inch thick, height equal to slab thickness, with removable top section that will form 1/2 inch deep sealant pocket after removal.

1. Material: ASTM D1751, cellulose fiber.
 2. Manufacturers: As approved by Architect before use. See Section 01 6000.
- D. Expansion Joint Filler:
1. Expansion Joint Filler Material:
 - a. Design Criteria:
 - 1) Resilient, flexible, non-extruding, expansion-contraction joint filler meeting requirements of ASTM D1751.
 - 2) 1/2 inch (12.7 mm) thick.
 - 3) Resilience:
 - (a) When compressed to half of original thickness, recover to minimum of seventy (70) percent of original thickness.
 - b. Manufacturers: As approved by Architect before use. See Section 01 6000.
- E. Finishing Material (Exposed Vertical Faces of Foundation and Retaining Walls):
1. Do not apply finishing material (parge coat) to foundation or retaining walls.
- F. Slab Contraction Joint Device (if used): Preformed linear strip intended for pressing into wet concrete to provide straight route for shrinkage cracking.
1. Manufacturers: As approved by Architect before use. See Section 01 6000.
- G. Slab Construction Joint Devices (if used and required by contract drawings): Combination keyed joint form and screed, galvanized steel, with rectangular or round knockout holes for conduit or rebar to pass through joint form at 6 inches on center; ribbed steel stakes for setting.
1. Provide removable plastic cap strip that forms wedge-shaped joint for sealant installation.
 - a. Height: To suit slab thickness.
 - b. Manufacturers: As approved by Architect before use. See Section 01 6000.
 2. Dowel Sleeves: Plastic sleeve for smooth, round, steel load-transfer dowels.
 - a. Manufacturers: As approved by Architect before use. See Section 01 6000.

2.08 CURING MATERIALS

- A. Membrane Curing:
1. Clear water-based, ready-to use membrane curing agent that cures freshly placed concrete, forming effective barrier against moisture loss from concrete surface.
 2. Design Criteria:
 - a. Exterior Concrete:
 - 1) Dissipating or non-dissipating membrane curing agent.
 - b. Interior Concrete:
 - 1) Dissipating membrane curing agent only.
 - 2) Gradually dissipate after twenty-eight (28) days without leaving stain or discoloring concrete surface.
 - c. VOC-compliant compound.
 - d. Meet requirements of ASTM C309 and AASHTO M 148, Type 1 or 1-D, Class B.
 - e. Interior concrete: containing no mineral spirits, naphtha, or other components detrimental to finish flooring installation.
 - f. Maintain ninety-five (95) percent of mix water present in concrete mass after application.
 3. Horizontal and Vertical Cast-In-Place Structural Concrete:
 - a. Acceptable Products.
 - 1) Exterior Concrete:
 - (a) Clear Cure J7WB by Dayton Superior Corporation, Miamisburg. OH www.daytonsuperior.com.
 - (b) Clear Water Resin by Right Point, Dekalb, IL www.rightpointe.com.
 - (c) L&M Cure R by L&M Construction Chemicals, Inc. Omaha, NE www.lmcc.com.

- (d) VOCOMP 20 (do not use when concrete sealer will be applied in areas of freeze/thaw and deicer salts) by W.R. Meadows, Inc. Hampshire, IL www.wrmeadows.com.
- (e) 1100-Clear by W. R. Meadows, Inc. Hampshire, IL www.wrmeadows.com.
- (f) Equal as approved by Architect before use. See Section 01 67000
- 2) Interior Concrete:
 - (a) Clear Cure J7WB by Dayton Superior Corporation, Miamisburg. OH www.daytonsuperior.com.
 - (b) Clear Water Resin by Right Point, Dekalb, IL www.rightpointe.com.
 - (c) L&M Cure R by L&M Construction Chemicals, Inc. Omaha, NE www.lmcc.com.
 - (1) 1100-Clear by W. R. Meadows, Inc. Hampshire, IL www.wrmeadows.com.
 - (d) Equal as approved by Architect before use. See Section 01 6000.
- B. Water Curing:
 - 1. Required Locations:
 - a. Used on all interior concrete floor surfaces including offices that receive carpet.
 - 2. Water-Curing Materials:
 - a. Type Two Acceptable Products:
 - 1) Absorptive Cover: Meet requirements of AASHTO M 182, Class 2 burlap cloth made from jute or kenaf and weighing minimum of 9 oz per sq yd (305 grams per sq m) when dry.
 - 2) Moisture-Retaining Cover: White, opaque membrane meeting requirements of ASTM C171 minimum.
 - 3) Equals as approved by Architect before using. See Section 01 6000.

2.09 MIXING

- A. On Project Site: Mix in drum type batch mixer, complying with ASTM C685/C685M. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.
- B. Transit Mixers: Comply with ASTM C94/C94M.
- C. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify lines, levels, and dimensions before proceeding with work of this section and before concrete is placed.
 - 1. Notify Architect of incorrect dimensions or spot elevations in writing.
 - 2. Do not place concrete until corrections are made and verified.
- B. Detectable Warning Panels:
 - 1. Examine substrate and verify substrate is suitable for installation of detectable warning panels:
 - a. Notify Architect of unsuitable conditions in writing.
 - b. Do not install detectable warning panels over unsuitable conditions.
 - c. Commencement of Work by installer is considered acceptance of substrate.

3.02 PREPARATION

- A. Formwork: Comply with requirements of ACI 301. Design and fabricate forms to support all applied loads until concrete is cured, and for easy removal without damage to concrete.
- B. Verify that forms are clean and free of rust before applying release agent.
- C. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.

- D. Concrete Mixing:
1. General:
 - a. All concrete shall be machine mixed.
 - b. Water gauge shall be provided to deliver exact predetermined amount of water for each batch.
 - c. Reliable system must be employed to insure that no less than predetermined amount of cement goes into each batch.
 - d. Re-tempering partly set concrete will not be permitted.
 2. Transit Mix:
 - a. Transit mix concrete may be used provided it conforms to Specifications and tests herein described and ASTM C94/C94M.
 - b. Central plant producing concrete and equipment transporting it are suitable for production and transportation of controlled concrete and plant is currently approved by local state DOT.
 - c. Maximum elapsed time between time of introduction of water and placing shall be one (1) hour.
 - d. Minimum time of mixing shall be one (1) minute per cubic yard after all material, including water, has been placed in drum, and drum shall be reversed for an additional two (2) minutes.
 - e. Mixing water shall be added only in presence of Inspecting Engineer or inspector employed by Testing Agency.
 - f. Trucks shall not be overloaded in excess of rated capacity as recommended by manufacturer.
 3. Cold Weather Concreting Procedures:
 - a. General Requirements:
 - 1) Materials and equipment required for heating and protection of concrete shall be approved and available at Project site before beginning cold weather concreting.
 - 2) Forms, reinforcement, metallic embedments, and fillers shall be free from snow, ice, and frost. Surfaces that will be in contact with newly placed concrete, including subgrade materials, shall be 35 deg F (2 deg C) minimum at time of concrete placement.
 - 3) Thaw sub-grade 6 inches (150 mm) deep minimum before beginning concrete placement. If necessary, re-compact thawed material.
 - 4) Use no frozen materials or materials containing ice.
 - 5) See ACI 306.1 'Standard Specification for Cold Weather Concreting' for additional requirements.
 4. Hot Weather Concreting Procedures:
 - a. General:
 - 1) Maximum concrete temperature allowed is 90 deg F (32 deg C) in hot weather.
 - 2) Cool aggregate and subgrades by sprinkling.
 - 3) Avoid cement over 140 deg F (60 deg C).
 - 4) Use cold mixing water or ice.
 - 5) Use fog spray or evaporation retardant to lessen rapid evaporation from concrete surface.
 - 6) See ACI 305.1 'Specification for Hot Weather Concreting' for additional requirements.
- E. Surface Preparation:
1. Earthwork Preparation:
 - a. Aggregate base and subgrade:
 - 1) Prepare aggregate base as specified in Section 312323.
 - 2) Prepare natural soil subgrade as specified in Section 31 2200.
 - 3) Prepare fill subgrade as specified in Section 31 2323.
 2. Concrete Slab Thickness:

- a. Increase thickness of concrete beneath detectable warning panels one inch (25 mm).
- 3. Inserts, bolts, boxes, templates, pipes, conduits, and other accessories required by Divisions 22, 23, and 26 shall be installed and inspected before placing concrete.
- 4. Install inserts, bolts, boxes, templates, pipes, conduits, and other accessories furnished under other Sections to be installed as part of work of this Section:
 - a. Tie anchor bolts for hold-down anchors and columns securely to reinforcing steel.
- F. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in according to bonding agent manufacturer's instructions.
 - 1. Use latex bonding agent only for non-load-bearing applications.
- G. Where new concrete with integral waterproofing is to be bonded to previously placed concrete, prepare surfaces to be treated in accordance with waterproofing manufacturer's instructions. Saturate cold joint surface with clean water, and remove excess water before application of coat of waterproofing admixture slurry. Apply slurry coat uniformly with semi-stiff bristle brush at rate recommended by waterproofing manufacturer.
- H. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.
- I. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Comply with ASTM E1643. Lap joints minimum 6 inches. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before coving.
- J. Removal:
 - 1. Remove water and debris from space to be placed.
 - 2. Vapor Retarder Over Aggregate Base: Install compactible granular fill before placing vapor retarder as indicated on drawings. Do not use sand.

3.03 INSTALLATION OF FORMWORK

- A. Forms:
 - 1. Assemble forms so forms are sufficiently tight to prevent leakage.
 - 2. Properly brace and tie forms.
 - 3. Provide temporary cleanouts at base of tall forms if used to facilitate cleaning and inspection.
 - 4. Make proper form adjustments before, during, and after concreting.
 - 5. Use new forms, or used forms that have been cleaned of loose concrete and other debris from previous concreting and repaired to proper condition. Use APA Plyform B-B Class I, or APA HDO Plyform B-B Class I, on exposed to view concrete that do not receive a smooth rubbed finish.
 - 6. Use metal cold joint forms when unable to place concrete for footings, foundations, and slabs in continuous pours.
 - 7. Provide beveled 2 inch by 4 inch keys where shown on Contract Drawings for tall or heavily loaded walls.
- B. Accessories:
 - 1. General:
 - a. Provide for installation of inserts, templates, fastening devices, sleeves, and other accessories to be set in concrete before placing.
 - b. Position anchor bolts for hold-down anchors and columns and securely tie in place before placing concrete.
 - 2. Form Release / Finish Agents:
 - a. Film thickness shall be no thicker than as recommended by Manufacturer.
 - b. Allow no release / finish agent on reinforcing steel or footings.
 - 3. Expansion Joints:
 - a. Install at joints between floor slab and foundation wall where shown on Drawings.
- C. Form Removal (Slab on Grade):

1. Removal of forms can usually be accomplished in twelve (12) to twenty-four (24) hours.
2. If temperature is below 50 deg F (10 deg C) or if concrete (stairs, beams, etc) depends on forms for structural support, leave forms intact for sufficient period for concrete to reach adequate strength.
3. For exposed to view surfaces that receive a smooth rubbed finish, remove forms while concrete is still "green".
4. Metal bars or prys should not be used. Use wood wedges, tapping gradually when necessary.

3.04 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

- A. Fabricate reinforcement bars according to the Concrete Reinforcing Steel Institute (CRSI) 'Manual of Standard Practice' and details on Contract Documents.
- B. Fabricate and handle epoxy-coated reinforcing in accordance with ASTM D3963/D3963M.
- C. Comply with requirements of ACI 301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.
- D. Install welded wire reinforcement in maximum possible lengths, and offset end laps in both directions. Splice laps with tie wire.
- E. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with concrete placement.
- F. Avoid cutting or puncturing vapor retarder during reinforcement placement and concrete operations.
- G. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete.
- H. Blowtorch shall not be used to facilitate field cutting or bending or any other reinforcing work.
- I. Reinforcement shall not be bent after partially embedded in hardened concrete.
- J. Placing Reinforcement:
 1. Comply with Concrete Reinforcing Steel Institute CRSI 'Manual of Standard Practice' recommended practice for 'Placing Reinforcing Bars' for details and methods of reinforcement placement and supports. and as herein specified.
 2. Accurately position, support, and secure reinforcement against displacement by formwork, construction, or concrete placement operations:
 - a. Locate and support reinforcing by chairs, runners, bolsters, bar supports, spacers, or hangers, as required as recommended by 'ACI Detailing Manual, except slab on grade work.
 - b. Support bars in slabs on grade and footings with specified bar supports around perimeter and at 4-1/2 feet on center each way maximum to maintain specified concrete cover.
 - c. Install bar supports at bar intersections.
 3. Bend bars cold.
 4. Dowel vertical reinforcement for formed concrete columns or walls out of footing or structure below with rebar of same size and spacing required above.
 5. Securely anchor and tie reinforcement bars and dowels before placing concrete. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- K. Splices:
 1. Per requirements of Structural Drawings.
- L. Tolerances:
 1. Provide following minimum concrete cover for reinforcement as per ACI 318 or ACI 318M.
- M. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations:
 1. Concrete cast against and permanently exposed to earth:

- a. Interior Slabs on Grade: 1 inch clear from top of slab at 4 inches slabs, 2 inches clear at 6 inches slabs.
 - 1) Sections other than Slabs: 3 inches.
- b. Concrete Exposed to Earth or Weather:
 - 1) No. 6 and Larger Bars: 2 inches.
 - 2) No. 5 and Smaller Bars, W31 and D31 Wire: 1-1/2 inches.
- c. Concrete not exposed to weather or in contact with ground:
 - 1) Slabs, walls, and joists:
 - (a) No. 14 and No. 18 bars: 1-1/2 inches.
 - (b) No. 11 bars and smaller: 3/4 inches.
 - 2) Beams and Columns:
 - (a) Primary reinforcement, ties, stirrups and spirals: 1-1/2 inches.

3.05 PLACING CONCRETE

- A. Place concrete in accordance with ACI 304R.
- B. Place concrete for floor slabs in accordance with ACI 302.1R.
- C. Notify Architect not less than 24 hours prior to commencement of placement operations.
- D. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
- E. General:
 - 1. Place as soon after mixing as possible.
 - 2. Deposit as nearly as possible in final position.
 - 3. No concrete shall be deposited in water.
 - 4. Placing of concrete shall be continuous until panel or section is complete.
 - 5. Compact concrete in forms by vibrating and other means where required.
 - a. Thoroughly consolidate concrete around reinforcing bars (Consolidation not required in concrete around reinforcing bars with Mix Type G).
 - b. Use and type of vibrators shall conform to ACI 309.
 - 6. Form vertical surfaces full depth. Do not allow concrete to flow out from under forms in any degree into landscaped areas.
 - 7. Consolidate concrete thoroughly.
 - 8. Do not embed aluminum in concrete.
 - 9. Do not use contaminated, deteriorated, or re-tempered concrete.
 - 10. Avoid accumulation of hardened concrete.
 - 11. Dusting with cement not permitted.
- F. Footings:
 - 1. Bear 12 inches (300 mm) minimum into undisturbed earth or on mechanically compacted engineered fill. Step footings at ratio of 1-1/2 horizontal to One vertical unless detailed otherwise.
 - 2. Level top of finish footing and leave rough.
 - 3. Where joints are required, bulkhead, key horizontally, and dowel with two No. 5 reinforcing bars, 48 inches (1 200 mm) long.
- G. Foundation Walls: Leave steel projecting where required for floor tie.
- H. Interior Slabs:
 - 1. For continuous placing and where shown on Drawings, saw cut one inch (25 mm) deep control joints before shrinkage occurs (2 inches at 6 inch slabs) (50 mm at 150 mm slabs).
 - a. Do not install control joints where Drawings indicate they are not to be installed.
- I. Exterior Slabs:
 - 1. For continuous placing and where shown on Drawings, saw cut one inch (25 mm) deep control joints before shrinkage occurs (2 inches at 6 inch slabs) (50 mm at 150 mm slabs).
- J. Miscellaneous Concrete Elements:

1. Detectable Warning Panels:
 - a. Follow Manufacturer's recommendations on following:
 - 1) Temperature requirements.
 - 2) Expansion and control joint requirements.
 - 3) Installation of panels.
 - 4) Curing of panels.
 2. Equipment Bases: Coordinate with appropriate Sections for locations and dimensions.
 3. Light Pole Bases, Mow Strips, and Aprons:
 - a. Install bond breaker consisting of three (3) layers of 30 lb (13.6 kg) roofing felt between pole base and adjoining sidewalk, mow strip and building foundations, and aprons and building foundations.
 4. Mow Strips and Aprons:
 - a. Aggregate base not necessary under mow strips and aprons.
 - b. Form and cast mow strips in place.
 - c. Elevations:
 - 1) Refer to Section 32 9122-Topsoil Grading for relation of finish grades to top of mow strip elevations.
 - 2) Refer to Civil Drawings for top of apron elevations.
 - d. Compact topsoil underneath mow strips and aprons to density of undisturbed earth.
 5. Pipe Bollards:
 - a. Install plumb and fill with concrete.
 6. Sidewalks, Exterior Stairs, And Landings:
 - a. Slope with cross slope of 1/8 to 1/4 inch per ft (3 to 6 mm per 300 mm) (one to two percent) in direction of intended drainage.
 - b. Slope away from building 1/8 to 1/4 inch per ft (3 to 6 mm per 300 mm) (one to two percent) minimum.
 - c. Concrete walks shall be screeded to bring surface to grades and lines as indicated.
 - d. Surface shall be floated with wood float with no coarse aggregate showing and then given broom finish before concrete sets.
- K. Vertical Surfaces:
1. Retaining Walls, Exposed Foundations, etc:
 - a. Finish provided by form release / finish agent specified.
 - b. Repair of Unacceptable Concrete.
 2. Immediately after removing forms, remove joints, marks, bellies, projections, loose materials, and cut back metal ties from surfaces to be exposed.
 3. Point up voids with cement mortar, 1:2 mix, and rub exposed surface with carborundum to smooth, even surface matching surrounding undamaged area.
 4. Light Pole Bases: Exposed portion to have rubbed finish.
- L. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.
- M. Place concrete continuously without construction (cold) joints wherever possible; where construction joints are necessary, before next placement prepare joint surface by removing laitance and exposing the sand and sound surface mortar, by sandblasting or high-pressure water jetting.

3.06 SLAB JOINTING

- A. Locate joints as indicated on drawings (do not use control joints in interior concrete slabs in meetinghouse).
1. Concrete Control Joints on Center Spacing.
 - a. Sidewalks: 4-6 feet
 - b. Curbs and Gutters: 10 feet
 - c. Mow Strips: 3-5 feet.
 - d. Flat Drainage Structures: 10 feet.

- e. Retaining Walls with guardrails: Align with posts.
- f. Retaining Walls with Fencing: Align with posts.
- 2. Concrete Expansion Joint (isolation) Joints on Center Spacing.
 - a. Sidewalks, Curbs and Gutters: 40-100 feet
 - b. Mow Strips and Aprons: 20-40 feet.
 - c. Flat Drainage Structures: 50 feet.
 - d. Retaining Walls with guardrails: 36 feet.
 - e. Retaining Walls with Fencing: 50 feet.
- B. Anchor joint fillers and devices to prevent movement during concrete placement.
- C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.
 - 1. Install wherever necessary to separate slab from other building members, including columns, walls, equipment foundations, footings, stairs, manholes, sumps, and drains.
- D. Load Transfer Construction and Contraction Joints: Install load transfer devices as indicated; saw cut joint at surface as indicated for contraction joints.
- E. Saw Cut Contraction Joints: Saw cut joints before concrete begins to cool, within 4 to 12 hours after placing; use 3/16 inch thick blade and cut at least 1 inch deep but not less than one quarter (1/4) the depth of the slab.
- F. Contraction Joint Devices: Use preformed joint device, with top set flush with top of slab.
- G. Construction Joints: Where not otherwise indicated, use metal combination screed and key form, with removable top section for joint sealant.
- H. Seal expansion joints as specified in Section 07 9200 for following areas:
 - 1. Between entryway slabs and building foundations.
 - 2. Between sidewalks and building foundations.
 - 3. Concrete retaining walls.
 - 4. Within curbs and gutters.
 - 5. Within flat drainage structures and at joints between flat drainage structures and other concrete elements.
- I. Expansion joints are not required to be sealed for following areas:
 - 1. Within aprons and where apron abuts sidewalks.
 - 2. Within mow strips and where mow strip abuts building foundation and sidewalks.
 - 3. Within sidewalks.

3.07 FLOOR FLATNESS AND LEVELNESS TOLERANCES

- A. An independent testing agency, as specified in Section 01 4000, will inspect finished slabs for compliance with specified tolerances.
- B. Correct the slab surface if tolerances are less than specified.
- C. Minimum F(F) Floor Flatness and F(L) Floor Levelness Values:
 - 1. Exposed to View and Foot Traffic: F(F) of 20; F(L) of 15, on-grade only.
 - 2. Under Carpeting: F(F) of 25; F(L) of 20, on-grade only.
 - 3. Under Thin Resilient Flooring and Thinset Tile: F(F) of 35; F(L) of 25, on-grade only.
- D. Measure F(F) Floor Flatness and F(L) Floor Levelness in accordance with ASTM E1155 (ASTM E1155M), within 48 hours after slab installation; report both composite overall values and local values for each measured section.
- E. Correct the slab surface if composite overall value is less than specified and if local value is less than two-thirds of specified value or less than F(F) 13/F(L) 10.
- F. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.08 CONCRETE FINISHING

- A. Repair surface defects, including tie holes, immediately after removing formwork.
- B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch or more in height.
- C. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/4 inch or more in height. Provide finish as follows:
 - 1. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, immediately after form removal.
- D. Interior Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:
 - 1. Screed Concrete.
 - 2. Float Finish:
 - a. Float as soon after screeding as possible.
 - b. Consolidate surface with power-driven floats with exception of areas inaccessible to power-driven floats, which may be hand-floated.
 - c. Re-straighten, cutting down high spots and filling low spots.
 - d. Repeat float passes and re-straightening until surface has uniform, smooth, granular texture.
 - e. Surfaces to Receive Thick Floor Coverings: "Wood float" as described in ACI 302.1R; thick floor coverings include quarry tile, ceramic tile, and Portland cement terrazzo with full bed setting system.
 - 3. Trowel Finish:
 - a. Steel trowel slab after concrete has set enough to avoid bringing water and fines to surface.
 - b. Perform troweling with power-driven trowels with exception of areas inaccessible to power-driven trowels, which may be hand-troweled.
 - c. Continue troweling passes and re-straightening with 10 foot (3 meter) highway straightedge until surface is free of trowel marks and uniform in texture and appearance.
 - d. Apply burnished, burned-out trowel finish.
 - e. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI 302.1R; thin floor coverings include carpeting, resilient flooring, seamless flooring, resinous matrix terrazzo, thin set quarry tile, and thin set ceramic tile.
 - 4. Decorative Exposed Surfaces: Trowel as described in ACI 302.1R; take measures necessary to avoid black-burnish marks; decorative exposed surfaces include surfaces to be stained or dyed, pigmented concrete, surfaces to receive liquid hardeners, surfaces to receive dry-shake hardeners, surfaces to be polished, and all other exposed slab surfaces.
 - 5. Other Surfaces to Be Left Exposed: Trowel as described in ACI 302.1R, minimizing burnish marks and other appearance defects.
- E. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains at 1:100 nominal.

3.09 CURING AND PROTECTION

- A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
 - 1. Normal concrete: Not less than seven days.
 - 2. High early strength concrete: Not less than four days.
- C. Formed Surfaces: Cure by moist curing with forms in place for full curing period.
- D. Surfaces Not in Contact with Forms:

1. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by membrane curing, water ponding, water-saturated sand, water-fog spray, or saturated burlap.
2. Slabs and Floors To Receive Adhesive-Applied Flooring: Membrane Cure. Curing compounds and other surface coatings are usually considered unacceptable by flooring and adhesive manufacturers. If such materials must be used, either obtain the approval of the flooring and adhesive manufacturers prior to use or remove the surface coating after curing to flooring manufacturer's satisfaction.
3. Slabs and Floors to Receive Polished Finish: Water cure
4. Final Curing: Begin after initial curing but before surface is dry.
 - a. Moisture-Retaining Sheet: Lap strips not less than 3 inches and seal with waterproof tape or adhesive; secure at edges.
 - b. Curing Compound: Apply in two coats at right angles, using application rate recommended by manufacturer.

3.10 POST INSTALLED ANCHORS

- A. General:
 1. Drill holes with rotary impact hammer drills using carbide-tipped bits.
 2. Unless otherwise shown on Drawings, drill holes perpendicular to concrete surface.
 3. Perform anchor installation in accordance with Manufacturer's published instructions.
- B. Adhesive Anchors:
 1. Clean holes in accordance with Manufacturer's published instructions before installation of adhesive:
 - a. Follow Manufacturer's recommendations to ensure proper mixing of adhesive components.
 2. Adhesive:
 - a. Inject adhesive into holes proceeding from bottom of hole and progressing toward surface so as to avoid introduction of air pockets into adhesive.
 - b. Inject sufficient adhesive into hole to ensure that annular gap is filled to surface.
 - c. Remove excess adhesive from surface and threads of anchor as necessary.
 3. Shim anchors with suitable device to center anchor in hole. Do not disturb or load anchors before Manufacturer's specified cure time has elapsed.
 4. Temperature:
 - a. Observe Manufacturer's recommendations with respect to installation temperatures for adhesive anchors.
 - b. Base material temperatures must be maintained above minimum temperatures allowed by Manufacturer for full required epoxy cure time.
- C. Expansion Anchors:
 1. Protect threads from damage during anchor installation and prior to use.
 2. Set anchors to Manufacturer's recommended torque, using a torque wrench. Following attainment of ten (10) percent of specified torque, one hundred (100) percent of specified torque shall be reached within 7 or fewer complete turns of nut. If specified torque is not achieved within required number of turns, remove and replace anchor, unless otherwise directed by Architect.
- D. Screw Anchors:
 1. Protect threads from damage during anchor installation and prior to use.
 2. Set anchor flush, collared.
 3. Do not exceed Manufacturer's maximum allowed torque when seating anchor.

3.11 NON-SHRINK GROUTING

- A. Surface Preparation:
 1. Prepare concrete surfaces in accordance with Manufacturer's written instructions:
 2. Remove all loose materials.

3. Clean surface of any substance that could interfere with bond on material including dirt, paint, tar, asphalt, wax, oil, grease, latex compounds, form release agents, laitance, loose toppings, foreign substances and any other residues.
 4. Saturate area to be grouted with water in accordance with Manufacturer's written instructions.
- B. Mixing:
1. Mix grout in accordance with Manufacturer's written instructions.
 2. Add mix water in amount in accordance with Manufacturer's written instructions to provide required placing consistency.
 3. Do not add water in amount that will cause bleeding or segregation of mixed grout.
 4. Do not add any sand, cement, admixtures, or fluidifiers to grout.
- C. Placement:
1. Place grout in accordance with Manufacturer's written instruction including but not limited to the following:
 - a. Proper curing is required.
 - b. Use cold weather or hot weather grouting procedures in accordance with Manufacturer's written instructions, as temperature dictates:
 - 1) Do not use at temperatures that may cause premature freezing.
 - 2) Do not allow to freeze until 4000 psi (27.6 MPa) is attained.
 - c. Employ cold weather or hot weather grouting practices as temperatures dictates.
 2. Completely eliminate air pockets and provide full contact between grout and item being grouted. Do not exceed Manufacturer's recommended thickness.
- D. Curing:
1. Cure grout in accordance with Manufacturer's written instructions or ACI curing practices.
 2. Wet cure grout until forms are removed.
 3. Seal grout surfaces after forms are removed as recommended by Manufacturer.
- E. Keep grout surfaces wet after curing compound has dried for as long as recommended by Manufacture.
- F. Protect placed grout from freezing until minimum strength of 4000 psi (27.58 MPa) is reached.
- G. Protect placed grout from damage during construction.

3.12 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.
- B. Quality Control is sole responsibility of Contractor.
 1. Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform testing and inspection as part of his Quality Control:
 - a. Testing and inspections, if performed by Contractor, will be responsibility of Contractor to be performed by an independent entity.
- C. Provide free access to concrete operations at project site and cooperate with appointed firm.
- D. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.
- E. Tests of concrete and concrete materials may be performed at any time to ensure compliance with specified requirements.
- F. Compressive Strength Tests: ASTM C39/C39M, for each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cubic yards or less of each class of concrete placed.
- G. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.

- H. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.
- I. Slab Testing: Cooperate with manufacturer of specified moisture vapor reducing admixture (MVRA) to allow access for sampling and testing concrete for compliance with warranty requirements.
- J. Permeability Test: Test concrete with waterproofing admixture according to COE CRD-C 48.
- K. Precast Concrete:
 - 1. Testing Agency shall provide inspection including following:
 - a. Review all precast plant test reports.
 - b. Provide inspection of all precast during construction, transportation, and erection, verifying precast is undamaged, and installed in accordance with requirements of Contract Documents.
 - c. Provide inspection of precast concrete anchorages to other components of structure.
- L. Expansion Anchors / Adhesive Anchors / Screw Anchors:
 - 1. Certified Inspector from Testing Agency shall verify procedures used for installation of all concrete anchors and monitor their installation for compliance with Manufacturer's requirements.
 - 2. Inspections:
 - a. Inspections shall include required verification and inspection of anchors as referenced in IBC Table 1704.4 and in accordance with most current version of ACI 318 or ACI 318M and applicable ASTM material standards that:
 - 1) The correct rod/anchor is used; size and type.
 - 2) The correct hole size is used and prepared per Manufacturer's instructions.
 - 3) That climactic conditions, and concrete temperature, allow for the anchors' installation and use.
 - 4) Proper hole cleaning equipment, per Manufacturer's instructions, is used.
 - 5) Torque applied to anchors does not exceed Manufacturer's allowable limits.
 - (a) Torque applied to anchors is per Manufacturer's instructions.

3.13 DEFECTIVE CONCRETE

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

3.14 PROTECTION

- A. Do not permit traffic over unprotected concrete floor surface until fully cured.
- B. Protect installed products from damage during construction.

END OF SECTION

**SECTION 04 7300
MANUFACTURED STONE VENEER MASONRY**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Manufactured stone veneer masonry.
- B. Mortar and grout.
- C. Anchors, inserts and anchorage.
- D. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 07 1900: 'Water Repellents'.
- B. Section 07 2100 - Thermal Insulation: Insulation for cavity spaces.
- C. Section 07 2500 - Weather Barriers.
- D. Section 07 9200 - Joint Sealants: Sealing control and expansion joints.

1.03 REFERENCE STANDARDS

- A. American Concrete Institute (ACI).
- B. ASTM C 39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
- C. ASTM C 67, Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile.
- D. ASTM C 177, Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
- E. ASTM C 192, Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory.
- F. ASTM C 270, Standard Specification for Mortar for Unit Masonry.
- G. ASTM C 482, Standard Test Method for Bond Strength of Ceramic Tile to Portland Cement.
- H. ASTM C 1670 - Standard Specification for Adhered Manufactured Stone Masonry Veneer Units.
- I. ASTM C 1780 - Standard Practice for Installation Methods for Adhered Manufactured Stone Masonry Veneer
- J. ASTM E 2556/ E 2556M Standard Specification for Vapor Permeable Flexible Sheet Water Resistive Barriers Intended for Mechanical Attachment.
- K. Building Materials Evaluation Commission.
- L. Masonry Standards Joint Committee (MSJC) of The Masonry Society.
- M. Texas Department of Insurance Product Evaluation.
- N. UL 723, Standard for Safety for Surface Burning Characteristics of Building Materials.
- O. ICC ES AC 51 Acceptance Criteria for Manufactured Stone Veneer
- P. Masonry Veneer Manufactures Association (MVMA): Installation Guide for Adhered Manufactured Stone Veneer

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all relevant installers.
 - 1. Conduct conference at Project site.
 - 2. Schedule pre-installation conference during construction of mockup panel.
 - 3. In addition to agenda items specified in Section 01-3100, review following:
 - a. Review storage and handling requirements.

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- b. Review cold and hot weather procedure requirements.
- c. Review protection requirements.
- d. Review masonry cleaning requirements.
- e. Review clean up requirements.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufactured masonry and application materials including mortar color charts, and water resistive barrier.
- C. Samples:
 - 1. Panel containing full-size samples of specified manufactured masonry showing full range of colors and textures complete with specified mortar.
 - 2. Actual size of masonry sample approximately 12 by 12 inches (300 by 300 mm) minimum. Provide larger samples as required to show full range of colors and textures.
- D. Quality Assurance/Control Submittals:
 - 1. Qualifications:
 - a. Proof of manufacturer qualifications.
 - b. Proof of installer qualifications.
 - 2. Certificates: ICC-ES Report.
 - 3. Test Reports for physical properties.
 - 4. Manufacturer's Installation Instructions.
- E. Closeout Submittals:
 - 1. Include following in Operations and Maintenance Manual specified in Section 01 7800:
 - a. Record Documentation: Manufacturers Documentation:
 - 1) Manufactured Stone Veneer Manufacturer's literature or cut sheet.
 - 2) Manufactured Stone Veneer color and type selection.
 - 3) Maintenance instructions.
 - 4) Special warranties.
- F. Maintenance Material Submittals: Extra Stock Materials:
 - 1. Furnish extra manufactured stone material in a variety of shapes and sizes in quantity equal to three percent of the installed stone of the same 'production run' material to be used on Project.
 - 2. Furnish extra stock of adhesives, mortars, pointing mortars, and other installation materials.

1.06 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Manufacturer:
 - a. Minimum five years experience in producing manufactured masonry.
 - b. Member of the following organizations:
 - 1) MSJC.
 - 2) ACI.
 - 3) ASTM.
 - 2. Installer: Requirements of Section 01 4301 applies, but not limited to following:
 - a. Minimum of five (5) years experience on successfully completed projects of similar nature, including installation of adhesives, mortars, grouts, and other materials similar to this Project's requirements.
 - b. ISO 9001-2008 certification.

1.07 MOCK-UP

- A. Construct a sample panel sized 4 feet long by 4 feet high; include proposed color range, texture, bond, mortar, and workmanship. Include mock-up framing and sheathing to show wall construction to be used on Project, including:

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1. Sample of corner conditions.
 2. Required substrates, including any backer boards, drainage boards, and air and water barriers.
 3. Required mortar, mortar coloring, and tooling.
 4. Any specialty details, such as reveals, soldier courses, window details, etc.
 5. Flexible flashing and required components at foundation.
- B. Sample panel(s) shall be constructed using 'production run' material to be used on Project unless otherwise approved in writing by Architect and/or Owner.
 - C. Sample panel(s) to be used as standard of comparison for masonry work built of same material.
 - D. Sample panel(s) shall remain at jobsite until all masonry is completed.
 - E. Sample panel(s) shall be installed with adequate time to order material after approval of the sample panel(s) without adversely affecting the Project's schedule.
 - F. Do not start the work of this Section until Architect has accepted sample panel(s).
 - G. At Architect's direction, demolish mock-ups and remove debris.
 - H. Locate where directed.
 - I. Mock-up may remain as part of the Work.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Materials shall be delivered in original, unopened packages with labels intact.
- B. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.
- C. Do not use damaged masonry units, damaged components of structure, or damaged packaged materials.
- D. Storage and Handling Requirements:
 1. Follow manufacturer's instructions.
 2. Store moisture-sensitive materials in weather-protected enclosures.
 3. Aggregate:
 - a. Store different aggregates separately.
 - b. Store on high ground, or ideally, off ground to prevent contamination from dirt, organic materials and ground water, any of which may contribute to efflorescence and may be deleterious to mortar performance.
 - c. Store under protective cover to avoid saturation and freezing in cold weather.
 4. Cementitious material:
 - a. Store in such manner as to prevent deterioration or intrusion of foreign material or moisture.
 - b. Do not use cementitious materials that have become contaminated.
 - c. Protect from precipitation and groundwater.
 - 1) Store materials on elevated platforms, under cover, and in dry location.
 - 2) Do not use cementitious materials that have become damp or have become unsuitable for good construction.
 5. Masonry accessories:
 - a. Store masonry accessories clear of ground, including metal items, to prevent corrosion and contamination by dirt and ground water which may contain soluble salts and other matter which may contribute to efflorescence and staining.
 - b. Plastic and asphalt coated flashing material should not be stored in areas exposed to sunlight. During installation, flashing must be pliable so that no cracks occur at corners or bends.
 - c. Protect from damage until installation.
 6. Masonry units:
 - a. Store materials protected from exposure to harmful weather conditions as directed by manufacturer.

- b. Store material on planks clear of ground which may contain soluble salts and protect from damage, dirt, or disfigurement.
- c. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof membrane, securely tied. If units become wet, do not install until they are dry.

1.09 FIELD CONDITIONS

- A. Ambient Conditions:
 - 1. Maintain materials and ambient temperature in area of installation at minimum 40 degrees F (7 degrees C) and not more than 100 degrees F (38 degrees C) prior to, during, and for 48 hours following installation.
 - 2. Mist water on the scratch coated surface and the backs of the masonry veneer for installations that exceed 90 degrees (32 degrees C).
- B. Provide ventilation and protection of adjacent materials as recommended by the Manufacturer.
- C. Provide adequate ventilation of temporary heaters to avoid damage to all components of the masonry veneer system.

1.10 WARRANTY

- A. Special Warranty:
 - 1. Provide Manufactured Stone Veneer Masonry manufacturer's standard limited warranty against defects in manufacturing for a period of 50 years following date of Substantial Completion.
- B. MVIS Warranty:
 - 1. The manufacturer of adhesives, mortars, grouts and other installation materials shall provide a written fifteen (15) year warranty, which covers replacement of LATICRETE products only – reference LATICRETE Warranty Data Sheet 230.15SPD for complete details and requirements.

PART 2 PRODUCTS

2.01 SYSTEM

- A. Manufacturers:
 - 1. Cultured Stone
200 Mansell Court E. Suite 305
Roswell, GA 30076

Tel: 800-255-1727
cs@westlake.net
www.culturedstone.com
 - 2. LATICRETE International, Inc.
1 Laticrete Park North
Bethany, CT 06524-3423 USA

800-243-4788
(203) 393-0010
technicalservices@laticrete.com
www.laticrete.com
- B. Materials:
 - 1. Manufactured Stone Veneer Masonry:
 - a. Style and Color:
 - 1) Stone Type #1:
 - (a) Cultured Stone: Hewn Stone, "Foundation".
 - 2) Stone Type #2:
 - (a) Cultured Stone: Pro-Fit Alpine LedgeStone, "Chardonnay".
 - 3) Cap Stone at Stone Type #2 wainscot where occurs:

- (a) Cultured Stone: Architectural Trim, "Taupe".
- 4) Before ordering Manufactured Stone Veneer Masonry, verify color selections and types with Architect.
- b. Physical properties:
 - 1) Compressive Strength: ASTM C 192 and ASTM C 39, 1800 psi (12.4 MPa)
 - 2) Bond Between Stone Unit, Type S Mortar, and Backing: ASTM C 482, 50 psi (345 kPa).
 - 3) Thermal Resistance: ASTM C 177, R-factor, 0.355 per inch (25.4 mm) of thickness.
 - 4) Freeze/Thaw: ASTM C 67, 50 cycles, no disintegration and less than 3 percent weight loss.
 - 5) Fire Hazard Test, UL 723:
 - (a) Flame spread: 0.
 - (b) Smoke Development: 0.
 - 6) Maximum Veneer Unit Weight: 15 psf (73 kg/m²).
- 2. Mortar:
 - a. Latex-modified portland cement mortar:
 - 1) MVIS Hi-Bond Veneer Mortar by LATICRETE International, Inc.
 - 2) Setting mortar shall be natural color.
 - 3) Equal as approved by Architect before bidding. See Section 01 6200.

2.02 ACCESSORIES

- A. Weather-Resistive Barrier:
 - 1. See Section 07 2500 Weather Barriers.
- B. Cement Backer Board:
 - 1. USG Durock Cement Board.
 - a. Rated for exterior applications.
 - b. Thickness: 1/2".
 - c. Size: Width and length as appropriate for framing and building conditions.
 - d. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
 - e. Seams between cement boards shall be treated using 4 inch wide alkali-resistant fiberglass mesh tape.
 - f. Fasteners:
 - 1) Wood Screws: DUROCK Brand Wood or USG Sheathing WF screws with corrosion-resistant coating.
 - 2) Length as required for 1/2" minimum embedment into studs.
 - 3) Install fasteners at 8 inches on center vertically on each stud.
 - 2. Equal as approved by Architect before bidding. See Section 01 6200.
- C. Cleaning Compounds:
 - 1. Use type of compound recommended by Manufacturer based on minerals present in masonry units.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification Of Conditions:
 - 1. Examine substrate and verify substrate is suitable for installation of masonry.
 - 2. Notify Architect of unsuitable conditions in writing.
 - a. Do not install masonry over unsuitable conditions.
 - b. Commencement of Work by installer is considered acceptance of substrate.

3.02 PREPARATION

- A. Protection:

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1. Prevent work from occurring on the opposite of walls to which manufactured masonry is applied during and for 48 hours following installation of the manufactured masonry.
- B. Surface Preparation:
 1. Follow manufacturer's instructions designated below for the appropriate type of manufactured masonry and substrate.

3.03 INSTALLATION

- A. Install Manufactured Stone Veneer Masonry products in accordance with manufacturer's installation instructions using tight fit joints.
- B. Install Manufactured Stone Veneer Masonry accessories specified above in accordance with type of substrate and Manufactured Stone Veneer Masonry manufacturer's installation instructions.
- C. Proceed with veneer installation only after curbs, vents, drains, piping, and other projections through substrate have been installed and when substrate construction and framing of openings have been completed.
- D. Sheathing Installation:
 1. Provide adequate support of framing elements during erection to prevent racking, twisting or bowing. Lay out the sheathing installation so all board edges are supported by wall framing (studs vertically and purlins horizontally). Cut/fit the sheathing and add additional framing elements as required to support board edges.
- E. Weather-Resistive Barrier:
 1. Install cement board only after all joints and penetrations through the weather-resistive barrier have been sealed.
- F. Cement Board Panels Installation:
 1. Cut/fit the Cement Board Panels as required. Stagger boards in courses to prevent continuous vertical joints and allow 1/8" - 3/16" (3-5mm) between sheets.
- G. Manufactured Stone Veneer Masonry:
 1. General:
 - a. Install in accordance with current version of Masonry Veneer Manufacturer's Association (MVMA) "Installation Guide for Adhered Concrete Masonry Veneer" and/or veneer manufacturer's specific written installation instructions.
 - b. Cut and fit Manufactured Stone Veneer Masonry neatly around corners, fittings, and obstructions. Perimeter pieces shall be minimum half veneer unit.
 - c. Chipped, cracked, split pieces and edges are not acceptable.
 - d. Make joints even, straight, plumb and of uniform width to tolerance +/- 1/16" over 8' (1.5mm in 2.4m). Install divider strips at junction of flooring and dissimilar materials.
 2. Stacked Veneer Installation:
 - a. After proper installation and curing of latex-modified portland cement mortar scratch coat, moisten the back of each veneer unit and the top of the scratch coat so the surfaces appear damp but are free of standing water.
 - b. Install masonry veneer adhesive mortar in compliance with current revisions of Masonry Veneer Manufacturer's Association (MVMA) "Installation Guide for Adhered Concrete Masonry Veneer" and/or veneer manufacturer's specific written installation instructions.
 - c. Use the appropriate installation tools to ensure proper bedding of veneer unit.
 - d. Work the masonry veneer adhesive mortar into good contact with the back of the veneer unit making sure the entire unit is buttered to a nominal 1/2" (12mm) thickness.
 - e. Firmly work buttered masonry veneer units onto the scratch coat and slide slightly back and forth or with a slight rotating motion.
 - f. Allow installation to set until firm.
 - g. Clean excess latex portland cement mortar from masonry veneer or stone face and joints between pieces.

- h. Install tight fitted masonry veneer from the corners toward the middle of the wall, and from the bottom toward the top of the wall.
 - i. Install manufactured cap stone tight fit with no mortar joints.
- H. Expansion Joints:
 - 1. Provide expansion joints at all transitions to dissimilar materials.
 - 2. Provide expansion joints where Manufactured Stone Veneer Masonry abuts restraining surfaces and at all changes in plane and corners.
 - 3. Expansion joint design shall conform to Manufactured Stone Veneer Masonry manufacturer's recommendations for stacked veneer applications.
- I. Interface With Other Work:
 - 1. Make cuts proper size to accommodate work of other trades. Cut openings for electrical devices using cover plates no larger than can be covered by standard size plate.
 - 2. Replace unit masonry in which larger than necessary openings are cut. Do not patch openings with mortar or other material.
- J. Flashing:
 - 1. General:
 - a. Install embedded flashing, metal drip edges, with weep holes and other components in masonry at lintels, ledges, floors, and other obstructions to downward flow of water in wall, and where indicated.
 - b. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing.
 - 2. Drip edge/plate: Install with sealant (or equal) between drip edge/plate and substrate.
 - 3. Flexible flashing:
 - a. Install embedded flashing on top of sheathing and behind cement backer board.
 - b. Carry flashing vertically as detailed, but not less than 6 inch (150 mm) above horizontal plane.
 - c. Lap flexible flashing minimum of 6 inch (150 mm).
 - d. Seal all flashing laps with compatible lap cement.
 - e. Install flashing with sealant between flashing and drip edge/plate.
 - f. Treat the joint between the cement backer board and the stainless steel drip edge with Water Resistive Barrier, Epoxy Waterproofing Membrane, and Joint Pre-treatment Material as noted for joints and seams in the concrete backer board.
 - g. All discontinuous flashing shall be turned up minimum 1 inch (25 mm) into head joint at flashing ends to form an end dam.
- K. Laying:
 - 1. Use mortar within time frame of initial mixing as required by the mortar manufacturer. Discard mortar that has begun to set.
 - 2. Set masonry units within one minute of spreading mortar.

3.04 FIELD QUALITY CONTROL

- A. Non-Conforming Work:
 - 1. Remove and replace defective material at Architect's direction and at no additional cost to Owner.

3.05 PROTECTION

- A. General:
 - 1. During construction, all walls should be kept dry by covering top of wall with a strong, water-resistant membrane at end of each day or shutdown period. Covering should overhang wall by at least 24 inches (610 mm) on each side, and should be secured against wind.
 - 2. Covering should remain in place until top of wall is completed or protected by adjacent materials.
 - 3. Protect masonry with covering during rainy weather.

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4. Protect finished installations. Close areas to other trades and traffic until veneer being installed has set firmly.
 5. Extend period of protection of veneer work at lower temperatures, below 60°F (15°C), and at high relative humidity (>70% RH) due to retarded set times of mortar/adhesives. Replace or restore work of other trades damaged or soiled by work under this section.
- B. Freezing:
1. In cold weather, all materials and walls should be properly protected against freezing including storing of materials, preparation of mortar, heating of masonry units, laying precautions, and protection of Work. Follow recommendations for cold weather of Masonry Standards Joint Committee (MSJC) - The Masonry Society (TMS) / American Concrete Institute (ACI) / American Society of Civil Engineers (SEI/ASCE) TMS 402/ACI 530/ASCE 5-11 and TMS 602/ACI 530.1/ASCE 6.
 2. Remove all masonry deemed frozen or damaged.
- C. Stain prevention: Prevent grout, mortar, and soil from staining face of masonry to be left exposed. Immediately remove mortar and soil that come in contact with such masonry.
1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 2. Protect sills, ledges, and projections from mortar droppings.
 3. Protect surfaces of window and door frames, as well as similar products with pointed and integral finishes, from mortar droppings.
 4. Turn scaffold boards near wall on edge at end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Finished work:
1. Protect finished work from rain during and for 48 hours following installation.
 2. Protect finished work from damage during remainder of construction period.

3.06 CLEANING

- A. General:
1. Clean manufactured masonry in accordance with manufacturer's installation instructions.
 2. Clean excess mortar/latex portland cement mortar from veneer surfaces with water before they harden and as work progresses.
 3. Do not contaminate open grout/caulk joints while cleaning.
 4. Sponge and wash veneers diagonally across joints.
 5. Do not use acids for cleaning.
 6. Polish with clean dry cloth.
 7. Wash adjacent non-masonry surfaces. Use detergent and soft brushes or cloth.
 8. Sweep and rake adjacent pavement and grounds to remove mortar and debris. Where necessary, pressure wash pavement surfaces to remove mortar, dust, dirt, and stains.
- B. Waste Management:
1. Clean up masonry debris and remove from site.

END OF SECTION

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**SECTION 05 1200
STRUCTURAL STEEL FRAMING**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Pergola structural steel framing members.

1.02 REFERENCE STANDARDS

- A. ACI 318 - Building Code Requirements for Structural Concrete 2019, with Errata (2021).
- B. AISC (MAN) - Steel Construction Manual 2017.
- C. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges 2016.
- D. AISC 360 - Specification for Structural Steel Buildings 2016 (Revised 2021).
- E. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2014.
- F. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless 2020.
- G. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.
- H. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength 2014, with Editorial Revision (2017).
- I. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes 2020.
- J. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings 2020.
- K. ASTM A992/A992M - Standard Specification for Structural Steel Shapes 2011 (Reapproved 2015).
- L. ASTM C827/C827M - Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures 2016.
- M. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength 2019.
- N. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength 2018.
- O. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination 2012.
- P. AWS D1.1/D1.1M - Structural Welding Code - Steel 2020.
- Q. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel 2018.
- R. AWS D1.4/D1.4M - Structural Welding Code - Steel Reinforcing Bars 2018, with Amendment.
- S. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel 2018.
- T. RCSC (HSBOLT) - Specification for Structural Joints Using High-Strength Bolts; Research Council on Structural Connections 2014, with Errata (2015).
- U. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer 1999 (Ed. 2004).
- V. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic) 2019.
- W. SSPC-SP 1 - Solvent Cleaning 2015, with Editorial Revision (2016).
- X. SSPC-SP 2 - Hand Tool Cleaning 2018.
- Y. SSPC-SP 3 - Power Tool Cleaning 2018.
- Z. SSPC-SP 6 - Commercial Blast Cleaning 2007.

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1.03 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Product data and samples, if requested by Architect.
- B. Shop Drawings:
 - 1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.
 - 2. Connections not detailed.
 - 3. Indicate cambers and loads.
 - 4. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.
 - 5. Engineered drawings prepared by a licensed structural engineer.
- C. Informational Submittals:
 - 1. Certificates:
 - a. Certificate of conformance by Manufacturer certifying that steel is new steel conforming to referenced ASTM requirements and standards.
 - b. Fabricator certificates.
 - c. Mill certificates certifying chemical and physical properties of all steel furnished on Project.
 - d. Welding certificates
- D. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Record Documentation:
 - 1) Testing and Inspection Reports:
 - (a) Testing Agency Inspection Reports of structural steel framing.

1.04 QUALITY ASSURANCE

- A. Fabricate structural steel members in accordance with AISC (MAN) "Steel Construction Manual."
- B. Pre-Installation Conference:
 - 1. Participate in pre-installation conference.
 - 2. In addition to agenda items specified in Section 01 3000, review following:
 - a. Review Section 01 4000 for Testing and Inspection administrative requirements and responsibilities and Field Quality Control tests and inspections required of this section.
 - 1) Review requirements and frequency of testing and inspections.
 - b. Meet with Architect before commencing repair of galvanized surfaces to establish extent of repairs required and, if applicable, choice of methods to be used.
- C. Scheduling:
 - 1. Notify Testing Agency and Architect twenty-four (24) hours minimum before placing structural steel framing.
 - 2. Notify Testing Laboratory at least three (3) weeks in advance of fabrication
- D. Design connections not detailed on drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.
- E. Testing And Inspection.
 - 1. Owner is responsible for Quality Assurance. Quality assurance performed by Owner will be used to validate Quality Control performed by Contractor.
 - 2. Owner will provide Testing and Inspection for inspection of structural steel framing:
 - a. Owner will employ testing agencies to perform inspection of structural steel framing as specified in Field Quality Control in Part 3 of this specification:

- 1) Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform the Work in strict accordance with requirements of Contract Documents and perform contractor testing and inspection.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Steel Angles and Plates: ASTM A36/A36M.
- B. Steel W Shapes and Tees: ASTM A992/A992M.
- C. Rolled Steel Structural Shapes: ASTM A992/A992M.
- D. Cold-Formed Structural Tubing: ASTM A500/A500M, Grade C.
- E. Pipe: ASTM A53/A53M, Grade B, Finish black.
- F. Structural Bolts and Nuts: Carbon steel, ASTM F3125 Gr. A325.
- G. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- H. Grout: ASTM C1107/C1107M; Non-shrink; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
 1. Minimum Compressive Strength at 48 Hours: 2,000 pounds per square inch.
 2. Minimum Compressive Strength at 28 Days: 7,000 pounds per square inch.
 3. Height Change, Plastic State; when tested according to ASTM C827/C827M:
 - a. Maximum: Plus 4 percent.
 - b. Minimum: Plus 1 percent.

2.02 FABRICATION

- A. Shop fabricate to greatest extent possible.
- B. Requirements: Structural metal shall be product of domestic mill.
 1. ANSI/AISC 360 shall serve as minimum standard.
 2. Fabricate items to be embedded in concrete or masonry according to approved details of work to be connected.

2.03 FINISH

- A. Powder-coating on zinc primer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that conditions are appropriate for erection of structural steel and that the work may properly proceed.

3.02 ERECTION

- A. Erect structural steel in compliance with AISC 303.
- B. Allow for erection loads and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing.
- C. Do not field cut or alter structural members without approval of Architect.
- D. Do not overload or exceed carrying capacity of any structural steel element during construction period.

3.03 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.

END OF SECTION

**SECTION 05 5000
METAL FABRICATIONS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Shop fabricated steel and aluminum items.
 - 1. Prefabricated ladders.
 - 2. Miscellaneous steel.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.
- B. Section 05 1200 - Structural Steel Framing: Structural steel column anchor bolts.

1.03 REFERENCE STANDARDS

- A. ALI A14.3 - Ladders - Fixed - Safety Requirements 2008.
- B. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements 2018.
- C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2014.
- D. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless 2020.
- E. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates 2018.
- F. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength 2014, with Editorial Revision (2017).
- G. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes 2021a.
- H. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing 2021.
- I. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength 2019.
- J. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination 2012.
- K. AWS D1.1/D1.1M - Structural Welding Code - Steel 2020.
- L. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer 1999 (Ed. 2004).
- M. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic) 2019.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's data sheets on each ladder safety system product to be used, including installation instructions.
- C. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
 - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
 - 2. Design data: Submit drawings and supporting calculations, signed and sealed by a qualified professional structural engineer.
 - a. Include the following, as applicable:
 - 1) Design criteria.
 - 2) Engineering analysis depicting stresses and deflections.

- 3) Member sizes and gauges.
- 4) Details of connections.
- 5) Support reactions.
- 6) Bracing requirements.

1.05 QUALITY ASSURANCE

- A. Welders shall be certified 30 days minimum before beginning work on project. If there is doubt as to proficiency of welder, Architect may require welder to take another test, at no expense to Owner. Certification shall be by Pittsburgh Laboratories or other authority approved by Architect.
- B. Maintain welders' certifications on job-site.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

- A. Steel Sections: ASTM A36/A36M.
- B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.
- C. Plates: ASTM A283/A283M.
- D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.
- E. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, plain.
 1. Anchor Rods For Steeple Base Connections: Conform to requirements of ASTM A36/A36M.
 2. Anchor bolts: Conform to requirements of ASTM A307, Grade A.
- F. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- G. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
- H. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

- A. Fit and shop assemble items in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. Continuously seal joined members by intermittent welds and plastic filler.
- D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.03 FABRICATED ITEMS

- A. Vertical Ladders: Steel; in compliance with ANSI A14.3; with mounting brackets and attachments; prime paint finish.
 1. Refer to Drawings for ladder requirements.
 2. Requirements for cages, wells, and ladder safety systems used with fixed ladders, in order to minimize personal injuries.
 3. All parts and appurtenances necessary for safe and efficient ladder shall be considered integral parts of design.
 4. Weld joints. Grind joints to be smooth to the touch and finished to match adjoining surfaces.
 5. Fabricate mounting brackets of drilled angles.

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6. Prime interior ladders.

2.04 FABRICATION TOLERANCES

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

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.
- B. Confirm that the ladder structure to which the ladder safety system is installed is capable of withstanding the loads applied by the system in the event of a fall.

3.02 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.03 INSTALLATION

- A. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- B. Field weld components as indicated on drawings.
- C. Perform field welding in accordance with AWS D1.1/D1.1M.
- D. Minimum weld sizes, unless detailed otherwise:
 - 1. Weld pipe columns to base plates and top plates with 1/4 inch fillet weld all around.
 - 2. Weld glu-lam connection side plates to base plates with 1/4 inch fillet weld all along outside edges.
 - 3. Weld stiffeners to pipe columns with 1/4 inch fillet weld all around.
- E. Obtain approval prior to site cutting or making adjustments not scheduled.
- F. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

3.04 LADDER INSTALLATION

- A. Support ladder with welded steel brackets located at top and bottom, and equally spaced but no more than 60 inches on center between top and bottom where ladder is installed against a wall. Size brackets to support design loads specified in ANSI/ALI A14.3.

3.05 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

3.06 ADJUSTING

- A. Immediately after installation, touch up primed surfaces damaged by installation procedures to provide appropriate surface for finish painting.

END OF SECTION

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SECTION 06 0573 WOOD TREATMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Preservative treatment for wood materials.
- B. Insect Prevention treatment for wood materials.

1.02 DEFINITIONS

- A. Preservative-Treated Wood: Wood exposed to high levels of moisture or heat susceptible to decay by fungus and other organisms, and to insect attack. The damage caused by decay or insects can jeopardize the performance of the wood members so as to reduce the performance below that required. Preservative treatment requires pressure-treatment process to achieve depth of penetration of preservative into wood to verify that the wood will be resistant to decay and insects over time.
- B. Treated Wood: Wood impregnated under pressure with compounds that reduce its susceptibility to flame spread or to deterioration caused by fungi, insects, or marine bores.
- C. Flame Spread: The propagation of flame over a surface.
- D. Flame Spread Index: The numerical value assigned to a material tested in accordance with ASTM E84 or UL 723.
- E. Smoke-Developed Index: The numerical value assigned to a material tested in accordance with ASTM E84 or UL 723.

1.03 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2021a.
- B. AWPA U1 - Use Category System: User Specification for Treated Wood 2018.
- C. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials 2006.
- D. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

1.04 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals (Fire-Retardant Wood Treatment):
 - 1. Fire-Test-Response Characteristics: Identify products with appropriate markings of applicable testing agency.
 - a. Surface-Burning Characteristics:
 - 1) All lumber and plywood specified to be exterior fire retardant treated wood shall have Class A flame spread rating in accordance with ASTM E84 or UL 723UL 723 and show no evidence of significant progressive combustion when test is continued for an additional twenty (20) minute period. In addition, flame front shall not progress more than 10.5 feet beyond centerline of burner at any time during test.
 - (a) Class A (Flame spread index 0-25; Smoke-developed index 0-450).
 - (b) Equipped with an "FRS" rating under UL classification, exhibiting a flame spread and smoke rating of 25 or less.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.
- B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, or installation.

- C. Keep materials dry during transit with labels intact and store in dry location at all times.

PART 2 PRODUCTS

2.01 FACTORY APPLIED WOOD TREATMENT

- A. Factory Applied Preservative Wood Treatment:
1. Acceptable Manufacturers:
 - a. Arch Wood Protection Inc, Atlanta, GA www.wolmanizedwood.com.
 - b. Hoover Treated Wood Products, Thomson, GA www.frtw.com.
 - c. Osmose Inc, Griffin, GA www.osmose.com.
 - d. U S Borax Inc, Valencia, CA www.borax.com/wood.
 - e. Viance LLC, Charlotte, NC www.treatedwood.com.
 - f. Equal as approved by Architect before bidding. See Section 016000.
 2. Framing lumber grade and species shall be as specified in Section 061100 for particular use.
 3. Interior Wood In Contact With Concrete or Masonry:
 - a. Preservatives:
 - 1) Disodium octoborate tetrahydrate (DOT / SBX) meeting requirements of AWPA U1 and with retention of 0.25 lbs per cu ft.
 - 2) Zinc borate meeting requirements of AWPA U1 and with retention of 0.17 lbs per cu ft.
 - 3) CCA-C (47.5 percent chromium trioxide, 18.5 percent copper oxide and 34 percent arsenic pentoxide) by Koppers Performance Chemicals, Griffin, Georgia, <http://www.koppersperformancechemicals.com/> (0.25 lb/cu ft minimum retention).
 - 4) DURA-GUARD by Hoover Treated Wood Products, Thomson, GA www.frtw.com (.40 lb/cu ft minimum retention).
 - b. Lumber: Treat in accordance with AWPA U1.
 - c. Millwork: Treat in accordance with AWPA N1 and dry after treatment.
 4. Exterior Wood Continuously Exposed To Weather:
 - a. Preservatives: Waterborne preservatives meeting requirements of AWPA U1 with retention levels as required by AWPA U1 for specific application.
 - b. Lumber: Treat in accordance with AWPA U1.
- B. Factory Applied Insect Prevention Wood Treatment (control of termites):
1. Design Criteria:
 - a. Description:
 - 1) Preservative treatment for insect protection of exterior wood and wood cellulose composite millwork products. Requirements for exterior millwork for preservation formulations applied with pressure or no-pressure methods for treated exterior wood and wood cellulosic composite millwork.
 - 2) LSL material can be treated but LVL material is not to be treated.
 - 3) Millwork is defined in this specification as exterior products such as prefit wood windows, sash, screens, window frames, blinds, shutters, wood doors, door jambs, cut-to-length trim, and machined knocked-down parts of those products.
 - b. General:
 - 1) Treat lumber and wood sheathing for new work in accordance with AWPA Standards and dried after treatment.
 - 2) Hardwood lumber and wood sheathing used in Architectural Millwork shall be preserved by fifteen (15) minute dip treatment in accordance with requirements of WDMA I.S.4.
 - 3) Wood products that are saw cut or bored after treatment shall have raw edges treated with two brush coats of same preservative originally used for treatment.
 - 4) Plywood, Pine and Hemlock: Follow recommendations of AWPA N1.
 - c. Lumber:

- 1) Framing Lumber, LSL Material and Wood Plywood:
 - (a) Design Criteria:
 - (1) Product must be AWWPA approved.
 - (2) Provide retention rate required to provide 40 year minimum protection using the AWWPA category system (UCS) standards. Adjust the retention rate for the potential hazard of decay and termites.
 - (3) The assay zone is the outer 0.60 inches of the wood for these specifications.
 - (4) Incising not required but allowed with structural engineer of record approval.
 - (5) Incising can reduce the structural capacity of the wood.
 - (b) Quality Standards. See Section 01 4000.
 - (1) Hi-Clear II by Permapost Products Co., Hillsboro, OR www.permapost.com (0.25 lb/cu ft retention; do not use this product in Hawaii, California or Southeast).
 - (2) CCA-C (47.5 percent chromium trioxide, 18.5 percent copper oxide and 34 percent arsenic pentoxide) by Koppers Performance Chemicals, Griffin, GA www.koppersperformancechemicals.com (0.60 lb/cu ft minimum retention for projects in Hawaii, California and Southeast).
 - (3) Hi-Bor by Koppers Performance Chemicals, Griffin, GA www.koppersperformancechemicals.com (0.17 lb/cu ft minimum; 0.40 lb/cu ft minimum retention for projects in Hawaii, California and Southeast). Borate treated wood is to be stored off ground and be covered for protection from water.
 - (4) SillBor by Arch Wood Protection, Inc., Atlanta, GA www.lonza.com/products-services/wood-protection.aspx (0.17 lb/cu ft minimum; 0.40 lb/cu ft minimum retention of SillBor for projects in Hawaii, California and Southeast). Borate treated wood is to be stored off ground and be covered for protection from water.
 - (c) For Treating Cut Ends, Notches, and etc, at Job Site:
 - (1) Apply copper naphthenate solution or other solution containing at least 1 percent copper. use generous amount to completely saturate any untreated areas exposed by cutting or drilling.
 - d. Moisture Requirements:
 - 1) Water-soluble treated wood shall have moisture reduced to twelve (12) percent to fifteen (15) percent before installation.
 - 2) Tribucide treated wood shall have moisture reduced to nineteen (19) percent before installation.

PART 3 EXECUTION

3.01 PREPARATION

- A. Remove dust, dirt and other contaminants from treatment surfaces. Remove tarpaulins, drop cloths, strippable protective films, etc., from areas to be treated. Move equipment and stored materials that block or prevent product application.

3.02 INSTALLATION - GENERAL

- A. Provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.03 SITE APPLIED WOOD TREATMENT

- A. Comply with manufacturers written mixing and installation instructions.

3.04 APPLICATION

- A. Treated wood shall not be installed in areas where it is exposed to precipitation, direct wetting, or regular condensation.

3.05 FIELD QUALITY CONTROL

A. Field Tests:

1. Post-Treatment of Fire Retardant:

- a. Testing Agency shall provide testing for fire-retardant compliance to specification.

END OF SECTION

**SECTION 06 1000
ROUGH CARPENTRY**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Structural dimension lumber framing.
- B. Non-structural dimension lumber framing.
- C. Rough opening framing for doors, windows, and roof openings.
- D. Sheathing.
- E. Roof-mounted curbs.
- F. Roofing nailers.
- G. Preservative treated wood materials.
- H. Miscellaneous framing and sheathing.
- I. Communications and electrical room mounting boards.
- J. Concealed wood blocking, nailers, and supports.
- K. Miscellaneous wood nailers, furring, and grounds.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Setting anchors in concrete.
- B. Section 05 5000 - Metal Fabrications: Miscellaneous steel connectors and support angles for wood framing.
- C. Section 06 1733 - Wood I-Joists.
- D. Section 06 1753 - Shop-Fabricated Wood Trusses.
- E. Section 06 1800 - Glued-Laminated Construction.
- F. Section 07 2500 - Weather Barriers: Water-resistive barrier over sheathing.
- G. Section 09 2116 - Gypsum Board Assemblies: Gypsum-based sheathing.
- H. Section 31 3116 - Termite Control: Field-applied termiticide and mildewcide for wood materials.

1.03 REFERENCE STANDARDS

- A. ASTM D2559 - Standard Specification for Adhesives for Bonded Structural Wood Products for Use Under Exterior Exposure Conditions 2012a (Reapproved 2018).
- B. ASTM F1667 - Standard Specification for Driven Fasteners: Nails, Spikes, and Staples 2021.
- C. AWC (WFCM) - Wood Frame Construction Manual for One- and Two-Family Dwellings 2018.
- D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.
- E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.
- F. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing 2003 (Reapproved 2017).
- G. ASTM D3498 - Standard Specification for Adhesives for Field-Gluing Wood Structural Panels (Plywood or Oriented Strand Board) to Wood Based Floor System Framing 2019a.
- H. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials 2016.
- I. ICC-ES AC38 - Acceptance Criteria for Water-Resistive Barriers 2016.
- J. ICC-ES AC380 - Acceptance Criteria for Termite Physical Barrier Systems 2014, with Editorial Revision (2017).
- K. PS 1 - Structural Plywood 2009.

- L. PS 2 - Performance Standard for Wood-Based Structural-Use Panels 2010.
- M. PS 20 - American Softwood Lumber Standard 2020.
- N. SPIB (GR) - Grading Rules 2014.
- O. WCLIB (GR) - Standard Grading Rules for West Coast Lumber No. 17 2018.
- P. WWPA G-5 - Western Lumber Grading Rules 2017.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide technical data on wood preservative materials and application instructions.
- C. Manufacturer's literature on framing anchors and powder-actuated fasteners.
 - 1. Submit diameter and lengths of fasteners proposed for use on Project. If length of diameter of proposed fasteners differ from specified fasteners, also include technical and engineering data for proposed fasteners including, but not limited to:
 - a. Adjusted fastener spacing where using proposed fasteners and,
 - b. Adjusted number of fasteners necessary to provide connection capacity equivalent to specified fasteners.
 - 2. Submit on powder-actuated fasteners other than those specified in Contract Documents, show design criteria equivalents at each location.
 - 3. Show type, quantity and installation location of framing anchors. Where necessary, reference Drawing details, etc, for installation locations.
- D. Structural Composite Lumber: Submit manufacturer's published structural data including span tables, marked to indicate which sizes and grades are being used; if structural composite lumber is being substituted for dimension lumber or timbers, submit grading agency structural tables marked for comparison.
- E. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
 - 1. Protect lumber and sheathing and keep under cover in transit and at job site.
 - 2. Do not deliver material unduly long before it is required.
- B. Storage And Handling Requirements:
 - 1. Store lumber and sheathing on level racks and keep free of ground to avoid warping.
 - 2. Stack to insure proper ventilation and drainage.

1.06 QUALITY ASSURANCE

- A. Pre-Installation Conference:
 - 1. Participate in MANDATORY pre-installation conference.
 - a. Schedule pre-installation conference immediately before beginning framing work.
 - b. In addition to agenda items specified in Section 01 3100, review following:
 - 1) Equipment and gypsum board blocking in wood framed walls.
 - 2) Operable partition headers.
 - 3) Rough opening.
 - 4) Shear walls and struts.
 - 5) Nails and nailing requirements.
 - 6) Truss installation.
 - 7) Connections.
 - 2. Participate in pre-installation conference held jointly with Section 08 4113.
 - a. Schedule pre-installation conference for one (1) week before scheduled installation of storefront system.
 - b. In addition to agenda items specified in Section 01 3100, review following:

- 1) Rough opening requirements.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Suppliers:

1. Builders First Choice, West Jordan, UT. www.BLDR.com. Contact Dan Egelund.
 - a. Office: (801) 224-0541.
 - b. Mobile: (801) 376-2385.
 - c. E-Mail: Dan.Egelund@bldr.com
2. J. M. Thomas Forest Products, Ogden, UT. www.thomasforest.com. Contact Tom Karren:
 - a. Office: (800) 962-8780.
 - b. FAX: 801-782-9652.
 - c. E-Mail: tom@thomasforest.com.
3. Shelter Products, Inc., Portland, OR www.shelter-products.com. Contact Mike Running:
 - a. Office: (800) 662-3612.
 - b. Cell: NA.
 - c. FAX: (503) 238-2663.
 - d. E-Mail: mrunning@shelter-products.com.

B. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.

1. Species: Douglas Fir-Larch, unless otherwise indicated.
2. If no species is specified, provide any species graded by the agency specified; if no grading agency is specified, provide lumber graded by any grading agency meeting the specified requirements.
3. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
4. Design Criteria:
 - a. Meet requirements of PS 20 and National Grading Rules for softwood dimension lumber.
 - b. Bear grade stamp of WWPA, SPIB, or other association recognized by American Lumber Standards Committee identifying species of lumber by grade mark or by Certificate of Inspection.
 - c. Lumber 2 inches (50 mm) or less in nominal thickness shall not exceed 19 percent in moisture content at time of fabrication and installation and be stamped 'S-DRY', 'K-D', or 'MC15'.
 - d. Preservative Treated Plates / Sills:
 - 1) 2x4 (38 mm by 64 mm): Standard and better Douglas Fir, Southern Pine, or HemFir, or StrandGuard by iLevel by Weyerhaeuser Boise, ID www.ilevel.com. (LSL 1.3 E) or as indicated on Contract Drawings.
 - 2) 2x6 (38 mm by 140 mm) And Wider: No. 2 or MSR 1650f - 1.5e Douglas Fir, Southern Pine, HemFir, or StrandGuard by iLevel by Weyerhaeuser, Boise, ID www.ilevel.com. (LSL 1.3 E) or as indicated on Contract Drawings.
5. Lumber of other species or grades is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.

C. Posts, Beams, And Timbers 5 Inches by 5 Inches (125 mm by 125 mm) And Larger:

1. Design Criteria:
 - a. No. 1 or better Douglas Fir or Southern Pine unless noted otherwise by Contract Drawings.

D. Lumber Ledgers:

1. Design Criteria:
 - a. No. 1 Douglas Fir-Larch, or Southern Pine unless noted otherwise by Contract Drawings.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

- A. Sizes: Nominal sizes as indicated on drawings, S4S.
- B. Moisture Content: S-dry or MC19.
- C. Stud Framing:
 - 1. Species: Any allowed under referenced grading rules, or as noted by contract drawings.
 - 2. Grade: No. 2, or as noted by Contract Drawings.
- D. Joist, Rafter, and Small Beam Framing:
 - 1. Machine stress-rated (MSR) as follows:
 - a. Fb-single (minimum extreme fiber stress in bending): 1350 psi, or as noted by Contract Drawings.
 - b. E (minimum modulus of elasticity): 1,300,000 psi, or as noted by contract drawings.
 - 2. Species and Grades: As indicated on drawings for various locations.
- E. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
 - 1. Lumber: S4S, No. 2 or Standard Grade.
 - 2. Boards: Standard or No. 3.

2.03 STRUCTURAL COMPOSITE LUMBER

- A. At Contractor's option, structural composite lumber may be substituted for concealed dimension lumber and timbers.
- B. Materials shall be tested and evaluated in accordance with ASTM D5456.
- C. Materials shall have current ICC-ES Evaluation Report, report approved by International Codes Council, or report issued by Architect approved model code evaluation service and shall comply with requirements of report.
- D. Identify materials by stamp or stamps indicating manufacturer's name, product trade name, grade, species (if applicable), evaluation report number, plant number, and name or logo of independent inspection agency.
- E. Adhesive: Meet requirements of ASTM D2559.
- F. Factory fabricated beams, headers, and columns, of sizes and types indicated on drawings; structural capacity as published by manufacturer.
 - 1. Columns: Use laminated veneer lumber, laminated strand lumber, or parallel strand lumber with manufacturer's published E (modulus of elasticity): 1,800,000 psi, minimum.
 - 2. Beams: Use laminated veneer lumber, laminated strand lumber, or parallel strand lumber with manufacturer's published E (modulus of elasticity): 1,800,000 psi, minimum.
 - 3. Headers Not Longer Than 48 inches: Use laminated veneer lumber, laminated strand lumber, or parallel strand lumber.
 - 4. Manufacturers:
 - a. Boise Cascade Company: www.bc.com/#sle.
 - b. Weyerhaeuser Company: www.weyerhaeuser.com/#sle.
 - c. Jager Industries Inc, Calgary, AB www.jagerbuildingsystems.com 4. Louisiana Pacific Corp, Portland, OR www.lpcorp.com.
 - d. Roseburg Forest Products, Roseburg, OR www.roseburg.com.
 - e. Trus Joist Corp, Div Weyerhaeuser, Boise, ID www.tjm.com or Surrey, BC (604) 588-7878.
 - f. Web Joist, Chehalis, WA www.webjoist.com.

2.04 CONSTRUCTION PANELS (WOOD SHEATHING)

- A. See Contract Drawings for required thicknesses, span ratings and attachment requirements.
- B. Sheathing: Meet requirements of PS 1, PS 2, or PRP-133 (TECO). Except where plywood is specifically indicated on Contract Drawings, oriented strand board (OSB) is acceptable.
- C. Sheathing shall bear grade stamp from American Plywood Association (APA) or equal grading organization.

- D. Sheathing shall not exceed 18 percent moisture content when fabricated or more than 19 percent when installed in Project.
- E. Sheathing used for same purpose shall be of same thickness. In all cases, thickness specified is minimum required regardless of span rating.
- F. Minimum span ratings for given thicknesses shall be as follows:
 - 1. Thickness = Span Rating
 - a. 3/8 inch = 24 / 0
 - b. 7/16 inch nominal = 24 / 16
 - c. 15/32 inch actual = 32 / 16
 - d. 1/2 inch nominal = 32 / 16
 - e. 19/32 inch actual = 40 / 20
 - f. 5/8 inch nominal = 40 / 20
 - g. 23/32 inch actual = 48 / 24

2.05 ACCESSORIES

- A. Fasteners and Anchors:
 - 1. General:
 - a. Fasteners for preservative treated and fire-retardant-treated wood shall be of hot dipped zinc-coated galvanized steel, stainless steel, silicon bronzed, or copper. Coating weights for zinc-coated fasteners shall be in accordance with ASTM A153/A153M.
 - 2. Blocking:
 - a. Sound lumber without splits, warps, wane, loose knots, or knots larger than 1/2 inch.
 - b. Utility or better
 - 3. Nails:
 - a. Meet requirements of ASTM F1667.
 - b. Unless noted otherwise, nails listed on Drawings or in Specifications shall be common nail diameter, except 16d nails, which shall be box diameter.
 - 4. SDS Screws:
 - a. Category Four Approved Products. See Section 01 6200 for definitions of categories.
 - b. SDS Screws by Simpson Strong Tie Co, Dublin, CA www.strongtie.com.
 - 5. Powder-Actuated Fasteners:
 - a. Type One Quality Standard: Hilti X-DNI 62P8.
 - b. Manufacturers:
 - 1) Hilti, Tulsa, OK www.us.hilti.com.
 - 2) Redhead Division of ITW, Wood Dale, IL www.itw-redhead.com and Markham, ON www.itwconstruction.ca.
 - 6. Drywall Screws: Bugle head, hardened steel, power driven type, length three times thickness of sheathing.
 - 7. Framing Anchors:
 - a. Framing anchors and associated fasteners in contact with preservative hot dipped zinc coated galvanized steel or stainless steel. Do not use stainless steel items with galvanized items.
 - b. Acceptable Products:
 - 1) KC Metals Inc, San Jose, CA www.kcmetals.com.
 - 2) Simpson Strong Tie Co, Dublin, CA www.strongtie.com.
 - 3) United Steel Products Co Inc (USP), Montgomery, MN www.uspconnectors.com.
 - 4) Equals as approved by Architect through shop drawing submittal before installation.
- B. Joist Hangers: Hot dipped galvanized steel, sized to suit framing conditions.
 - 1. For contact with preservative treated wood in exposed locations, provide minimum G185 galvanizing complying with ASTM A653/A653M.

- C. Sill Gasket on Top of Foundation Wall: 1/4 inch thick, plate width, closed cell plastic foam from continuous rolls.
- D. Termite-Resistant Sill Plate Barrier: Self-adhesive, film-backed barrier with release sheet; adheres to concrete substrates and blocks termite access.
 - 1. Thickness: 68 mils (0.068 inch).
 - 2. Termite Resistance: 100 percent when tested in accordance with ICC-ES AC380.
- E. Subfloor Adhesives: Waterproof, air cure type, cartridge dispensed; adhesives designed for subfloor applications and complying with either ASTM C557 or ASTM D3498.
- F. Construction Adhesives: Adhesives complying with ASTM C557 or ASTM D3498.
 - 1. Manufacturers:
 - a. Meet requirements of 'APA-The Engineered Wood Association' Specification AFG-01 or ASTM D3498.
 - b. Use phenol-resorcinol type for use on pressure treated wood products.

PART 3 EXECUTION

3.01 PREPARATION

- A. Use preservative treated wood for wood members in contact with concrete or masonry, including wall, sill and ledger plates, door and window subframes and bucks, etc.
- B. Install sill gasket under sill plate of framed walls bearing on foundations; puncture gasket cleanly to fit tightly around protruding anchor bolts.
- C. Coordinate installation of rough carpentry members specified in other sections.

3.02 INSTALLATION - GENERAL

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

3.03 FRAMING INSTALLATION

- A. Furring Strips:
 - 1. On Wood or Steel: Nail or screw as required to secure firmly.
 - 2. At ceilings:
 - a. Attach furring strips to the underside of structural elements with #8 wood screws, of length to penetrate wood framing 1 inch minimum.
- B. Floor Framing:
 - 1. Place with crown side up.
 - 2. Install structural blocking and bridging as necessary and as described in Contract Drawings.
 - 3. Provide accurately fitted header and trimmer joist of same size as regular joists around floor openings, unless detailed otherwise and support by steel joist hangers.
 - 4. Double joists under partitions that parallel run of joists.
- C. Roof and Ceiling Framing:
 - 1. Place with crown side up.
 - 2. Install structural blocking and bridging as necessary and as described in Contract Drawings.
 - 3. Special Requirements:
 - a. Roof and Ceiling Joists: Lap joints 4 inches minimum and secure with code approved framing anchors.
 - b. Roof Rafters and Outlookers:
 - 1) Cut level at wall plate and provide at least 2-1/2 inches bearing where applicable. Spike securely to plate with three 10d nails.

- 2) Attach to trusses or other end supports with framing anchors described in Contract Drawings.
 - 3) Provide for bracing at bearing partitions.
- D. Installation of Wood Trusses:
1. Handle, erect, and brace wood trusses in accordance with TPI/WTCA Booklet BCSI.
 2. Do not install damaged or broken wood trusses. Replace wood trusses that are broken, damaged, or have had members cut out during course of construction.
 3. Provide construction bracing from trusses in accordance with TPI DSB-89.
 4. Provide continuous 2x4 horizontal web bracing as shown on truss shop drawings.
 - a. Secure bracing to each truss with two 10d or 16d nails.
 - b. Lap splice bracing by placing bracing members side by side on common web member. Butt splices are not acceptable.
 5. Unless directed or shown otherwise, provide diagonal 2x4 bracing between trusses at each line of horizontal web bracing.
 - a. This diagonal bracing shall be continuous and extend from junction of web and top chord of one truss to junction of web and bottom chord of different truss.
 - b. Install bracing at approximately 45 degree angle. Bracing will extend over three trusses minimum or more as determined by height of trusses and 45 degree installation angle.
 - c. Install brace on side of web opposite horizontal web bracing and nail to each web with two 10d or 16d nails.
 - d. Install one brace every 20 feet as measured from top of brace to top of next brace.
- E. Wall Framing:
1. Openings: Single, bearing stud supporting header and on adjacent (king) stud continuous between top and bottom plates, unless show otherwise.
 2. Corners And Partition Intersections: Triple Studs.
 3. Top Plates in Bearing Partitions/Walls: Doubled or tripled and lapped, unless shown otherwise. Stagger joints at least 48 inches.
- F. Installation of GlueLams:
1. Install work in accordance with Fabricator's instructions and GlueLam Erection Safety Practices.
 2. Adequately support and brace work until tied into building structure to insure against collapse due to wind or other forces.
 3. Maintain protection of beams until roofing has been installed.
- G. Installation of Structural Composite Lumber:
1. Install temporary horizontal and cross bracing to hold members plumb and in safe condition until permanent bracing is installed.
 2. Install permanent bracing and related components before application of loads to members.
- H. Installation of Wood Web Joists (I-Joists):
1. Handle, erect, and brace sheathing wood web joists in accordance with Manufacturer's instructions.
 2. Do not install damaged or broken wood web joists.
 3. Install temporary horizontal and cross bracing to hold members plumb and in safe condition until permanent bracing is installed.
 4. Cut holes through webs at locations or of sizes shown on Drawings and as recommended by Manufacturer.
- I. Firestops:
1. Horizontal or vertical concealed spaces in walls, light coves, soffits, drop ceilings, and other features over 10 feet in length or height, and at stairs, ceiling levels, floor levels, and other junctures of horizontal to vertical concealed spaces.

2. Within concealed spaces of exterior wall finishes and exterior architectural elements, such as trims, cornices or projections, at maximum intervals of 20 feet, length or height.
- J. Sill Plates:
1. Shear Walls and Bearing Walls (structural walls):
 - a. Provide specified anchor 12 inches maximum and 4 inches minimum from each end of each plate.
 - b. Fasten with anchor bolts embedded in concrete or with post-installed anchors as noted in Contract Drawings.
 2. Non-Structural Walls: Fasten with powder actuated fasteners.
 3. In addition to requirements of paragraphs '1' and '2' above, set sill plates of interior walls measuring less than 36 inches in length in solid bed of specified construction adhesive, except where sill sealer is used.
 4. Install specified seal sealer under sill plates of exterior walls and of acoustically insulated interior walls.
- K. Posts And Columns:
1. Unless shown otherwise, nail members of multiple member columns together with 16d at 6 inches on center from each side.
- L. Beams And Girders:
1. Built-Up Members:
 - a. Stagger individual members of multiple span beams and girders so, over any one support, no more than half the members will have a joint. In all cases, however, joints shall occur over supports.
 - b. Unless shown otherwise on Contract Drawings, nail two-ply built-up members with 10d nails 12 inches on center top and bottom, staggered on opposite sides. Nail three-ply built-up members with 16d nails at 12 inches on center, top and bottom, staggered, on opposite sides. Set with crown edge up with full bearing at ends and intermediate supports.
 2. Pre-Fabricated Members:
 - a. Solid glue-lam, LVL, LSL or PSL members may be used in place of built-up 2x framing members. Size shall be same as built-up member.
 - b. Solid LVL or PSL members may be used in place of built-up LVL members. Size shall be same as sum of built-up members.
 3. Wood shims are not acceptable under ends.
 4. Do not notch framing members unless specifically shown in Drawing detail.
- M. Nailing:
1. Use nails and nail spacings required by Contract Drawings and:
 - a. Top plates: Spiked together, 16d, 16 inches on center.
 - b. Top plates: Laps, lap members 48 inches minimum and nail with 16d nails 4 inches on center
 - c. Top plates: Intersections, three 16d
 - d. Backing and blocking: Three 8d, each end.
 - e. Corner studs and angles: 16d, 16 inches on center.
- N. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members.
- O. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.
- P. Install structural members full length without splices unless otherwise specifically detailed.
- Q. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes, AWC (WFCM) Wood Frame Construction Manual.

- R. Install horizontal spanning members with crown edge up and not less than 1-1/2 inches of bearing at each end.
- S. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.
- T. Provide bridging at joists in excess of 8 feet span as detailed. Fit solid blocking at ends of members.
- U. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.

3.04 BLOCKING, NAILERS, AND SUPPORTS

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.
- B. In framed assemblies that have concealed spaces, provide solid wood fire blocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to code authorities may be used in lieu of solid wood blocking.
- C. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.
- D. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.
- E. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.
- F. Provide the following specific non-structural framing and blocking:
 - 1. Cabinets and shelf supports.
 - 2. Wall brackets.
 - 3. Handrails.
 - 4. Grab bars.
 - 5. Towel and bath accessories.
 - 6. Wall-mounted door stops.
 - 7. Display boards.
 - 8. Wall paneling and trim.
 - 9. Joints of rigid wall coverings that occur between studs.

3.05 ROOF-RELATED CARPENTRY

- A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.
- B. Provide wood curb at all roof openings except where prefabricated curbs are specified and where specifically indicated otherwise. Form corners by alternating lapping side members.

3.06 INSTALLATION OF CONSTRUCTION PANELS (WOOD SHEATHING)

- A. Roof Sheathing: Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.
 - 1. At long edges use sheathing clips ("H" clips) where joints occur between roof framing members.
 - 2. At long edges provide solid edge blocking where joints occur between roof framing members where roof is blocked. Refer to Contract Drawings.
 - 3. Nail panels to framing; staples are not permitted.
 - 4. Placing:
 - a. Lay face grain at right angles to supports. Provide blocking for support if framing turns at roof overhang.
 - b. Provide 1/8 inch (3 mm) space between sheets at end and side joints.
 - c. Stagger panel end joints.

- d. Sheathing shall be continuous of two spans minimum.
- 5. Edge Bearing and Blocking:
 - a. As indicated on Contract Drawings.
- 6. Nail Spacing:
 - a. As indicated on Contract Drawings.
 - b. Place nails at least 3/8 inch (9.5 mm) in from edge.
- 7. Thickness:
 - a. As indicated on Contract Drawings.
- 8. Do not install any piece of roof sheathing with shortest dimension of less than 24 inches (600 mm) unless support is provided under all edges.
- B. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails, screws, or staples.
 - 1. Use plywood or other acceptable structural panels at building corners, for not less than 96 inches, measured horizontally.
 - 2. Provide inlet diagonal bracing at corners.
 - 3. Place water-resistive barrier horizontally over wall sheathing, weather lapping edges and ends.
 - 4. Spacing:
 - a. Provide 1/8 inch (3 mm) space between sheets at end and edge joints.
 - 5. Edge Bearing And Blocking:
 - a. Panel edges shall bear on framing members and butt along their center lines.
 - b. Back block panel edges, which do not bear on framing members, with 2 inch nominal (45 mm) framing.
 - 6. Nail Spacing:
 - a. As indicated on Contract Drawings.
 - b. Place nails not less than 3/8 inch (9.5 mm) in from edge.
 - 7. Thickness:
 - a. As indicated on Contract Drawings.
- C. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.
 - 1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
 - 2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
 - 3. Install adjacent boards without gaps.
 - 4. Size: 48 by 96 inches.
 - 5. Size and Location: As indicated on drawings.

3.07 TOLERANCES

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

3.08 FIELD QUALITY CONTROL

- A. Field Inspections:
 - 1. Sheathing:
 - a. General:
 - 1) Owner is responsible for Quality Assurance. Quality assurance performed by Owner will be used to validate Quality Control performed by Contractor.
 - 2) Quality Control is sole responsibility of Contractor as specified in Section 01 4523 'Testing And Inspection Services'.

- b. For walls and roof areas where nail spacing is 4 inches and less on center, Inspector shall verify wood panel sheathing, grade, thickness and nominal size of framing members, adjoining panel edges, nail size and spacing, bolting and other fastening of other components.

END OF SECTION

**SECTION 06 1753
SHOP-FABRICATED WOOD TRUSSES**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Shop fabricated wood trusses for roof framing.
- B. Bridging, bracing, and anchorage.
- C. Preservative treatment of wood.

1.02 RELATED REQUIREMENTS

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

1.03 REFERENCE STANDARDS

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.
- B. TPI 1 - National Design Standard for Metal-Plate-Connected Wood Truss Construction 2014.
- C. TPI BCSI 1 - Building Component Safety Information Booklet: The Guide to Good Practice for Handling, Installing & Bracing of Metal Plate Connected Wood Trusses 2018.
- D. TPI DSB-89 - Recommended Design Specification for Temporary Bracing of Metal Plate Connected Wood Trusses 1989.

1.04 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on plate connectors, bearing plates, and metal bracing components.
- B. Shop Drawings: Show truss configurations, sizes, spacing, size and type of plate connectors, cambers, framed openings, bearing and anchor details, and bridging and bracing.
 - 1. Include identification of engineering software used for design.
 - 2. Provide shop drawings stamped or sealed by design engineer.
 - 3. Submit design calculations.
- C. Designer's Qualification Statement.
- D. Fabricator's Qualification Statement.
- E. Certificates:
 - 1. Complete and provide copy of certification "Truss Plant Certification Requirements Form" to Architect before bid.
 - 2. Provide attachment copy of truss plant certification with completed "Truss Plant Certification Requirements Form" to Architect and Testing Agency before commencing fabrication of Wood Trusses.
- F. Test And Evaluation Reports:
 - 1. Copies of previous four quarterly inspection reports verifying compliance with TPI regulations unless the Truss Fabricator provides proof that they are certified and in good standing with the In-Plant WTCA QC program certification.

1.05 QUALITY ASSURANCE

- A. Designer Qualifications: Perform design by or under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State in which the Project is located.
- B. Metal Connector-Plate Manufacturer Qualifications:
 - 1. Member of TPI and complies with quality-control procedures in TPI 1 for manufacturer of connector plates.

- a. Fabricator's responsibility includes providing professional engineering services needed to assume engineering responsibility.
 - b. Engineering responsibility: Preparation of shop drawings and comprehensive engineering analysis by qualified professional engineer registered in location of jurisdiction.
- C. Fabricator Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
- 1. Fabricator must have a letter providing evidence that they are certified and in good standing with their third-party accredited Quality Assurance business.
 - 2. Fabricator shall have in place a program requiring fabrication plant to be inspected four times each year by an independent testing laboratory in accordance with TPI regulations.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Handle and erect trusses in accordance with TPI BCSI 1.
- B. Store trusses in vertical position resting on bearing ends.
- C. Bracing of Metal Plate Connected Wood Trusses'.
 - 1. Trusses may be unloaded by dumping if trusses are shipped horizontally, are rolled off low profile roller bed trailer, and if no part of any truss is required to drop more than 18 inches (450 mm).
 - 2. After delivery of trusses:
 - a. Inspect for damage before installing trusses.
 - b. Inspect for "gaps" between framing members.
 - c. Discard and replace trusses that are damaged or defective.

PART 2 PRODUCTS

2.01 TRUSSES

- A. Performance:
 - 1. Design Criteria:
 - a. Top and Bottom Chords and Web Members:
 - 1) Designed in accordance with ANSI/TPI 1 for given design loads.
 - b. Metal Gusset Plates:
 - 1) Plate design and manufacture shall be as approved by 'The Research Committee for the ICC'.
 - 2) Truss plates for symmetrical trusses shall be same size on both sides of truss. Determine size to be used by highest loading value on either side of truss.

2.02 MATERIALS

- A. Lumber:
 - 1. Moisture Content: Between 7 and 9 percent.
 - 2. Lumber fabricated from old growth timber is not permitted.
- B. Metal Gusset Plates:
 - 1. Connector plates to comply with TPI 1 from hot-dip galvanized steel sheet complying with ASTM A653/A653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G60 coating designation; and not less than 0.036 inch (0.914 mm) thick.
 - a. Use for interior locations.
 - 2. Manufacturer's name or trademark shall be visible on plates.
 - 3. Approved Manufacturers. See Section 01 6200 for definitions of Categories:
 - a. Eagle Metal Products, Dallas, TX www.eaglemetal.com.
 - b. ITW Building Components Group, Glenview, IL www.itwbcg.com.
 - c. MiTek Industries, Inc.; a subsidiary of Berkshire Hathaway Inc. Chesterfield, MO www.mii.com or MiTek Canada, Bradford ON www.mii.com/canada.

- d. Simpson AS Truss Connector Plates; Simpson Strong-Tie Company Inc. Pleasanton, CA www.strongtie.com.
- C. Fabrication:
 - 1. General:
 - a. Fabrication of trusses shall be as approved by ICC except that this Specification shall govern when it exceeds ICC requirements.
 - b. Fabricate trusses from approved shop drawings.
 - c. Fabricate trusses in jigs with members accurately cut to provide good bearing at joints.
 - D. Joints shall be acceptable if the average opening between ends of members immediately after fabrication is less than 1/16 inch.
 - 1. Each chord section shall be involved in two (2) panel points before being spliced.
 - 2. Metal Gusset Plates:
 - a. No panel point shall have more than one (1) plate per truss side.
 - b. Plates shall have minimum bite of 2-1/2 inches on members. Measure bite along center line of webs and perpendicular to chord axes. Orient plate axis parallel with truss chord axis except where chords change pitch or terminate. Plates may be placed parallel with webs at single web joints.
 - 1) Minimum bite requirements are waived for non-structural webs parallel to top chords added for insulation backing and for other non-structural members.
 - 2) Minimum bite requirements are waived for truss blocking.
 - c. Plate Sizes:
 - 1) Minimum width of plates shall be 3 inches.
 - (a) Minimum bite requirements are waived for non-structural webs parallel to top chords added for insulation backing.
 - (b) Minimum width requirements are waived for truss blocking.
 - 2) For flat bottom chord trusses, size plates for 110 percent of member forces. For scissor trusses, size plates for 150 percent of member forces. If webs are double cut, plates are to be sized for additional 10 percent of the member forces.
 - 3) Size plates, nail and steel section for 110 percent of member forces.
 - 4) No increase in plate values will be allowed for duration of loading or other factors.
 - d. Press plates into members to obtain full penetration without crushing outer surface of wood. Plate embedment is acceptable if opening between plate and wood surface is less than 1/32 inch.
 - e. Lumber defects and plate misplacement, in combination, shall not reduce plate area or number of effective teeth, prongs, or nails by more than ten percent.
 - f. Do not apply metal gusset plates after shop fabrication.
 - E. Truss Bridging: Type, size and spacing recommended by truss manufacturer.

2.03 ACCESSORIES

- A. Wood Blocking, Bridging, Plates, and Miscellaneous Framing: As specified in Section 06 1000.

2.04 WOOD TREATMENT

- A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

- A. Coordinate placement of bearing items.

3.03 ERECTION

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

3.04 SITE APPLIED WOOD TREATMENT

- A. Treat all site-sawn cuts of pressure-treated wood using same type of treatment (i.e. preservative or fire-retardant).
- B. Apply preservative treatment to non-pressure-treated wood wherever it will come into contact with cementitious materials, roofing, asphaltic materials, or metals.
- C. Apply treatment in accordance with manufacturer's instructions.
- D. Allow field-applied treatment to dry prior to erecting members.

3.05 TOLERANCES

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

3.06 FIELD QUALITY CONTROL

- A. Field Tests And Inspections:
 - 1. Prefabricated Metal Plate Connected Wood Trusses:
 - a. Testing Agency will obtain "Truss Plant Certification Requirements Form" attachment copy from Architect as per requirements of Section 06 1753 - Shop-Fabricated Wood Trusses: Trusses Rafters.
 - b. Inspector shall verify that temporary installation restraint/bracing and permanent individual truss member restraint/bracing are installed in accordance with approved truss submittal package

3.07 ATTACHMENTS

- A. Truss Plant Certification Requirements Form

END OF SECTION

**SECTION 06 1753.01
TRUSS PLANT CERTIFICATION REQUIREMENTS FORM**

Metal Plate Connected Wood Truss suppliers shall be certified as evidenced by submittal of a copy of the truss plant certification with this completed form to the Architect and Testing Agency before commencing fabrication of Wood Trusses.

Metal Plate Connected (MPC) wood truss operations must design, manufacture and provide quality control and quality audits that comply with the latest edition of ANSI/TPI-1 promulgated by the Truss Plate Institute.

The truss plant must be certified by an independent third party accredited Quality Assurance business such as, but not limited to, the Truss Plate Institute (TPI); the Southern Pine Inspection Bureau, the Timber Products Inspection Bureau or the PFS Corp. The third party accredited Quality Assurance business must be under the auspices of the International Accreditation Services (IAS) or the American National Standards Institute (ANSI) and be ISO/IES Standard 17020 compliant. The inspection/audit process is to be completely independent of the truss manufacturer.

Truss plant shall fulfill the following requirements (see www.sbcindustry.com and www.tpinst.org or www.tpic.ca):

- Shall have an independent and accredited third party inspection agency (Quality Assurance business) staff member visit the truss plant for the certification, and shall have at least one inspection done quarterly by an independent third party inspection agency that is itself certified.
- Shall meet all necessary in-plant requirements including: The Acceptance Criteria for Quality Documentation (ICC AC-10) by the ICC Evaluation Service, Inc. which shall include the quality control requirements of the Product Standard of ANSI / TPI. Meeting the ANSI / TPI standard includes having an in-plant quality control manual, quality control procedures in place, and meeting the weekly inspection frequency.
- Do inspections at the required frequency and of the type established by the certification program. Specifically as a minimum, three trusses per set up location per shift per week.
- Not manufacture trusses or use components that do not comply with the requirements of this form and of the Contract Documents.
- Provide proof of compliance to the requirements of this form and provide the proof to the General Contractor who will forward it to the Architect prior to the truss plant providing a bid.

OR

Truss plant shall be certified and be in good standing with the In-Plant WTCA QC program. This includes the following requirements (see www.sbcindustry.com and www.tpinst.org or www.tpic.ca):

- Truss plant has been trained by SBCA on the ANSI/TPI 1 QC standard.
- Truss plant has quarterly third party inspections, and that the third party has been trained by SBCA.
- Truss plant has quality control manual that meets the AC-10 requirements.
- Truss plant has quality control procedures in place including: meeting the weekly inspection frequency, performing detailed inspections, and documenting any inspection problems and how they were resolved.
- Truss plant is sending their data quarterly to SBCA for review.
- Truss plant shall not manufacture trusses or use components that do not comply with the requirements of this form and of the Contract Documents.

In-Plant WTCA QC certified plants are listed at www.sbcindustry.com/wtcaqccertco.php.

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**SECTION 06 1800
GLUED-LAMINATED CONSTRUCTION**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Glue laminated wood beams and purlins.
- B. Preservative treatment of wood.
- C. Steel hardware and attachment brackets.

1.02 REFERENCE STANDARDS

- A. AITC 117 - Standard Specifications for Structural Glued Laminated Timber of Softwood Species 2010.
- B. AITC A190.1 - American National Standard for Wood Products - Structural Glued Laminated Timber 2007.
- C. ANSI A190.1 - Standard for Wood Products - Structural Glued Laminated Timber 2017.
- D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2014.
- E. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.
- F. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.
- G. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts 2015.
- H. ASTM A563M - Standard Specification for Carbon and Alloy Steel Nuts (Metric) 2007 (Reapproved 2013).
- I. ASTM D2559 - Standard Specification for Adhesives for Bonded Structural Wood Products for Use Under Exterior Exposure Conditions 2012a (Reapproved 2018).
- J. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength 2019.
- K. AWPA U1 - Use Category System: User Specification for Treated Wood 2018.
- L. AWS D1.1/D1.1M - Structural Welding Code - Steel 2020.
- M. RIS (GR) - Standard Specifications for Grades of California Redwood Lumber 2019.
- N. SPIB (GR) - Grading Rules 2014.
- O. WCLIB (GR) - Standard Grading Rules for West Coast Lumber No. 17 2018.
- P. WWPA G-5 - Western Lumber Grading Rules 2021.

1.03 SUBMITTALS

- A. Product Data: Provide technical data on wood preservative materials, application technique and resultant performance information.
- B. Shop Drawings: Indicate framing system, sizes and spacing of members, loads and cambers, bearing and anchor details, bridging and bracing, and framed openings.
 - 1. Submit design calculations signed and sealed by design engineer.
- C. Designer's Qualification Statement.
- D. Manufacturer's Qualification Statement.

1.04 QUALITY ASSURANCE

- A. Designer Qualifications: Design structural members under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.

- B. Manufacturer/Fabricator Qualifications: Company specializing in manufacture of glue laminated structural units with three years of documented experience, and certified by AITC in accordance with AITC A190.1.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect members to AITC requirements for individually wrapped.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Glued-Laminated Structural Units:
1. Approved Suppliers.
 - a. Builders First Choice, West Jordan, UT. www.BLDR.com. Contact Dan Egelund:
 - 1) Office: (801) 224-0541.
 - 2) Mobile: (801) 376-2385.
 - 3) E-Mail: Dan.Egelundr@bldr.com
 - b. J. M. Thomas Forest Products, Ogden, UT. www.thomasforest.com. Contact Tom Karren:
 - 1) Office: (800) 962-8780.
 - 2) FAX: 801-782-9652.
 - 3) E-Mail: tom@thomasforest.com.
 - c. Shelter Products, Inc., Portland, OR www.shelter-products.com. Contact Mike Running:
 - 1) Office: (800) 662-3612.
 - 2) Cell: NA.
 - 3) FAX: (503) 238-2663.
 - 4) E-Mail: mrunning@shelter-products.com.
 - d. Substitutions: See Section 01 6000 - Product Requirements.

2.02 GLUED-LAMINATED UNITS

- A. Glued-Laminated Units: Fabricate in accordance with AITC 117 Industrial grade.
1. Verify dimensions and site conditions prior to fabrication.
 2. Cut and fit members accurately to length to achieve tight joint fit.
 3. Fabricate member with camber built in.
 4. Do not splice or join members in locations other than those indicated without permission.
 5. Fabricate steel hardware and connections with joints neatly fitted, welded, and ground smooth.
 6. Welding: Perform welding in accordance with AWS D1.1/D1.1M.
 7. After end trimming, seal with penetrating sealer in accordance with AITC requirements.

2.03 MATERIALS

- A. Lumber: Softwood lumber complying with RIS (GR) grading rules with 12 percent maximum moisture content before fabrication. Design for the values noted on Contract Drawings.
- B. Steel Connections and Brackets: ASTM A36/A36M weldable quality, galvanize per ASTM A123/A123M.
- C. Anchor Bolts: ASTM F3125/F3125M, Type 1 heavy hex high strength bolts and ASTM A563 (ASTM A563M) nuts; hot-dip galvanized to meet requirements of ASTM A153/A153M, matching washers.
- D. Laminating Adhesive: Tested for wet/exterior service in accordance with ASTM D2559.
- E. Wood Sealer.
- F. Bearing Plate Anchors: Expansion shield and lag bolt type for anchorage to solid masonry or concrete.

2.04 WOOD TREATMENT

- A. Factory-Treated Lumber: Comply with requirements of AWPA U1 - Use Category System for pressure impregnated wood treatments determined by use categories, expected service conditions, and specific applications.
- B. Preservative Pressure Treatment:
 - 1. Preservative Pressure Treatment of Glued-Laminated Structural Units: AWPA U1, Use Category UC3B, Commodity Specification F using waterborne preservative to 0.25 lb/cu ft retention.
 - a. Kiln dry lumber after treatment and before lamination to maximum moisture content of 19 percent.
 - 2. Marking: Marked each piece with stamp of an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

2.05 FABRICATION

- A. Fabricate glue laminated structural members in accordance with AITC Industrial grade. At locations exposed in public areas: Architectural Grade.
- B. Fabricate beams in accordance with requirements of ANSI A190.1.
- C. Camber beams to radius of 2000 ft unless shown otherwise on Contract Drawings.
- D. Welding: Perform welding in accordance with AWS D1.1/D1.1M.
- E. Verify dimensions and site conditions prior to fabrication.
- F. Cut and fit members accurately to length to achieve tight joint fit.
- G. Fabricate member with camber built in.
- H. Do not splice or join members in locations other than those indicated without permission.
- I. Fabricate steel hardware and connections with joints neatly fitted, welded, and ground smooth.
- J. After end trimming, seal with penetrating sealer in accordance with AITC requirements.
- K. Field Finishing of Members: Specified in Section 09 9113 and 09 9123.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

- A. Coordinate placement of bearing items.

3.03 ERECTION

- A. Lift members using protective straps to prevent visible damage.
- B. Set structural members level and plumb, in correct positions or sloped where indicated.
- C. Provide temporary bracing and anchorage to hold members in place until permanently secured.
- D. Fit members together accurately without trimming, cutting, splicing, or other unauthorized modification.
- E. Swab and seal the interior wood surfaces of field drilled holes in members with primer.

END OF SECTION

**SECTION 06 4100
ARCHITECTURAL WOOD CASEWORK**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Specially fabricated cabinet units.
- B. Countertops.
- C. Hardware.
- D. Preparation for installing utilities.

1.02 REFERENCE STANDARDS

- A. ANSI/BHMA A156.11 - Cabinet Locks 2019.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2021a.
- C. ASTM E162 - Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source 2021.
- D. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards 2014, with Errata (2018).
- E. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards 2021, with Errata.
- F. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood 2016.
- G. KCMA A161.1 - Performance and Construction Standard for Kitchen and Vanity Cabinets 2017.
- H. NEMA LD 3 - High-Pressure Decorative Laminates 2005.
- I. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.
- J. WDMA I.S. 6A - Interior Architectural Wood Stile and Rail Doors 2013.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the efforts of the various trades affected by the Work of this Section.
 - 2. Coordinate completion of wall blocking for custom casework.
 - 3. Coordinate completion of custom casework.

1.04 SUBMITTALS

- A. Certificates:
 - 1. Provide Manufacturer's certification of compliance to ANSI/NEMA LD 3.
- B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
 - 1. Scale of Drawings: 1-1/2 inch to 1 foot, minimum.
 - a. Include plan and elevation views, materials used, standing and running trim profiles, assembly methods, joint details, fastening methods, accessories, and hardware.
 - 2. Provide the information required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).
 - 3. Fabricator First Submittal:
 - a. Provide 1/4 inch (or larger) scale building layout and/or description of required room walls required for field dimension for Field Quality Control Submittal. Provide submittal before rough framing is completed.
 - 4. Fabricator Second Submittal:
 - a. Provide shop drawings for cabinet and casework that are included for project showing details, casework locations and layout and required dimensions based on Field Quality Control Submittals for compliance to Contract Drawings for approval to Project Architect.
- C. Product Data: Provide data for hardware accessories.

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- D. Samples: Submit actual samples of architectural cabinet construction, minimum 12 inches square, illustrating proposed cabinet, countertop, and shelf unit substrate and finish.
- E. Samples: Submit actual sample items of proposed pulls, hinges, shelf standards, and locksets, demonstrating hardware design, quality, and finish.
 - 1. Before performing work of this Section, prepare Control Sample, to match sample available from Owner, to be used as finishing standard for interior clear finished hardwood as specified in Section 09 9324.
 - 2. Provide 8 inch by 10 inch (200 mm by 255 mm) sample(s) of Red Oak to match Owner provided stain color selected for Project.
 - 3. Control Sample will be used as performance standard for evaluating finish provided.
- F. Closeout Submittals:
 - 1. Record Documentation:
 - a. Manufacturer's literature for plastic laminate.
 - b. Color selections.

1.05 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Fire-Test-Response Characteristics: Provide plastic laminate with surface burning characteristics as determined by testing identical products by qualified testing agency.
 - a. Surface-Burning Characteristics:
 - 2. Plastic Laminate shall have Class A flame spread rating in accordance with ASTM E84 or UL 723 Type 1.
 - a. Class A (Flame spread index 0-25; Smoke-developed index 0-450).
 - b. Flash point: None.
- B. Mockups:
 - 1. Before fabrication of complete casework package, submit section or sections of cabinetry containing typical drawer, shelving, cabinet door panel, and hardware.
 - 2. Match Owner provided selected sample finish specified in Section 09 9324.
 - 3. Mockups may be installed in Project after approval.
- C. Approved Fabricators:
 - 1. Advanced Cabinets, 6860 South Cottonwood Street, Midvale, Utah 84047. Office 801.251.0155. Fax 801.812.8481. Email: office@advanced-cabinets.com.
 - a. Contact: Jason West, office manager, 385.228.0929, jasonw@advanced-cabinets.com.
 - 2. Anderson Cabinet and Millwork, 198 North 4700 East, Rigby, ID 83442.
 - a. Contact Information: Matt Miller phone (208) 538-7415 cell (208) 317-7412 e-mail matt@andersoncabinet.net.
 - 3. Michael Seiter & Co., Inc., P.O. Box 315 Heber City, UT 84032.
 - a. Contact Information: Mark Seiter phone (435) 654-0601 fax (435) 654-0613 e-mail mark@msandcoinc.com.
 - 4. Thompson and Sons Cabinets, 11834 N. 3400 West, Deweyville, UT 84309.
 - a. Contact Information: David Thompson cell (435) 230-0876 office (435) 257-7152 e-mail zcabinets@comcast.net.
 - 5. Interwest Wood Design, 728 Grangeville Salmon Rd, Grangeville, ID 83530.
 - a. Contact Information: Kirk, phone (208) 451-4076.
- D. Fabricator Qualifications
 - 1. Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
 - 2. Company with at least one project in the past 5 years with value of woodwork within 20 percent of cost of woodwork for this Project.
 - 3. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.
 - 4. Firm experience in supplying products indicated for this Project.

5. Firm with sufficient production capacity to produce required units.
6. Firm will comply with specifications and Contract Documents for this Project.
7. Minimum five (5) years experience in Woodwork installations.
8. Minimum five (5) satisfactorily completed installations in past three (3) years of projects similar in size, scope, and installation procedures required for this project before bidding.
9. Upon request by Architect or Owner, submit documentation.

1.06 MOCK-UP

- A. Provide mock-up of typical base cabinet, wall cabinet, and countertop, including hardware, finishes, and plumbing accessories.
- B. Mock-up may remain as part of the Work.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Protect units from moisture damage.
- B. Delivery And Acceptance Requirements:
 1. Fabricator Responsibility:
 - a. Assemble architectural woodwork at Architectural Woodwork Fabricator's plant and deliver ready for erection insofar as possible.
 - b. Protect architectural woodwork from moisture and damage while in transit to job site.
 2. General Contractor Responsibility:
 - a. Report damaged materials received within two (2) days from delivery at project site.
- C. Storage And Handling Requirements:
 1. General Contractor Responsibility:
 - a. Unload and store in place where it will be protected from moisture and damage and convenient to use.

1.08 WARRANTY

- A. Manufacturer Extended Warranty:
 1. Approved Fabricator's written guarantee that all Goods and Services will be free from defects in materials and workmanship for a period of five (5) years from date of substantial completion.

PART 2 PRODUCTS

2.01 DESIGN CRITERIA

- A. AWS Custom Grade is minimum acceptable standard, except where explicitly specified otherwise, for materials, construction, and installation of architectural woodwork.
- B. Materials:
 1. Use maximum lengths possible, but not required to exceed 10 feet without joints. No joints shall occur closer than 72 inches in straight runs exceeding 18 feet. Runs between 18 feet and 10 feet may have no more than one joint. No joints shall occur within 72 inches of outside corners nor within 18 inches of inside corners.
 2. Moisture content shall be six (6) percent maximum at fabrication. No opening of joints due to shrinkage is acceptable.

2.02 CABINET COMPONENTS

- A. Laminate Materials:
 1. Regulatory Agency Sustainability Approvals:
 - a. Fire-Test-Response Characteristics: Provide plastic laminate with surface burning characteristics as determined by testing identical products by qualified testing agency.
 - 1) Surface-Burning Characteristics:
 - (a) Plastic Laminate shall have Class A flame spread rating in accordance with ASTM E84 or UL 723 Type 1.
 - (1) Class A (Flame spread index 0-25; Smoke-developed index 0-450).

- (2) Flash point: None.
- 2. Manufacturers:
 - a. Panolam Industries International, Inc; Nevamar Standard
HPL: www.panolam.com/#sle.
- 3. Approved Colors:
 - a. Nevamar Fossil Gray S-6031.
 - b. Equal as approved by the Architect prior to installation.
- B. General:
 - 1. Except as noted otherwise, fabricate the work of this section according to AWS - 'Custom Grade' is the minimum acceptable standard.
- C. Framed structure at foyer desk:
 - 1. Use lumber or other wood products that will be plumb and level without warping or causing any discrepancy in the substrate for the foyer desk.
- D. Panel Product for all cabinet bodies, shelves, panels, doors, and drawers:
 - 1. Plastic laminate panel product.
 - a. Use plastic laminate facing on panel product, except on following surfaces, where Kortron or Melamine shall be used.
 - 1) Cabinet interiors and shelving faces behind cabinet doors in all rooms.
 - 2) Cabinet interiors and shelving faces always open to view.
 - 3) Cabinet exteriors permanently concealed.
 - 4) Drawer sides, backs, bottoms, and subfronts.
 - 2. Hardwood veneer on foyer desk: Clear white maple to match wood doors in Section 08 1416.
 - 3. Glues and adhesives:
 - a. Glues and adhesives used in manufacture and fabrication of panel products shall be Type I or II.
 - b. Adhesives shall be spray grade, high heat resistant, neoprene contact adhesive.
 - 4. Cores:
 - a. Cabinet Doors: Medium density fiberboard (MDF) with minimum density of 48 lbs per cu ft.
 - b. All Other: Industrial grade particle board with minimum density of 45 lbs per cu ft.
 - 5. Facings:
 - a. Solid-colored plastic laminate.
 - b. All other facings shall be Melamine or Kortron.
 - 6. Edgings:
 - a. Hot-glued, 3 mm thick, PVC edge-banding.
 - b. Color shall match door, drawer, shelf, or panel material.

2.03 SOLID SURFACE

- A. Materials:
 - 1. Acrylic Solid Surface with Medium density fiberboard substrate covered with HPDL:
 - a. Approved Manufacturers. See Section 01 6000.
 - 1) Corian by DuPont Co, Wilmington, DE. Contact Steve Finch at (314) 941-5179 or email stephen.m.finch@dupont.com.
 - b. 1/2 inch thick 100 percent acrylic polymer.
 - c. Thicken front edge by bonding layers to achieve the thickness shown on the Construction Drawings.
 - d. Approved Colors:
 - 1) Horizontal surfaces: Clam Shell by Corian.
 - 2) Vertical surfaces (at foyer desk): Weathered Aggregate by Corian.
 - 3) Window stools: Rain Cloud by Corian.
 - 4) Equal as approved by the Architect prior to installation.
 - e. Verify colors with architect prior to ordering materials or fabrication.

2.04 HARDWARE AND ACCESSORIES

- A. Manufacturer Contact List for Accessories:
1. Accuride, Santa Fe Springs, CA www accuride.com.
 2. Anybumper, Amite, LA www Anybumper.com.
 3. Blum Inc, Stanley, NC www blum.com.
 4. CompX National, Mauldin, SC www nclnet.com.
 5. Flynn & Enslow, San Francisco, CA www flynnenslow.com.
 6. Glynn Johnson, Chicago, IL www glynn-johnson.com.
 7. Grass America Inc, Kernerville, NC www grassusa.com.
 8. Hafele America Co., Archdale, NC www hafele.com.
 9. Hillside Wire Cloth Co., Inc., Bloomfield, NJ www hillsidewirecloth.com.
 10. Ives, Indianapolis, IN www iveshardware.com.
 11. Knappe & Vogt, Grand Rapids, MI www knapeandvogt.com or Knappe & Vogt Canada, Mississauga, ON (905) 676-8972.
 12. Salice America Inc, Charlotte, NC www saliceamerica.com.
 13. Stanley, New Britain, CT www stanleyhardware.com.
 14. TWP Inc., Berkley, CA www twpinc.com.
 15. Wire Cloth Manufacturers, Inc., Mine Hill, NJ www wireclothman.com.
- B. Cabinet Hardware:
1. Cabinet And Drawer Pulls:
 - a. Satin Chromium Plated brass / bronze core bow handles, 4 inches (100 mm) long minimum.
 - b. Acceptable Products:
 - 1) 4484 by Stanley.
 2. Cabinet And Drawer Locks:
 - a. General:
 - 1) Pin tumbler type suitable for location.
 - 2) Keying:
 - (a) Key each cabinet and drawer alike.
 - 3) Provide six (6) keys per cabinet.
 - b. Design Criteria:
 - 1) Barrel diameter: 7/8 inch (22 mm).
 - 2) Cylinder length: 7/8 inch (22 mm).
 - 3) Key removable in locked or unlocked position.
 - 4) Meet ANSI/BHMA A156.11 Grade 2 requirements.
 - c. Acceptable Manufacturers:
 - 1) Advantage Plus cam lock by CompX National Lock.
 - 2) 100DR/200DW N Series door and drawer lock by Olympus Lock Inc.
 - 3) Equal as approved by Architect before installation. See Section 01 6200.
 3. Locker Door Locks:
 - a. General:
 - 1) Keyless, battery powered, electronic push button cabinet lock.
 - 2) 10 button numerical key pad.
 - 3) Programmable: 20 user codes including 19 user and 1 supervisor.
 - 4) External battery access.
 - b. Mounting:
 - 1) Recessed mount.
 - 2) Vertical, knob down, vertical keypad layout.
 - c. Finish: Matt Black.
 - d. Acceptable Manufacturers:
 - 1) Pearl by CompX National Lock.
 - 2) Equal as approved by Architect before installation. See Section 01 6200.

4. Cabinet Adjustable Shelf Supports:
 - a. Either of following systems are acceptable, at Fabricator's option:
 - 1) 32mm System: Casework Fabricator's standard.
 - 2) Traditional System:
 - (a) Quality Standards: 255 and 256 by Knappe & Vogt.
 5. Cabinet Hinges:
 - a. Description:
 - 1) Cup Hinge (Concealed Hinge or European style).
 - 2) Steel, nickel-plated, full overlay, self closing with dowel, Mod 17.
 - 3) Hydraulic soft closing.
 - b. Design Criteria:
 - 1) Doors 48 inches (1 200 mm) High or Less:
 - (a) Two (2) hinges.
 - (b) Hinge Opening: 165 degree minimum.
 - 2) Doors over 48 inches (1 200 mm) High:
 - (a) Four (4) hinges.
 - (b) Hinge Opening: 165 degree minimum.
 - c. Basis of Design: Model 329.03.558 with Model 329.73.510 mounting plate by Hafele, with hydraulic soft closing:
 - 1) Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories:
 - (a) Blum.
 - (b) Grass America.
 - (c) Hafele.
 - (d) Knappe & Vogt.
 - (e) Salice.
 - (f) Cabinet Inactive Leaf Catches:
 - d. Class Two Quality Standards:
 - 1) Full-Height Doors: Two Surface Bolts No 043 - 2 inch (50 mm) by Ives.
 - 2) All Other Doors: Elbow Catch No 2 by Ives.
 6. Drawer Guides:
 - a. Pencil Drawers:
 - 1) Steel ball bearings, 45 lb (20 kg) load rating minimum.
 - 2) Hydraulic soft closing.
 - 3) 3/4 extension, top mounting.
 - 4) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (a) Series 2006 by Accuride with hydraulic soft closing.
 - (b) Article 422.14.345 by Hafele with hydraulic soft closing.
 - (c) Series KV8200 by Knappe & Vogt with hydraulic soft closing.
 - b. Standard Drawers:
 - 1) Full extension, steel ball bearings, 100 lb (45 kg) load rating.
 - 2) Hydraulic soft closing.
 - 3) Category Four Approved Products. See Section 01 6200 for definitions of
 - 4) Categories:
 - (a) Series 3832-Classic by Accuride with hydraulic soft closing.
 - (b) Article 422.04.552 by Hafele with hydraulic soft closing.
 - (c) Series KV8400 by Knappe & Vogt with hydraulic soft closing.
- C. Cabinet Door Bumpers:
1. Description:
 - a. Polyurethane bumper to protect gypsum board from cabinet handle damage where cabinet handles hit gypsum wallboard surface.
 2. Design Criteria:

- a. Clear.
- b. Peel adhesion.
- c. Size: 3/8 inch (9.5 mm diameter x 1/8 inch (3 mm) thick.
3. Acceptable Products:
 - a. WS-34 Cylindrical Soft Durometer Cabinet Bumper by Anybumper.

PART 3 EXECUTION

3.01 FABRICATION

- A. Fabricators:
 1. Approved Fabricators. See Section 06 4001 for Category Three Approved Fabricators.
- B. Casework Construction Type:
 1. Type B: Face-frame construction where front edge of cabinet body components are overlaid with frame.
 2. If used, install Rail System adjustable shelf supports recessed.
- C. Door interface style:
 1. Type B Construction: Flush Overlay.
- D. Drawers:
 1. Fabricate with separate, screw-attached drawer front.
 2. Joints shall be dowel and pressure-glued, or lock shoulder, glued, and pin nailed.
 3. Set bottoms into sides, backs, and subfront with 1/4 inch (6 mm) deep groove with 3/8 inch (9.5 mm) minimum standing shoulder.
 4. Every drawer shall have specified drawer guides and pull installed. Install drawer guides with 'Euroscrows', and pulls with through-bolts passing through both front and sub-front.
- E. Cabinet Doors:
 1. Full height, panel product cabinet doors may be fabricated in two pieces and joined on back with metal backplate. Backplate shall match interior door surface color.
 2. Hinges: Install hinges using plastic insertion dowels for hinges and 'Euroscrows' for baseplates.
 3. Every cabinet door shall have specified pull installed.
- F. Cabinet Component Material Thickness:
 1. Ends, Divisions, Bottoms, Tops: 3/4 inch (19 mm) thick panel product.
 2. Rails: 3/4 inch (19 mm) thick panel product.
 3. Shelves:
 - a. Panel product.
 - b. Thickness:
 - 1) 30 Inch (750 mm) Span And Less: 3/4 inch (19 mm) thick.
 - 2) Spans Over 30 Inches (750 mm) To 42 Inches (1 050 mm): One inch (25 mm) thick.
 - 3) Spans Over 42 inches (1 050 mm): One inch (25 mm) thick and provide Hafele or equal center supports.
 4. Backs: 1/4 inch (6 mm) thick panel product.
 5. Doors: 3/4 inch (19 mm) thick panel product.
 6. Drawer Sides, Backs, And Subfronts: 1/2 inch (12.7 mm) thick minimum panel product.
 7. Drawer Bottoms: 1/4 inch (6 mm) thick panel product.
 8. Separate Drawer Front: 3/4 inch (19 mm) panel product.
 9. Hardboard Dividers: 1/4 inch (6 mm) thick panel product.
 10. Hardboard Shelves: 1/8 inch (3 mm) thick hardboard, smooth both sides.
- G. Cabinet and Drawer Locks:
 1. Install only on cabinets and drawers as shown on Contract Documents.
- H. Locker Door Locks:
 1. Install one recessed lock on each locker door.

- I. Install plastic grommets in cable access holes in countertops located as located on Contract Documents.
- J. Fabrication:
 - 1. Follow Architectural Woodwork Standards (AWS) for fabrication of Architectural Woodwork.
 - 2. Tolerances:
 - a. Maximum Gap: None allowed.
 - b. Flushness Variation: 0.015 inch maximum.
 - c. Plug screw holes. Screw locations shall not be visible beyond 18 inches.
 - 3. Fabricate work in accordance with measurements taken on job site.
 - 4. 'Ease' sharp corners and edges of exposed members. Radius of 'easing' shall be uniform throughout Project and between 1/32 and 1/16 of an inch.
 - 5. Install hardware in accordance with Manufacturer's directions. Leave operating hardware operating smoothly and quietly.
 - 6. Remove or repair damaged surface of or defects in exposed finished surfaces of architectural woodwork to match adjacent similar undamaged surface.

3.02 EXAMINATION

- A. Verify adequacy of backing and support framing.
- B. Verify location and sizes of utility rough-in associated with work of this section.
- C. Clear Finished Hardwood: Color matches Owner provided sample specified in Section 09 9324.

3.03 INSTALLATION

- A. Install work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.
- B. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.
- C. Use fixture attachments in concealed locations for wall mounted components.
- D. Use concealed joint fasteners to align and secure adjoining cabinet units.
- E. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.
- F. Secure cabinets to floor using appropriate angles and anchorages.
- G. Countersink anchorage devices at exposed locations. Conceal with plugs of material to match surrounding panel product; finish flush with surrounding surfaces.
- H. Site glaze glass materials using the Interior Dry method specified in Section 08 8000.

3.04 ADJUSTING

- A. Adjust installed work.
- B. Adjust moving or operating parts to function smoothly and correctly.

3.05 CLEANING

- A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION

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**SECTION 07 1113
BITUMINOUS DAMPPROOFING**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Bituminous dampproofing.

1.02 SUBMITTALS

- A. Product Data: Provide properties of primer, bitumen, and mastics.
- B. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.03 FIELD CONDITIONS

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

PART 2 PRODUCTS**2.01 BITUMINOUS DAMPPROOFING**

- A. Acceptable Products:
 1. Ecomul-11 by Epro Waterproofing Systems, Derby, KS www.eproserv.com.
 2. Henry 788 by Henry Company, El Segundo, CA www.henry.com.
 3. Karnak 100 by Karnak Chemical Corp, Clark, NJ www.karnakcorp.com.
 4. Sealmatic Asphalt Emulsion Dampproofing Type I by W R Meadows, Hampshire, IL www.wrmeadows.com.

PART 3 EXECUTION**3.01 EXAMINATION**

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

3.02 PREPARATION

- A. Protect adjacent surfaces not designated to receive dampproofing.
- B. Clean and prepare surfaces to receive dampproofing in accordance with manufacturer's instructions.
- C. Do not apply dampproofing to surfaces unacceptable to manufacturer.
- D. Apply mastic to seal penetrations, small cracks, or minor honeycombs in substrate.

3.03 APPLICATION

- A. Spray Application:
 1. Spray to a thickness of 10 mils (0.254 mm) minimum.
- B. Brush / Roller Application:
 1. Apply two coats of dampproofing at rate recommended by Manufacturer.
 2. Apply coats in cross hatch method so coats are applied perpendicular to each other.
 3. Before applying second coat allow first coat to dry in accordance with Manufacturer's recommendations.
- C. Prime surfaces in accordance with manufacturer's instructions.
- D. On all exterior surfaces of perimeter building foundation walls, apply from 6 inches below finish grade elevation down to and including the top of footings.
- E. Seal items watertight with mastic, that project through dampproofing surface.
- F. Do not backfill against bituminous dampproofing for twenty-four (24) hours after application.

END OF SECTION

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**SECTION 07 2100
THERMAL INSULATION**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Board insulation.
- B. Batt insulation.
- C. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

1.02 RELATED REQUIREMENTS

- A. Section 07 2500 - Weather Barriers: Separate air barrier and vapor retarder materials.

1.03 REFERENCE STANDARDS

- A. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation 2019.
- B. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing 2017.
- C. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board 2019.
- D. ASTM C764 - Standard Specification for Mineral Fiber Loose-Fill Thermal Insulation 2019.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2020.
- F. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C 2019a.

1.04 SUBMITTALS

- A. Product Data: Provide data on product characteristics, performance criteria, and product limitations.
- B. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

1.05 QUALITY ASSURANCE

- A. Pre-Installation Conferences:
 - 1. Participate in pre-installation conference as specified in Section 01 3100:
 - a. Schedule pre-installation conference prior to commencement of installing insulation with Installer and Manufacturer's Representative if available.
 - b. In addition to agenda items specified in Section 01 3100, review following:
 - 1) Review installation procedures.
 - 2) Review coordination of work with related and adjacent work.
 - 3) Review special details and flashing.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Thermal Insulation Manufacturers:
 - 1. Certainteed Corp, Valley Forge, PA www.certainteed.com.
 - 2. FiberTEK, Salt Lake City, UT www.fibertekinsulation.com.
 - 3. Guardian Fiberglass, Greer, SC www.guardianbp.com.
 - 4. Johns Manville, Denver, CO www.jm.com.
 - 5. Knauf Fiber Glass, Shelbyville, IN www.knaufusa.com.
 - 6. Owens-Corning Fiberglass Corporation, Toledo, OH www.owens-corning.com.
 - 7. Thermafiber, Wabash, IL www.thermafiber.com.

2.02 FOAM BOARD INSULATION MATERIALS

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- A. Below grade at interior side of perimeter building foundation walls:
 - 1. Extruded Polystyrene (XPS) Board Insulation: Complies with ASTM C578 with either natural skin or cut cell surfaces.
 - a. Type and Compressive Resistance: Type X, 15 psi (104 kPa), minimum.
 - b. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
 - c. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
- B. Above grade on exterior building walls:
 - 1. Extruded Polystyrene (XPS) Board Insulation: Complies with ASTM C578 with either natural skin or cut cell surfaces.
 - a. Type and Compressive Resistance: Type X, 15 psi (104 kPa), minimum.
 - b. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
 - c. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.

2.03 BATT INSULATION MATERIALS

- A. Order insulation by 'R' value rather than 'U' value, rating, or thickness, either 16 or 24 inches wide according to framing spacing.
- B. Where batt insulation is indicated, either glass fiber or mineral fiber batt insulation may be used, at Contractor's option.
- C. Glass Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C665; friction fit.
 - 1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
 - 2. Smoke Developed Index: 50 or less, when tested in accordance with ASTM E84.
 - 3. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
 - 4. Thermal Resistance: R-value in accordance with the following:
 - a. Acoustically Insulated Ceilings:
 - 1) Enclosed Spaces: Fill framed cavity with batts of appropriate thickness.
 - 2) Unenclosed Spaces above ceilings: R-30.
 - b. Thermally Insulated Roof:
 - 1) R-25 in 7-1/4 inches deep top chord.
 - 2) Refer to Drawings for required thicknesses.
 - c. Cavities and Voids Filled with Insulation to Remove Requirement for Fire Sprinklers:
 - 1) Fill framed cavity with unfaced batts of appropriate thickness.
 - d. Wood Wall Stud Framing:
 - 1) (R-11) 3-1/2 inches deep
 - 2) (R-19) 5-1/2 inches deep
 - 3) (R-25) 7-1/4 inches deep
 - 4) (R-30) 9-1/4 inches deep
 - 5) (R-38) 11-1/4 inches deep
 - e. Structural Composite Lumber (SCL) Wall Framing:
 - 1) (R-11) 3-1/2 inches deep
 - 2) (R-19) 5-1/2 inches deep
 - 3) (R-25) 7-1/4 inches deep
 - 4) (R-30) 9-1/2 inches deep
 - 5) (R-38) 11-7/8 inches deep
 - 5. Unfaced Insulation: Meet requirements of ASTM C665, Type I.
 - 6. Support at trussed rafters:
 - a. Provide support at trussed rafters where insulation is not enclosed by structure or drywall.

- b. Provide wires which run perpendicular to framing and attach at each trussed rafter and to framing at 32 inches on center minimum and where batt ends adjoin each other. Install wires after installation of sheet vapor retarder.

2.04 ACCESSORIES

- A. Sheet Vapor Retarder: Specified in Section 07 2500.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.
- B. Verification Of Conditions:
 - 1. Inspection:
 - a. Examine substrate and verify framing is suitable for installation of insulation:
 - b. Verify that mechanical and electrical services have been installed and tested.
 - c. Notify Architect of unsuitable conditions in writing.
 - d. Do not install insulation over unsuitable conditions:
 - 1) Commencement of Work by installer is considered acceptance of substrate.

3.02 BOARD INSTALLATION AT FOUNDATION PERIMETER (BELOW GRADE)

- A. Remove ties and concrete protrusions that would keep insulation from fully contacting foundation wall face.
- B. Install against interior side of perimeter foundation downward from top of slab 48 inches or to top of footing, whichever is less. Install using 3/8 inch beads of adhesive at 12 inches on center vertically and at each vertical and horizontal joint to completely seal insulation.

3.03 BOARD INSTALLATION AT EXTERIOR WALLS (ABOVE GRADE)

- A. Follow Manufacturer Installation Instructions including the following:
 - 1. Butt adjoining boards tightly together with all seams vertical.
 - 2. Tape seams with Manufacturer's white foil tape to cover joints and seams between boards of insulation. Match tape color to board color.
 - 3. Notch around wall members and other obstructions as closely as possible and seal with sealant.
- B. Rigid thermal insulation board is not a structural panel and may not be used as nailing base for other building products.

3.04 BATT INSTALLATION

- A. Install insulation and vapor retarder in accordance with manufacturer's instructions and the Drawings.
- B. Provide minimum clearance around recessed lighting fixtures as approved by local code.
- C. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.
- D. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
- E. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.
- F. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.
- G. Tape seal tears or cuts in vapor retarder.
- H. Extend vapor retarder tightly to full perimeter of adjacent window and door frames and other items interrupting the plane of the membrane. Tape seal in place.
- I. Coordinate work of this section with requirements for vapor retarder specified in Section 07 2500.
- J. Coordinate work of this section with construction of air barrier seal specified in Section 07 2500.

- K. Where insulation is not enclosed by structure or drywall, support in place with wire or other suitable material as approved by Architect before bid.
- L. Install tightly-packed batt insulation in hollow metal door frames. Allow space for gypsum board to be installed at the door frames.

3.05 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Field Tests And Inspections:
 - 1. Upon completion of installation, visually inspect each insulated area and verify that all insulation is complete and properly installed.
- C. Non-Conforming Work: Non-conforming work as covered in the General Conditions applies, but is not limited to the following:
 - 1. Correct any work found not complying with contract document requirements at no additional cost to the Owner.

3.06 PROTECTION

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

END OF SECTION

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**SECTION 07 2500
WEATHER BARRIERS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Vapor Retarders: Materials to make exterior walls, joints between exterior walls and roof, joints around frames of openings in exterior walls vapor resistant and air tight.

1.02 SUBMITTALS

- A. Product Data: Provide data on material characteristics and performance criteria.
- B. Manufacturer's Installation Instructions: Indicate preparation, installation methods, and storage and handling criteria.
- C. ABAA Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.

1.03 QUALITY ASSURANCE

- A. Air Barrier Association of America (ABAA) Evaluated Materials Program (EAP); www.airbarrier.org/#sle: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture, and use secondary materials approved in writing by primary material manufacturer.

1.04 FIELD CONDITIONS

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

PART 2 PRODUCTS

2.01 MATERIALS

- A. Air Barrier / Weather-resistive Barrier sheet (exterior side of exterior walls):
1. Water-vapor permeable.
 2. Non-woven.
 3. Meet requirements of ASTM E1677, Type I.
 4. Approved Products. See Section 01 6000:
 - a. Tyvek HomeWrap by DuPont Company, Wilmington, DE www.dupont.com
 - b. Typar Buildingwrap by Fiberweb, Old Hickory, TN www.typar.com.
 - c. Equal as approved by the Architect prior to bidding.
 5. Accessories:
 - a. Lap Sealant:
 - 1) As approved by Manufacturer before use. See Section 01 6200.
 - b. Sealing Tape:
 - 1) Acceptable Products:
 - (a) DuPont Contractor Tape.
 - (b) Typar Construction Tape.
 - (c) 3M Contractor Sheathing Tape.
 - (d) As recommended in writing by Weather-resistive Barrier Manufacturer.
 - c. Fasteners:
 - 1) Approved Products.
 - (a) Metal Framing: Corrosion resistant, self-tapping screws and plastic washers or Tyvek Wrap Caps. Screws to be 3/4 inch (19 mm) long minimum and washers one inch (25 mm) diameter.
 - (b) Wood Framing: Corrosion resistant roofing nails with 3/4 inch (19 mm) long shank minimum and one inch (25 mm) diameter plastic head or Tyvek Wrap Caps. Staples are only allowed to aid in installation with permanent fasteners installed immediately thereafter.
- B. Vapor Retarder sheet (interior side of exterior walls and underside of roof structure):

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1. 2 mil thick polyamide film vapor retarder meeting requirements of ASTM C665 and water-vapor permeance of ASTM E96/E96M.
2. Used with unfaced, vapor permeable mass insulation in wall and ceiling cavities.
3. Physical / Chemical Properties:
 - a. Water Vapor Permeance:
 - 1) Equal to or less than 1.0 perm as per ASTM E96/E96M desiccant method, or dry cup method and increases to greater than 10.0 perms using wet cup method as per ASTM E96/E96M.
 - b. Fungi Resistance:
 - 1) No growth as per ASTM C1338.
 - c. Corrosivity:
 - 1) No unusual aspect of corrosion such as pitting, cracking and adhesive cure inhibition as per ASTM C665).
4. Fire Hazard Classification:
 - a. Material surface burning characteristics shall have flame spread rating in accordance with ASTM E84:
 - 1) Flame spread index 20.
 - 2) Smoke-developed index 55.
5. Approved Products. See Section 01 6000:
 - a. Certainteed MemBrain, The SMART Vapor Retarder.
6. Accessories:
 - a. Lap Sealant:
 - 1) Acceptable Products:
 - (a) Tremco, Tremflex 834, siliconized acrylic latex sealant shall be used as specified caulking sealant conforming to ASTM C834 or equivalent acoustical or silicone-based sealants conforming to ASTM C920 or ASTM C834 shall be used.
 - (b) Equal as approved by Manufacturer before use. See Section 01 6200.
 - b. Sealing Tape:
 - 1) Acceptable Products:
 - (a) As approved by Manufacturer before use. See Section 01 6200.
 - c. Window/Door Openings:
 - 1) Sealant:
 - 2) Acceptable Products:
 - (a) As approved by Manufacturer before use. See Section 01 6200.
 - d. Fasteners:
 - 1) As approved by Manufacturer before use. See Section 01 6200.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces and conditions are ready to accept the work of this section.

3.02 PREPARATION

- A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.
- B. Clean and prime substrate surfaces to receive adhesives in accordance with manufacturer's instructions.

3.03 INSTALLATION

- A. Install materials in accordance with manufacturer's instructions.
- B. Do not use damaged or deteriorated materials.
- C. Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.

- D. Apply sealants and adhesives within recommended application temperature ranges. Consult manufacturer if temperature is out of this range.
- E. Weather-resistive Barrier (exterior side of exterior walls):
1. General Installation:
 - a. Install sheets shingle-fashion to shed water, with seams generally horizontal.
 - b. Overlap seams as recommended by manufacturer but at least 6 inches.
 - c. Overlap at outside and inside corners as recommended by manufacturer but at least 12 inches.
 - d. Attach to framed construction with fasteners extending through sheathing into framing. Space fasteners at 12 to 18 inches on center along each framing member supporting sheathing.
 - e. Attach to masonry construction using mechanical fasteners spaced at 12 to 18 inches on center vertically and maximum 24 inches on center horizontally.
 - f. Seal seams, laps, penetrations, tears, and cuts with self-adhesive tape; use only large-headed, gasketed fasteners recommended by the manufacturer.
 - g. Install water-resistive barrier over jamb flashings.
 - h. Install air barrier and vapor retarder underneath the jamb flashings.
 - i. Install head flashings under weather barrier.
 - j. At openings to be filled with frames having nailing flanges, wrap excess sheet into opening; at head, seal sheet over flange and flashing.
 2. At Openings and Penetrations:
 - a. Install flashing over sills, covering entire sill frame member, extending at least 5 inches onto weather barrier and at least 6 inches up jambs; mechanically fasten stretched edges.
 - b. At openings to be filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches wide; do not seal sill flange.
 - c. At openings to be filled with non-flanged frames, seal weather barrier to each side of opening framing, using flashing at least 9 inches wide, covering entire depth of framing.
 - d. At head of openings, install flashing under weather barrier extending at least 2 inches beyond face of jambs; seal weather barrier to flashing.
 - e. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
 - f. Service and Other Penetrations: Form flashing around penetrating item and seal to weather barrier surface.
- F. Vapor Retarder (interior side of exterior walls and underside of roof structure):
1. Install vapor retarder over insulation.
 2. Roof/Attic/Ceiling Applications:
 - a. Staple to bottom of ceiling joists/chords as recommended by Manufacturer.
 - b. Seal retarder to interior and exterior wall top plates using recommended sealants.
 - c. Fasten retarder through sealant to plates as recommended by Manufacturer.
 - d. Allow retarder to overlap at corners as recommended by Manufacturer.
 3. Exterior Wall Applications:
 - a. Install wall application as recommended by Manufacturer.
 - b. Apply recommended sealant over ceiling overlapped retarder material at top plate, to frame around window and door rough openings and to bottom plate as recommended by Manufacturer to ensure an air-tight assembly.
 4. Acoustical and Sealant Application at Sheet Terminations:
 - a. Install sealants as recommended by Manufacturer to ensure an air-tight assembly.
 5. Lapped Joint Treatment:
 - a. Apply recommended sealant to wood stud surface.
 - b. Overlap as recommended by Manufacturer.

- c. Seal overlapped joint using recommended sheathing tape.
- d. All vertical and horizontal seams should be treated as described above.
- 6. Penetrations:
 - a. Building envelope penetrations include windows, doors, electrical outlets, gas lines, plumbing, HVAC, structural members, truss chords, etc:
 - 1) Cut and fit sheathing tightly around penetrations as recommended by Manufacturer.
 - 2) Seal retarder around all electrical, HVAC, structural, and plumbing penetrations with recommended sealants or sheathing tapes.
- 7. Window and Door Treatment:
 - a. Cut sheathing to fit rough opening as recommended by Manufacturer.
 - b. Apply recommended sealant between retarder and window frame.
 - c. Attach through sealant to window head, jambs and sill. Seal window to rough opening with recommended sealant.
 - d. Apply recommended sealant between interior finishing material and attached sheathing.
- 8. Sheet Tears and Holes:
 - a. Cover all tears and holes with recommended sheathing tape.
 - b. Treat large holes (greater than 1 inch (25 mm)) like large penetrations using square patch.
- 9. Electrical Outlets:
 - a. Wrap and seal electrical boxes using recommended sheathing tapes and sealants.
 - b. Airtight plastic boxes are recommended.
- 10. Plumbing Penetrations:
 - a. Secure plumbing lines to rigid mounting panel.
 - b. Seal penetrations using recommended sealants.
 - c. Attach sheathing to mounting panel using recommended sealants.
- 11. Air Barrier System Continuity:
 - a. Install as continuous interior air barrier system:
 - 1) Maintain air barrier system continuity at wall, ceiling, floor, and foundation intersections. Use recommended sealants. Seal between framing and retarder overlaps.
 - 2) Coordinate installation details with framing and insulation trade contractors.
- G. Fasteners:
 - 1. Fasteners as approved by Manufacturer:
 - a. Following recommendations for type, size, spacing and installation methods.
 - b. To resist wind forces, fasten to supporting structure and support by gypsum wallboard on one side and insulation on other.
- H. Seal penetrations through vapor retarder immediately before installation of gypsum board.

3.04 FIELD QUALITY CONTROL

- A. Install airtight and free from holes, tears, and punctures.
 - 1. Immediately before installation of gypsum board, inspect vapor retarder for holes, tears, and punctures and repair damaged areas.
 - 2. Immediately before completion of Project, inspect exposed vapor retarder for holes, tears, and punctures and repair damaged areas.
- B. Do not cover installed weather barriers until required inspections have been completed.
- C. Obtain approval of installation procedures by the weather barrier manufacturer based on a mock-up installed in place, prior to proceeding with remainder of installation.
- D. Take digital photographs of each portion of the installation prior to covering up.

3.05 PROTECTION

- A. Do not leave materials exposed to weather longer than recommended by manufacturer.

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END OF SECTION

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SECTION 07 4616
PREFINISHED EXTRUDED ALUMINUM CLADDING

PART 1 GENERAL**1.01 RELATED DOCUMENTS**

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

1.02 SUMMARY

- A. Section includes prefinished aluminum wall and soffit cladding.
- B. Related Requirements:
 1. Section 06 1000 "Rough Carpentry" for wood furring, grounds, nailers, and blocking.
 2. Section 06 2013 "Exterior Finish Carpentry" for exterior trim.
 3. Section 072500 "Weather Barriers" for weather-resistive barriers.

1.03 COORDINATION

- A. Coordinate cladding installation with flashings and other adjoining construction to ensure proper sequencing.

1.04 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference with the Architect prior to installation of any part of this system.

1.05 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Samples for Initial Selection: For aluminum wall and soffit cladding including related accessories.
 1. Submit samples of the full color line of each applicable product for color selection by the Architect.
- C. Samples for Verification:
 1. 24-inch long-by-actual-width Sample of cladding.
 2. 24-inch long-by-actual-width Samples of trim and accessories.

1.06 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of aluminum cladding.
- B. Research/Evaluation Reports: For each type of aluminum cladding required, from ICC-ES.
- C. Sample Warranty: For special warranty.

1.07 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of product, including related accessories, to include in maintenance manuals.

1.08 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Furnish full lengths of aluminum wall cladding including related accessories, in a quantity equal to 2 percent of amount installed.

1.09 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for fabrication and installation.
 1. Build mockups for wall cladding including accessories.
 - a. Size: 48 inches (1200 mm) long by 60 inches (1800 mm) high.

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- b. Include outside corner, inside corner, window opening, bottom trim, and interior soffit detailing.
- 2. Approved mockup may remain in place as part of the wall installation if appropriately installed.
- 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with labels intact until time of use.
- B. Store materials on elevated platforms, under cover, and in a dry location.

1.11 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace products that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including cracking, fading, and deforming.
 - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - c. Warpage or other out of plane distortion.
 - 2. Fading is defined as loss of color, after cleaning with product recommended by manufacturer, of more than 4 Hunter color-difference units as measured according to ASTM D2244.
 - 3. Warranty Period: 15 years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Source Limitations: Obtain products, including related accessories, from single source from single manufacturer.
- B. Approved manufacturer:
 - 1. Knotwood.
Regional distributor:
Parallel Rep. LLC
www.parallelrep.com
866.472.7255
Regional Contact
Hailey Poehlman
720.435.1099
Hpoehlman@parallelrep.com
 - 2. Equal as approved by the Architect prior to bidding.

2.02 ALUMINUM WALL CLADDING (INTERIOR AND EXTERIOR)

- A. Aluminum Wall Cladding: Formed and coated product complying with AAMA 1402.
- B. Approved product:
 - 1. Knotwood extruded aluminum cladding.
<https://knotwood.com/cladding/cladding-technical-information/>
 - 2. Equal as approved by the Architect prior to bidding.
 - 3. Material: Coil-coated aluminum sheet, ASTM B209 (ASTM B209M), alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.
 - a. Pattern:
 - 1) Exterior application: 6 inch exposure, oriented horizontally.
 - 2) Interior application above decorative soffits: 6 inch exposure, oriented horizontally.

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- b. Nominal Thickness: 0.071 inch (1.8 mm).
- c. Panel Depth: 5/8 inch (16mm).
- d. Joint Style: Reveal joint.
- e. Finish: Manufacturer's standard wood-grain powder coating.
 - 1) Colors: As selected by Architect from manufacturer's full range of colors.

2.03 ACCESSORIES

- A. Cladding Accessories, General: Provide starter strips, edge trim, outside and inside corner caps, end caps, and other items as recommended by cladding manufacturer for building configuration.
 - 1. Provide accessories made from same material as adjacent cladding unless otherwise indicated.
- B. Extruded Aluminum Accessories: Where aluminum accessories are indicated, provide accessories complying with AAMA 1402.
- C. Fasteners:
 - 1. For fastening to wood, use #10 diameter or larger fasteners of sufficient length to penetrate a minimum of 1 inch (25 mm) into substrate.
 - 2. For fastening to metal, use #10 diameter or larger fasteners of sufficient length to penetrate a minimum of 1/4 inch (6 mm), or three screw-threads, into substrate.
- D. Soffit ventilation: Soffits installed under this Section are all interior and do not require ventilation.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of aluminum wall and soffit cladding and related accessories.
 - 1. Shim walls as necessary to achieve required tolerances.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.

3.03 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.
 - 1. Center nails in elongated nailing slots without binding cladding to allow for thermal movement.
- B. Install aluminum wall and soffit cladding and related accessories according to AAMA 1402.
 - 1. Install without hat channels behind cladding.
 - 2. Install cladding with full reveal joints.
 - 3. Install the cladding system in the "top-down" method, beginning with starter trim and a full-height cladding board. If the bottom course is less than halfway exposed, cut the starter top course to maintain at least a three-inch exposure on the bottom course.
 - 4. Stagger vertical joints of each row. Locate joints over supports.
 - 5. Install fasteners at 32 inches (813 mm) on center and attach fasteners to structural supports. Install aligned, level, and plumb. All fasteners shall be concealed except as approved by the Architect.
 - 6. Install expansion control joints at intervals recommended by the manufacturer. Coordinate specific locations with the Architect prior to installation.
- C. Install joint sealants as specified in Section 079200 "Joint Sealants" and to produce a weathertight installation.

- D. Where aluminum cladding contacts dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as recommended by manufacturer for this purpose.

3.04 ADJUSTING AND CLEANING

- A. Remove damaged, improperly installed, or otherwise defective materials and replace with new materials complying with specified requirements.
- B. Clean finished surfaces according to manufacturer's written instructions and maintain in a clean condition during construction.

END OF SECTION

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SECTION 07 5423
THERMOPLASTIC POLYOLIFIN ROOFING (TPO)

PART 1 GENERAL**1.01 SUMMARY**

- A. Includes But Not Limited To:
1. Furnish and install roofing membrane with flashings and other components to comprise total roofing system as described in Contract Documents including:
 - a. Single-ply membrane.
- B. Related Requirements:
1. Section 06 0573.13: 'Preservative Wood Treatment' for preservative treatment roof related blocking and roof nailers.
 2. Section 06 1100: 'Wood Framing' for roof related blocking, nailing and sheathing.
 3. Section 06 2001: 'Common Finish Carpentry Requirements' for wood nailers, curbs and blocking.
 4. Section 07 6220: 'Stainless Steel Flashing And Trim' for metal work installation and requirements.
- C. Products Installed But Not Furnished Under This Section:
1. Sheet metal work including caps, sleeves, umbrella hoods, pipe enclosures boxes, strapping, and scuppers.

1.02 REFERENCES

- A. Association Publications:
1. American National Standards Institute / Single Ply Roofing Industry:
 - a. ANSI/SPRI ES-1 2003, 'Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems'.
 - b. ANSI/SPRI WD-1 'Wind Design Standard for Roofing Assemblies'.
 2. FM Global Resource Catalogue by FM Global, Norwood, MA www.fmglobal.com.
 - a. Approval Guide:
 - 1) Factory Mutual Standard 4470 - Approval Standard for Class 1 Roof Covers.
 - b. Property Loss Prevention Data Sheet 1-28, 'Wind Design' (latest edition).
 - c. Property Loss Prevention Data Sheet 1-29, 'Roof Deck Securement and Above-Deck Components' (latest edition).
 - d. Property Loss Prevention Data Sheet 1-49, 'Perimeter Flashing' (latest edition).
- B. Definitions:
1. Flame Spread Classification: Categories as per ASTM E84/UL 723 or ULC S102:
 - a. Class A: Highest fire-resistance rating for roofing as per ASTM E108. Indicated roofing can withstand severe exposure to fire exposure to fire originating from sources outside building.
 - b. Class B: Fire-resistance rating indicating roofing materials can withstand moderate exposure to fire originating from sources outside of building.
 - c. Class C: Fire-resistance rating indicating roofing materials can withstand light exposure to fire originating from sources outside of building.
- C. Reference Standards:
1. ASTM International:
 - a. ASTM C208-12(2017), 'Specification for Cellulosic Fiber Insulating Board'.
 - b. ASTM C564-14, 'Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings'.
 - c. ASTM C920-18, 'Standard Specification for Elastomeric Joint Sealants'.
 - d. ASTM C1289-18a, 'Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board'.

- e. ASTM C1303/C1303M-15, 'Standard Test Method for Predicting Long-Term Thermal Resistance of Closed-Cell Foam Insulation'.
- f. ASTM D6878/D6878M-17, 'Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing'.
- g. ASTM E84-18b, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
- h. ASTM E108-17, 'Standard Test Methods for Fire Tests of Roof Coverings'.
- 2. International Building Code (IBC) (2018 edition or latest edition adopted by AHJ):
 - a. Chapter 15, 'Roof Assemblies And Rooftop Structures':
 - 1) Section 1507, 'Requirements for Roof Coverings':
 - (a) 1507.13, 'Thermoplastic Single-ply Roofing'.
- 3. National Fire Protection Association:
 - a. NFPA 101: 'Life Safety Code' (2018 or most recent edition adopted by AHJ).
- 4. Underwriters Laboratories (UL):
 - a. UL 580: 'Tests for Uplift Resistance of Roof Assemblies' (5th Edition).
 - b. UL 723, 'Tests for Safety Test for Surface Burning Characteristics of Building Materials' (11th Edition).
 - c. UL 790, 'Standard Test Methods for Fire Tests of Roof Coverings' (8th Edition).
 - d. UL 2218, 'Standard for Impact Resistance of Prepared Roof Coverings Materials' (2nd Edition).

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conferences:
 - 1. Participate in MANDATORY pre-installation conference.
 - a. Roofing Membrane Manufacturer and Roofing Installer's foreman and those responsible for installation of roofing to be in attendance.
 - 2. Schedule meeting after installation of roof substrate but before installation of any roofing system component.
 - 3. In addition to agenda items specified in Section 01 3100, review following:
 - a. Review Manufacturer's written instructions.
 - b. Review if Project is in high wind area.
 - c. Review delivery, storage, and handling requirements.
 - d. Review ambient conditions requirements.
 - e. Review roofing installation requirements including flashing and penetrations.
 - f. Review roofing drainage requirements.
 - g. Review temporary protections for roofing system.
 - h. Review cleaning and disposal requirements.
 - i. Review Special Procedure Submittal for Warranty Information to be given to Manufacturer before Manufacture will issue Roof Warranty by Installer.
 - j. Review safety issues.
 - k. Review field inspections and non-conforming work requirements.
 - l. Review protection of membrane by other trades after installation of membrane.

1.04 SUBMITALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Manufacturer's literature or cut sheet for each element of system.
 - b. Manufacturer's preparation and installation instructions and recommendations.
 - 2. Shop Drawings:
 - a. Prepared by Roofing Installer and approved by Roofing Membrane Manufacturer and include following:
 - 1) Base flashings.
 - 2) Location and type of penetrations.
 - 3) Membrane terminations.

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- 4) Outline of roof and roof size.
- 5) Perimeter and penetration details.
- 6) Roof insulation:
 - (a) Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
 - (b) Tapered insulation, including slopes.
- 7) Special details and materials.
- b. Confirm that specified FM Class and UL Class assembly is appropriate for Project location.
3. Samples:
 - a. Manufacturer's 4 inch (100 mm) square minimum sample representing actual color, membrane and thickness.
- B. Informational Submittals:
 1. Certificates:
 - a. Installer's signed certificate stating roofing system complies with Contract Documents performance requirements and work only performed by trained and authorized personnel in those procedures.
 - b. Manufacturer signed certificate that roof system has been inspected by Technical Service Representative and stating no deviation from system specified or approved shop drawings without written approval by Owner Representative and Manufacture.
 2. Test And Evaluation Reports: Submit evidence that roof system has been tested and approved or listed as follows:
 - a. Submit evidence that roof system has been tested and approved or listed to meet Factory Mutual Research Corporation (FM) Classification required for this Project.
 - b. Submit evidence that roof system has been tested to meet UL Class requirement required for fire-resistance rating for this Project.
 3. Manufacturer Instructions:
 - a. Two (2) copies of Roofing Manufacturer's published instructions for Architect and maintain one (1) at job-site.
 4. Special Procedure Submittals:
 - a. Installer to fill out 'Roof Manufacturer' Installer Workmanship Warranty' and 'Manufacturer System Warranty' from information provided in the Attachment 'Roofing Manufacturer's Information For Architect' from Manufacturer and from Architect. Warranties are to be included in Closeout Submittals.
 5. Qualification Statement:
 - a. Roofing Membrane Manufacturer's certification of Installer.
- C. Closeout Submittals:
 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Warranty Documentation:
 - 1) Final, executed copy of 'Roofing Manufacturer System Warranty' including wind speed coverage and required Owner mandatory information.
 - 2) Final, executed copy of 'Roof Installer Workmanship Warranty' including required Owner mandatory information.
 - 3) Verify mandatory information as specified in Special Procedure Submittal has been included in Final Warranty.
 - b. Record Documentation:
 - 1) Manufacturers Documentation:
 - (a) Record Shop Drawings if requested. Record shop drawings shall be given shop drawing number by Roofing Manufacturer.
 - (b) Certificate: Manufacturer Inspection report by Technical Service Representative.
 - (c) Certificate: Installer statement of compliance for performance requirements.

- (d) Test And Evaluation Report: UL fire-resistance rating test report.
- (e) Test And Evaluation Report: Factory Mutual Research Classification approval.

1.05 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Requirements:
 - 1. Roof system will meet requirements of all federal, state, and local codes having jurisdiction (AHJ).
 - 2. Fire Characteristics Performance Requirement:
 - 3. Roof system will achieve UL Class A rating when tested in accordance with ASTM E108 or ULC 102:
 - a. Materials shall be identified with appropriate markings of applicable testing agency.
 - 4. Thermal Performance Requirement:
 - a. Roof system will achieve minimum R value not less than 30.
 - 5. Wind Criteria as per ASCE 7-10:
 - a. See Structural Sheets of the Construction Documents.
- B. Qualifications:
 - 1. Requirements of Section 01 4301 applies but not limited to the following:
 - a. Installers Qualifications:
 - 1) Provide documentation if requested by Architect:
 - (a) Roofing Installer shall be approved and authorized by Roofing System Manufacturer to install Manufacturer's product and eligible to receive Manufacturer's special warranty.
 - (b) Roofing Installer shall be able to document roofing membrane installation for five (5) year minimum.
 - (c) Roofing Installer must have current license for the city, county, and state where project is located.
 - (d) Roofing Installer must have license for specific type of roofing work to be performed.
 - (e) Roofing Installer's foreman shall be skilled in his trade and qualified to lay out and supervise the Work.
 - (f) Membrane and flashing installation shall be performed by personnel trained and authorized by Roofing Manufacturer.
 - (g) Welding equipment shall be provided by or approved by Roofing Manufacturer. Mechanics intending to use equipment shall have successfully completed training course provided by Manufacturer's Technical Representative before welding.
 - b. Manufacturer Qualifications:
 - 1) Manufacturer that is UL listed for membrane roofing system used for this Project.
 - 2) Manufacturer shall manufacture membrane material for five (5) consecutive years. (Manufacturing is defined as owning the means of production, controlling, and monitoring the daily production of the membrane).
 - (a) No product with documented failure will be allowed.
 - 3) Source Limitations:
 - (a) Provide roof components including roof insulation and fasteners for roofing system from same Manufacturer as membrane roofing or approved by Roofing Membrane Manufacturer.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Delivery And Acceptance Requirements:
 - 1. Make no deliveries to Project until installation is about to commence, or until approved storage area is provided.

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2. Deliver and maintain materials in Manufacturer's original, unopened containers or rolls, with labels intact and legible.
 3. Deliver materials in sufficient quantities to allow continuity of work.
 4. Remove any material not approved from job site.
- B. Storage And Handling Requirements:
1. General:
 - a. Follow Manufacturer's instructions and precautions for storage of materials.
 - b. Handle and store roofing materials and place equipment in manner to avoid permanent deflection of roof decking.
 - c. Material Safety Data Sheets (MSDS) must be on location always during transportation, storage and application of materials.
 2. Storage Requirements:
 - a. Protection:
 - 1) Protect roof materials from physical damage, moisture, soiling, and other sources in a clean, dry, protected location and with temperature range required by Manufacturer. Protect from direct sunlight.
 - 2) Provide continuous protection of materials against moisture absorption (Manufacturer's/Supplier's shrink wrap is not accepted waterproofing).
 - b. Roof Insulation:
 - 1) Comply with insulation Manufacturer's written instructions for handling, storing, and protection during installation.
 - c. Safety:
 - 1) Liquid materials such as solvents and adhesives shall be stored off site and installed away from open flames, sparks, and excessive heat.
 - 2) Site storage is acceptable if liquid materials are placed in a locked, sealed storage container.
 - 3) Situate equipment and materials to preclude danger, disturbance, or interference to public safety and traffic, and to not constitute fire hazard.
 - d. Temperature:
 - 1) Store Materials, except membranes, in dry place with temperatures between 60 deg F (15.5 deg C) and 80 deg F (26.6 deg C).
 - 2) Restore materials which can become colder than specified temperature to proper temperature before using.
 - e. Unacceptable Material:
 - 1) Remove from job site materials that are determined to be damaged by Architect or by Roofing Manufacturer and replace at no additional cost to Owner.
 - 2) Remove all wet and damaged materials from site.
 - 3) Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
 3. Handling Requirements:
 - a. Select and handle operating equipment so as not to damage existing construction or new roofing system, or to overload structural system.
 - b. Handle rolled goods so as to prevent damage to edge or ends.

1.07 FIELD CONDITIONS

- A. Ambient Conditions:
1. Temperature ranges shall be within tolerances allowed for material being used.
 - a. Roof surface shall be free of ponding water, ice, and snow.
 - b. Cold temperature:
 - 1) Follow Manufacturer's written instructions for cold temperature requirements before applying membrane adhesive:
 - (a) Follow specified precautions.
 - (b) Expose only enough adhesive to be used as directed by membrane manufacturer:

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- (c) Low VOC restrictions (if required by local AHJ): Temperatures to be 40 deg F (4 deg C) and rising before applying.
- c. Hot temperature:
 - 1) Do not expose membrane and accessories to constant temperature more than 180 deg F (82 deg C).
- 2. Proceed with roofing work when existing and forecasted weather conditions permit.

1.08 WARRANTY

- A. Manufacturer Warranty:
 - 1. Roofing Membrane Manufacturer's Special Warranty for:
 - a. Thirty (30) year no dollar limit (NDL) material and labor covering roofing system, including insulation, components of membrane roofing system, membrane degradation, and workmanship.
 - b. Accidental Puncture Warranty:
 - 1) Membrane Manufacturer's written Accidental Puncture Warranty for up to sixteen (16) hours of Labor to repair punctures after final inspection.
 - c. Warranty shall include wind speed coverage to 90 mph (145 kph).
 - B. Roof Installer Workmanship Warranty:
 - 1. Written five (5) year guarantee covering workmanship and repairs or replacement of work without cost to Owner, counter-signed by Installer and Contractor from date of installation.
 - a. Roof Installer Workmanship Warranty must include information required in Attachment 'Warranty Information'.

PART 2 PRODUCTS

2.01 ASSEMBLIES

- A. Manufacturer:
 - 1. Category Three Approved Manufacturers: See Section 01 6200 for definitions of Categories:
 - a. Carlisle SynTec Incorporated, Carlisle PA www.carlisle-syntec.com. (717) 245-7000:
 - 1) Contact Information (USA, Canada and Global):
 - (a) Primary Contact: Greg Petschke (Manager Strategic Accounts), office (800) 479-6832 cell (717) 215-2681 greg.petschke@carlisesyntec.com.
 - (b) Secondary Contact: Kristen Morrow (Strategic Accounts Coordinator), phone (717) 245-7289 kristen.morrow@carlisleccm.com.
 - (c) Secondary Contact: Horner & Associates (Utah, Idaho, Wyoming, and Montana): Tom (801) 842-8305 tom@hornerassocd7.com or Gary (801) 712-0326 gary@hornerassocd7.com.
 - b. Firestone Building Products Co., Indianapolis, IN www.firestonebpc.com.
 - 1) Contact Information (USA and Canada):
 - (a) Primary Contact: Ben Cummins - Strategic Account Executive, office (615) 937-4869 cell (317) 402-1334 cumminsbenjamin@qbsg.net.
 - (b) Secondary Contact: Commercial Building Solutions, Layton, Utah: Kelly Orchard, cell (801) 859-4134 kellyorchard@cbs-utah.com.
 - c. Versico Roofing Systems (Carlisle Construction Materials, Inc.), Carlisle PA www.versico.com (800) 992-7663:
 - 1) Contact Information (USA, Canada and Global):
 - (a) Primary Contact: Chris Shermach, Corporate Accounts Manager: phone (815) 341-3770 shermach@versico.com.
 - (b) Secondary Contact: Kris Carruthers, phone (717) 960-4013 kristine.carruthers@versico.com.
 - (c) Secondary Contact (Utah only): Dan Barker phone (801) 668-4960 division7specialties@msn.com or Justin Spencer phone (801) 458-7207 js_division7specialties@msn.com.
- B. Design Criteria:

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1. General:
 - a. Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction.
 - b. Membrane roofing and base flashings shall remain watertight.
 2. Drainage Requirement:
 - a. Roof system to provide positive drainage where all standing water dissipates within forty-eight (48) hours after precipitation ends.
 3. Material Compatibility:
 - a. Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane Roofing Membrane Manufacturer based on testing and field experience.
 4. Metal details, fabrication practices, and installation methods shall conform to applicable requirements of following:
 - a. Corner, perimeter, and field-of-roof uplift pressure.
 - b. Factory Mutual Loss Prevention Data Sheet 1-49, 'Perimeter Flashing'.
 - c. Sheet Metal and Air Conditioning Contractors National Association Inc, 5th edition.
- C. Components:
1. Membrane:
 - a. Description:
 - 1) Thermoplastic Polyolefin Sheet (TPO) meeting requirements of ASTM D6878/D6878M, internally fabric or scrim reinforced, uniform, and flexible.
 - 2) Adhered.
 - b. Thickness: **80 mil (2.03 mm)** minimum thickness by optimum width and length determined by job conditions.
 - c. Exposed Face Color: white.
 2. Insulation:
 - a. FM or UL approved.
 - b. Polyisocyanurate Foam Insulation Board:
 - 1) Meet requirements of ASTM C1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.
 - 2) Insulation boards shall be Factory Mutual approved for classification selected for project.
 - 3) Insulation panels directly under roofing membrane and roof system cover board shall not exceed **48 inches by 96 inches (1 200 mm by 2 400 mm)**.
 - 4) Insulation shall have minimum 'R' value of 30.
 - 5) Tapered Insulation:
 - (a) Provide factory-tapered insulation boards.
 - (b) Tapered layer shall slope at **1/4 in per ft (20 mm per meter)** minimum.
 - 6) Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system Manufacturer.
 3. Roof System Cover Board (Recovery/Hard Board) Over Insulation:
 - a. Non-Fire Rated:
 - 1) Minimum thickness shall be verified by the roofing system Manufacturer based upon Warranty term and Wind Warranty requirements, but shall not be less than what is noted in the paragraph below.
 - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (a) **5/8 inch** thick minimum Dens-Deck Prime Roof Board by G-P Gypsum.
 - (b) **5/8 inch** thick minimum Securock by USG.

2.02 ACCESSORIES

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- A. Adhesives, Sealants and Sealer:
1. General:
 - a. Weathersealing expansion, contraction, perimeter, and other movement joint sealant.
 - b. Supplied by Roofing Membrane Manufacture.
 - c. Meet uplift and VOC requirements required for Project for specific application method and in compliance with all local codes and restrictions provided by Roofing Membrane Manufacture.
 - d. As accepted by Roofing Manufacturer under specified warranty.
 2. Bonding Adhesive:
 - a. Approved by Roofing Membrane Manufacturer for specified roof system.
 3. Cut Edge Sealant:
 - a. TPO Based squeeze tube consistency by Roofing Membrane Manufacturer.
 4. Nite Seal:
 - a. Compatible with materials with which it is used.
 - b. Furnished by Roofing Membrane Manufacturer.
 5. Pourable Sealer:
 - a. Approved by Roofing Membrane Manufacturer for specified roof system.
 6. Adhesive for Anchoring to Roof Membrane: Compatible with roof membrane and approved by roof membrane manufacturer.
 7. Insulation Board Adhesive: Two-component, low-rise polyurethane foam adhesive used for adhering insulation to low slope roof deck materials.
- B. Auxiliary Materials:
1. Furnish and install all auxiliary materials as recommended by Roofing Membrane Manufacturer for intended use and compatible with membrane roofing materials and specified warranty.
- C. Flashing:
1. Thermoplastic Polyolefin Unreinforced TPO, 0.060 inch (1.52 mm) thick, of same color as sheet membrane.
 2. Preformed Pipe Sleeves – Factory prefabricated, 0.060 inch (1.52 mm) thick.
 3. Preformed Inside and Outside sheet flashings.
 4. Square Tube Pipe Boot:
 - a. Only to be used where other flashing options are not compatible.
 - b. Description:
 - 1) Square retrofit.
 - 2) Temperature range: -65 deg F (-55 deg C) to +270 deg F (132 deg C).
 - c. Type:
 - 1) Weather resistant.
 - 2) Roof adaptability.
 - 3) EPDM (Ethylene Propylene Diene Monomer).
 - 4) Color: Black.
 - 5) Sealing unit to roof shall be done in accordance with Pipe Boot Manufacturer's recommendations.
 - d. Type Two Acceptable Products:
 - 1) Master Flash by Aztec Washer Company, Inc., Poway, CA www.aztecwasher.com.
 - (a) Model RF101BP-SQ.
 - 2) Large Retrofit Flashing by Portals Plus, Bensenville, IL www.portalsplus.com.
 - (a) Model 11025 with 4 inches (100 mm) square Adapter.
 - (b) Provide necessary adapter rings including angle iron and square tube adapters.
 - (c) Hardware shall be stainless steel.
 - 3) Equal as approved by Architect before installation. See Section 01 6200.

- D. Surface Cleaner/ Primer:
 - 1. Approved by Roofing Membrane Manufacturer for specified roof system.
- E. Termination Bars:
 - 1. Flat extruded aluminum bar with spaced holes for termination attachment furnished by Membrane Manufacture.
 - 2. Extruded aluminum bar with sealant track with spaced holes for termination attachment furnished by Roofing Membrane Manufacturer.
- F. Termination Bar Fasteners:
 - 1. Threaded fasteners with expansion sleeve that provide easy future removal and reuse, furnished by Roofing Membrane Manufacturer.
- G. Vapor Retarder / Air Barrier / Self-adhering Underlayment:
 - 1. Compatible with adjacent roofing products, including insulation and membrane, as recommended by the roof membrane manufacturer.
 - 2. Install directly on the roof deck to dry-in the roof.
 - 3. May be exposed after dry-in for up to 90 days.
 - a. Approved Products:
 - 1) Carlisle and Versico: VapAirSeal 725TR air and vapor barrier and temporary roof.
 - 2) Firestone: V-Force vapor retarder membrane and temporary roof.
 - 3) Equal as approved by the Architect prior to bidding.
- H. Vent Pipe Extensions:
 - 1. Pipe – Schedule 40 PVC pipe of equivalent diameter to vent pipe.
 - 2. Connectors- Neoprene pipe sleeves with stainless steel drawbands, meeting requirements of ASTM C564.
- I. Walk Pads:
 - 1. Walkway Pads as furnished by Roofing Membrane Manufacturer.
- J. Water Cut Off Mastic:
 - 1. Approved by Roofing Membrane Manufacturer for specified roof system.
- K. Wood Nailers (if required):
 - 1. Treat wood nailers as per Section 06 0573.13 for preservative wood treatment and Section 06 0573.33 for fire-retardant wood treatment. Creosote or asphaltic-treated wood is not acceptable.
 - 2. Wood nailers shall conform to Factory Mutual's Loss Prevention Data Sheet 1-49.
 - 3. Wood shall have maximum moisture content of 19 percent by weight on dry weight basis.

PART 3 EXECUTION

3.01 INSTALLERS

- A. Category Three Manufacture's Approved Roofing Installers: See Section 01 4301:
 - 1. Carlisle SynTec:
 - a. Perkes Roofing.
 - 1) Mark Perkes: 801.430.4483.
mark@perkesroofing.com
 - b. All Weather WaterProofing.
 - 1) John Moon: 801.633.7509.
jmoon@allweatherwaterproofing.com
 - c. NorthFace Roofing.
 - 1) Craig Peters: 801.455.8492.
craig@northfaceroofs.com
 - d. Other installers trained and certified by Carlisle SynTec to properly install the single-ply membrane roof and conform with Carlisle SynTec 's warranty requirements.
 - 2. Firestone:

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- a. Capitol Roofing Roofing.
 - 1) Paul: 801.913.6091.
 - b. UTR
 - 1) 801.674.4447.
 - c. Advanced Roofing.
 - d. Other installers trained and certified by Firestone to properly install the single-ply membrane roof and conform with Firestone's warranty requirements.
3. Versico:
- a. Layton Roofing.
 - 1) Isaac Greenwood : 801-372-5920.
 - b. White Roofing.
 - 1) Shannon White: 801-376-1088.
 - c. Labrador Roofing.
 - 1) Paul Dallin: 801-458-5296.
 - d. WeatherTech Roofing.
 - 1) Barry Rudd: 801.979.0461.
 - e. Other installers trained and certified by Versico to properly install the single-ply membrane roof and conform with Versico's warranty requirements.

3.02 EXAMINATION

- A. Examination And Assessment:
1. Examine decks for adequacy before commencing work. Requirements shall include but not limited to the following:
 - a. Designed slope required for proper drainage.
 - b. Location of roof drains.
 - c. Moisture conditions that will adversely affect quality of work.
 - d. Other condition incompatible with good roofing practice.
 2. Notify Architect in writing of conditions with letter copy to Roofing Membrane Manufacturer that would limit guarantee on part of Manufacturer or applicator.

3.03 PREPARATION

- A. Protection Of In-Place Conditions:
1. Prevent interior leakage, materials falling into interior, and other such occurrences.
 2. Install temporary water cut-offs at completion of each day's work and completely remove upon resumption of work.
 3. Provide temporary walkways and work platforms as necessary to complete work under this Section with no damage to existing surfaces, surfaces exposed during work, and to new materials applied.
 4. Coordinate application of membrane to provide protection of underlying materials from wetting or other damage by the elements on a continuous basis.
 5. Sheet metal sleeves, caps, and enclosures shall be completely installed on daily basis.
 6. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.
 7. Remove and discard temporary seals before beginning work on adjoining roofing.
- B. Surface Preparation:
1. Surfaces to receive new materials shall be clean, smooth, dry (free of moisture), free of flaws, sharp edges, loose and foreign material, dirt, oil and grease.
 - a. Mechanically scrape exposed surfaces, if necessary to remove projections.
 2. Verify that surfaces receiving new materials have no defects or errors that would result in poor application or cause latent defects in workmanship.
 - a. Roofing shall not start until defects have been corrected.
 3. Coordinate application of membrane to provide protection of underlying materials from wetting or other damage by elements on continuous basis.

4. Provide temporary walkways and work platforms as necessary to complete work under this section with no damage to surfaces exposed during work.
5. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.
6. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast.
7. Reset or replace existing fasteners that are loose, deformed, damaged, or corroded.
8. Remove and discard temporary seals before beginning work on adjoining roofing.

3.04 INSTALLATION

- A. Interface With Other Work:
 1. Coordinate with Installers whose work penetrates roof deck or requires men and equipment to traverse roof deck.
- B. General:
 1. Installation shall be in conformance with latest edition of manufacturer's specification except where Contract Documents are more restrictive.
 2. Roof surfaces shall be free of water, ice and snow. Surfaces to receive insulation, membrane, or flashings shall be dry. Should surface moisture occur, provide equipment necessary to dry surface before application.
 3. Secure new and temporary construction, including equipment and accessories, so as to preclude wind blow-off and subsequent roof or equipment damage.
 4. Install only as much roofing as can be made weathertight each day, including flashing and detail work. Clean seams and heat-weld before leaving jobsite.
 5. Schedule and execute work without exposing interior building areas to effects of inclement weather. Protect existing building and its contents against all risks.
 6. Before and during application, remove dirt, debris, and dust from surfaces either by vacuuming, sweeping, blowing with compressed air, or similar methods.
 7. Report rooftop contamination that is anticipated or that is occurring to Roofing Manufacturer to determine corrective steps to be taken.
- C. Insulation:
 1. Install self-adhering underlayment / temporary roof to the wood deck to dry-in the roof.
 2. Position first layer of insulation board with tight joints and staggered edges.
 - a. Install additional layers of board insulation in offset pattern and as directed by Roofing Membrane Manufacturer.
 - b. Lay out tapered board to provide positive flow to roof drains as shown on Contract Drawings.
 - c. Fasten roof insulation assembly in pattern as directed by Roofing Membrane Manufacturer.
 - d. Mechanically attach first layer of insulation board to deck as directed by Roofing Membrane Manufacturer.
 - e. Moisture content of insulation shall not exceed 4 percent.
 3. Over dry polyisocyanurate insulation, install roof system cover board.
- D. Roof System Cover Board:
 1. Offset roof system cover board joints **24 inches (610 mm)** minimum from joints in underlying substrate or insulation.
 2. On metal or wood deck, secure roof system cover board using low profile attachment plates and fasteners spaced as required by Roofing Membrane Manufacturer's warranty requirements.
- E. Membrane:
 1. Inspection:
 - a. Inspect surface of insulation or substrate before installation of roof membrane.

- b. Substrate shall be clean, dry and smooth with no excessive surface roughness, contaminated surfaces or unsound surfaces such as broken, delaminated, or damaged insulation boards.
 - c. All sharp projections shall be removed by sweeping, blowing or vacuum cleaning.
 2. Adhesive:
 - a. Follow ambient conditions as specified in Part 1 of this specification.
 3. Placement and attachment:
 - a. Install accordingly to Manufacturer's written instructions.
 - b. Start installation of roofing membrane in presence of Roofing Membrane Manufacturer's technical personnel.
 - c. Accurately align roofing membrane and maintain uniform side and end laps of minimum dimensions required by Manufacturer. Stagger end laps.
 - d. Fold roofing membrane sheet back lengthwise (onto itself) so half underside of membrane is exposed.
 - e. Apply Bonding Adhesive as recommended by Manufacturer's written instructions, to exposed underside of roofing membrane and corresponding substrate area. Do not apply Bonding Adhesive along splice edge of roofing membrane to be hot air welded over adjoining sheet. Allow adhesive to dry until it is tacky but will not string or stick to dry finger touch.
 - 1) Roll coated roofing membrane into coated substrate while avoiding wrinkles. Brush down bonded section of roofing membrane sheet immediately after rolling roofing membrane into adhesive with soft bristle push broom to achieve maximum contact.
 - 2) Fold back unbonded half of sheet lengthwise and repeat bonding procedures.
 - f. Position adjoining sheets to allow minimum overlap of **2 inches (50 mm)**.
 - g. Hot air weld roofing membrane sheets using Automatic Hot Air Welding Machine or Hot Air Hand Welder as recommended by Manufacturer's hot air welding procedures.
 - h. Pull roofing membrane back along welded splice so entire underside of roofing membrane is exposed once Hot Air Weld has been completed.
 - i. Apply Bonding Adhesive to exposed underside of roofing membrane sheet and substrate.
 - j. Allow adhesive to dry until tacky and roll roofing membrane into substrate and brush down bonded section with bristle broom following procedure noted above.
 - k. Continue to install adjoining roofing membrane sheets in same manner, overlapping edges minimum of **2 inches (50 mm)** and complete bonding previous procedures.
 4. Seams:
 - a. Clean seam areas, overlap roofing membrane and hot-air weld side and end laps of roofing membrane and sheet flashings according to Manufacturer's written instructions to ensure watertight seam installation.
 5. Splicing / hot air welding procedures:
 - a. Hot air weld roofing membrane using an Automatic Hot Air Welding Machine or Hot Air Hand Welder as recommended by Manufacturer. At splice intersections, roll seam with a silicone roller prior to roofing membrane seam cooling.
 - 1) Test lap edges with probe to verify seam weld continuity once hot air welds have thoroughly cooled (approximately 30 minutes). Apply lap sealant to seal cut edges of sheet roofing membrane.
 - 2) Verify field strength of seams minimum of twice daily and repair seam sample areas.
 - 3) Repair seam deficiencies same day they are discovered.
 - 4) Repair tears and voids in roofing that does not comply with requirements.
 - b. Apply Cut Edge Sealant on cut edges of roofing membrane (where scrim reinforcement is exposed) after seam probing is complete.
 6. Spread sealant bed over deck drain flange at roof drains and securely seal membrane roofing in place with clamping ring.

F. Flashing:

1. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system Manufacturer's written instructions.
2. Flashing of parapets, curbs, expansion joints and other parts of roof must be performed using reinforced membrane. Non-reinforced membrane can be used for flashing pipe penetrations, sealant pockets, scuppers, as well as inside and outside corners when use of pre-fabricated accessories is not feasible.
3. Follow Manufacturer's typical flashing procedures for wall, curb, and penetration flashing including metal edging/coping and roof drain applications.
4. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply to seam area of flashing.
5. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.
6. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.
7. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.
8. Metal Edge Flashing:
 - a. Install as per requirements of ANSI/SPRI ES-1, 'Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems'.

G. Walkways:

1. Install walkways at traffic concentration points (such as roof hatches, access doors, rooftop ladders, etc.) and locations as identified on Contract Documents.

H. Daily seal:

1. On phased roofing, when completion of flashings and terminations is not achieved by end of work day, daily seal must be performed to temporarily close roofing membrane to prevent water infiltration.
2. Complete acceptable roofing membrane seal in accordance with Manufacturer's requirements.

3.05 FIELD QUALITY CONTROL

A. Field Inspections:

1. Before Manufacturer's inspection for warranty, Installer must perform pre-inspection to review work and to verify flashing has been completed as well as application of caulking.
2. Final Roof Inspection:
 - a. Arrange for Roofing Membrane Manufacturer's technical personnel to inspect roofing installation on completion.
3. Upon completion of roof inspection, provide certification that installation has been performed in accordance with Contract Document and Roofing Manufacturer requirements.

B. Non-Conforming Work:

1. Correct all work not in compliance to Contract Documents at no additional cost to Owner.
 - a. Repair or remove and replace components of membrane roofing system where inspections indicate that they do not comply with specified requirements.
 - b. Replace contaminated membrane.
2. Additional inspections will be performed to determine compliance of replaced or additional work with specified requirements at no additional cost to Owner.
3. Repair landscaped areas damaged by construction activities at no additional cost to Owner.

3.06 CLEANING

A. Waste Management:

1. Perform daily clean-up to collect wrappings, empty containers, paper, and other debris from project site.

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- 2. Upon completion, roofing waste materials must be disposed from site to dumping area legally authorized to receive such materials.
- 3. Complete site cleanup, including both interior and exterior building areas that have been affected by construction, to Owner's satisfaction.

3.07 PROTECTION

- A. General Contractor Responsibility:
 - 1. Protection of roofing membrane from damage and wear from other trades from damage after completion of roof membrane.
 - 2. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by Manufacturer of affected construction.

END OF SECTION

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**SECTION 07 6200
SHEET METAL FLASHING AND TRIM**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fabricated sheet metal items, including flashings, counterflashings, sheet metal roofing, exterior penetrations, and other items indicated in Schedule.
- B. Sealants for joints within sheet metal fabrications.

1.02 DEFINITIONS

- A. Base Flashing: That portion of flashing attached to or resting on roof deck to direct flow of water onto the roof covering.
- B. Cap Flashing: Material used to cover top edge of base flashings or other flashings to prevent water seepage behind base flashing. Cap flashing overlaps base flashing.
- C. Collar: Pre-formed flange placed over vent pipe to seal roof around vent pipe opening. Also called vent sleeve.
- D. Drip Edge: Non-corrosive, non-staining material used along eaves and rakes to allow water runoff to drip clear of underlying building.
- E. Flange: Metal pan extending up and down roof slope around flashing pieces. Usually at plumbing vents.
- F. Flashing: Components used to prevent seepage of water into a building around any intersection or projection in a roof such as vent pipes, adjoining walls, and valleys.
- G. Metal Flashing: Roof components made from sheet metal that are used to terminate roofing membrane or other material alongside roof perimeters as well as at roof penetrations.
- H. Penetration: Any object that pierces surface of roof.
- I. Pipe Boot: Prefabricated flashing piece used to flash around circular pipe penetrations. Also known as a Roof Jack.
- J. Roof Jack: Term used to describe a Pipe Boot or Flashing Collar.
- K. Valley: Internal angle formed by intersection of two sloping roof planes to provide water runoff.
- L. Vent: Any outlet for air that protrudes through roof deck such as pipe or stack. Any device installed on roof, gable or soffit for purpose of ventilating underside of roof deck.
- M. Vent Sleeve: See collar.

1.03 REFERENCE STANDARDS

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix) 2017a.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.
- C. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process 2021a.
- D. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate 2014.
- E. ASTM C920 - Standard Specification for Elastomeric Joint Sealants 2018.
- F. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free 2007 (Reapproved 2018).

1.04 DELIVERY, STORAGE, AND HANDLING

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

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- B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers Of Metal:
1. CMG - Coated Metals Group, Denver, CO www.cmgmetals.com.
 2. Drexel Metals, LLC, Ivyland, PA www.drexmet.com.
 3. Fabral, Lancaster, PA www.fabral.com.
 4. Firestone Metal Products, Anoka, MN www.unaclad.com.
 5. MBCI, Houston, TX www.mbc.com.
 6. Metal Sales Manufacturing Corp, Sellersburg, IN www.mtlsales.com.
 7. O'Neal Flat Rolled Metals (member of O'Neal Industries), Brighton, CO www.ofrmetals.com.
 8. Petersen Aluminum Corp, Elk Grove, IL www.pac-clad.com.
 9. Ryerson, Chicago, IL www.ryerson.com.

2.02 COMPONENTS

- A. Aluminum Fascia:
1. Materials:
 - a. Aluminum: 0.032 inch thick minimum complete with accessories recommended by Manufacturer for proper installation.
 2. Finishes:
 - a. Face coating Polyvinylidene Fluoride (PVF2) Resin-base finish (Kynar 500 or Hylar 5000) for coil coating components containing 70 percent minimum PVF2 in resin portion of formula. Thermocured two coat system consisting of corrosion inhibiting epoxy primer and top coat factory applied over properly pre-treated metal.
 - b. Color as selected by Architect from Manufacturer's standard colors.
 - c. Stucco embossed.
 3. Fabrication: Fascia may either be shop-fabricated using metal from a specified manufacturer, or a factory-fabricated standard system from a specified manufacturer.
- B. Roof Jacks For Metal Flues: Factory-made galvanized steel.
- C. Pipe Flashing For Concentric Piping Flashing Retrofitting:
1. Description:
 - a. Black EPDM Pipe flashing for existing Concentric Piping for reroofing existing roofs (cutting Concentric Roof Termination cap off and replacing is not permitted).
 - b. Weather resistance to withstand ultra violet light and ozone.
 - c. Malleable base to conform to different roof pitches.
 - d. Pipe size: 1/2 inch to 4 inch.
 - 1) On-site customization.
 - e. Fasteners included.
 2. Acceptable Products:
 - a. Aztec RF101BP.
- D. Pipe Flashing For Plumbing Vent Lines and HVAC Air Piping: Ultra-pure high consistency molded one hundred (100) percent silicone rubber pipe boot that prevents cracking and splitting for life of roof.
1. Description:
 - a. Ultra-pure high consistency molded one hundred (100) percent silicone rubber pipe boot that prevents cracking and splitting for life of roof.
 2. Design Criteria:
 - a. Meet following Tests:
 - 1) ASTM B117 (Salt Spray Test).
 - 2) ASTM E283 (Air Leakage).
 - 3) ASTM E 330 (Uniform Structural Load).

- 4) ASTM E331 (Water Penetration).
- 5) ASTM E2140 (Water).
3. 24 ga coated galvanized steel plate.
4. Minimum 4 inch flashing on each side, 6 inch flashing at top, 3 inch flashing at bottom with nailing slots.
5. UV stable solid molded PVC compression collar.
6. Use Ultimate Pipe Flashing for PVC, ABS and IP.
7. Use Ultimate Pipe Flashing and Easy Sleeve for Copper, Cast Iron, or irregular and damaged pipes:
 - a. Black PVC with integral cap.
8. Sizes: 1-1/4 inch, 1-1/2 inch, 2 inch, 3 inch, and 4 inch.
9. Slope: Flat to 18/12 pitch.
10. Flashing Finish: Face coating polyvinylidene Fluoride (PVF₂) Resin-base finish (Kynar 500) for coil coating components containing seventy (70) percent minimum PVF₂ in resin portion of formula. Thermo-cured two coat system consisting of corrosion inhibiting epoxy primer and top coat factory applied over properly pre-treated metal.
11. Color: Brown (no other color available).
12. Approved Products. See Section 01 6200 for definitions of Categories:
 - a. Ultimate Pipe Flashing by Lifetime Tool & Building Products LLC, Winchester, VA www.lifetimetool.com (877) 904-1002.

2.03 FABRICATION

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Form pieces in longest possible lengths.
- C. Hem exposed edges on underside 1/2 inch; miter and seam corners.
- D. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

2.04 FACTORY FABRICATED ITEMS

- A. Galvanized Reglets:
 1. Acceptable Products:
 - a. Fry Springlock Reglets by Fry Reglet Corp, Alhambra, CA www.fryreglet.com.
- B. Stainless Steel Reglets:
 1. Acceptable Products:
 - a. Fry Springlock Reglets by Fry Reglet Corp, Alhambra, CA www.fryreglet.com.
- C. Metal Soffit Panels:
 1. Flush panel design.
 - a. Panels shall be interlocked full length of panel.
 - b. Panel width: 7 inches.
 - c. Panel height: 1 inch.
 2. Ventilation:
 - a. 12% minimum net free area in perforated panels. No ventilation at non-perforated panels. Refer to Contract Documents for locations of perforated and non-perforated panels.
 - b. Perforation shall be designed so one dimension does not exceed 1/8 inch.
 3. Materials:
 - a. 0.032 inch thick minimum 3105-H24 alloy aluminum meeting requirements of ASTM B209.
 4. Fabrication:
 - a. Panels shall be uniformly dimensioned, roll formed to lengths to avoid trimming.
 - b. Panel system shall be anchored as recommended by Manufacturer.
 - c. Panels shall be continuous.

5. Polyvinylidene Fluoride (PVF2) Resin-base (Kynar 500 or Hylar 5000) finish for coil coating components containing 70 percent minimum PVF2 in resin portion of formula. Thermo-cured two coat system consisting of corrosion inhibiting epoxy primer and top coat factory applied over properly pre-treated metal.
 6. Approved Product: Pac-clad Flush Wide Vent Soffit Panel System, by Peterson Aluminum.
 - a. Equal as approved by the Architect prior to bidding.
 7. Color as selected by Architect from Manufacturer's standard colors.
 8. Stucco embossed.
- D. Installation:
1. Conceal fasteners where possible. Paint heads of exposed fasteners to match background.
 2. Isolate from dissimilar metals to prevent electrolytic action.

2.05 ACCESSORIES

- A. Fasteners: Same material and finish as flashing metal, with soft neoprene washers of strength and type consistent with function.
- B. Concealed Sealants: Non-curing butyl sealant.
- C. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.
- D. Plastic Cement: ASTM D4586/D4586M, Type I.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

- A. Install starter and edge strips, and cleats before starting installation.
- B. Install surface mounted reglets true to lines and levels, and seal top of reglets with sealant.
- C. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

3.03 INSTALLATION

- A. Install with small, watertight seams.
- B. Slope to provide positive drainage.
- C. Provide sufficient hold down clips to insure true alignment and security against wind.
- D. Provide 4 inch (100 mm) minimum overlap.
- E. Allow sufficient tolerance for expansion and contraction.
- F. Insulate work to prevent electrolytic action.

3.04 CLEANING

- A. Leave metals clean and free of defects, stains, and damaged finish.

END OF SECTION

SECTION 07 7233**ROOF HATCHES****PART 1 GENERAL****1.01 SUMMARY**

- A. Products Supplied But Not Installed Under This Section:
 - 1. Roof hatches and scuttles indicated on Contract Drawings including:
 - a. Related hardware and attachments.
 - b. Safety post for fixed ladders in roof hatches.
- B. Related Requirements:
 - 1. Section 06 2001: 'Common Finish Carpentry Requirements' for installation of roof hatches and safety post in roof hatches.
 - 2. Sections Under 07 5000 Heading: Membrane Roofing.
 - 3. Sections Under 07 6000 Heading: Flashing and Sheet Metal.
 - 4. Section 07 9219: 'Elastomeric Joint Sealants' for sealant.

1.02 REFERENCES

- A. Association Publications:
 - 1. U.S. Department of Labor, Occupational Safety and Health Administration (OSHA):
 - a. 29 CFR 1910 Subpart D: Walking-Working Surfaces:
 - 1) 1910.23 (e) - Guarding floor and wall openings and holes.
 - 2) 1910.27 (c) - Hatch Covers.

1.03 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Roof Hatch:
 - 1) Manufacturer's technical data for each type of hatch assembly, including setting drawings, templates, finish requirements, and details of anchorage devices.
 - (a) Include locations, construction details, finishes, latching or locking provisions, and other pertinent data.
 - 2. Shop Drawings:
 - a. Roof Hatch:
 - 1) Indicate configuration and dimension of components, adjacent construction, required clearances and tolerances, and other affected Work.
 - (a) Hatch Units: Show types, elevations, thickness of metals, and full size profiles.
 - (b) Hardware: Show materials, finishes, locations of fasteners, types of fasteners, locations and types of operating hardware, and details of installation.
 - B. Informational Submittals:
 - 1. Manufacturers' Instructions:
 - a. Roof Hatch:
 - 1) Indicate installation requirements and rough-in dimensions.
 - C. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Warranty Documentation:
 - 1) Roof Hatch:
 - (a) Final, executed copy of Warranty.
 - 2) Roof Hatch Safety Railing:
 - (a) Final, executed copy of Warranty.

1.04 QUALITY ASSURANCE

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- A. Regulatory Agency Sustainability Approvals:
 - 1. OSHA Compliance:
 - a. Provide safety post for fixed ladders as required by OSHA Standard 1910.27 and as specified in this Section.
 - 1) Meet minimum concentrated load of 200 lbs (90 kg) load.
- B. Qualifications:
 - 1. Manufacturer:
 - a. Company specializing in manufacturing and installation of components specified in this Section with minimum of five (5) years documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
 - 1. Make no deliveries to Project until installation is about to commence, or until approved storage area is provided.
- B. Storage And Handling Requirements:
 - 1. Store materials under cover in dry and clean location off ground. Remove materials that are damaged or otherwise not suitable for installation from Project site and replace with acceptable materials at no additional cost to Owner.
 - 2. Exercise proper care in handling of Work so as not to injure finished surfaces. Protect Work from damage after it is in place.

1.06 WARRANTY

- A. Roof Hatch:
 - 1. Provide Manufacturer's standard written warranty for materials and workmanship against defects.
- B. Roof Hatch Safety Railing:
 - 1. Provide Manufacturer's five (5) year minimum warranty.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Type One Acceptable Manufacturers:
 - 1. Babcock-Davis Hatchways Inc, Arlington, MA www.babcock-davis.com.
 - 2. The Bilco Company, New Haven, CT www.bilco.com.
 - 3. Dur-Red Products, Cudahy, CA www.dur-red.com.
 - 4. Milcor, Bensenville, IL www.milcorinc.com.
 - 5. Equal as approved by Architect before bidding. See Section 01 6200.

2.02 MANUFACTURED UNITS

- A. Roof Hatch:
 - 1. Design Criteria:
 - a. Provide 36 inch (915 mm) x 30 inch (762 mm) for ladder access.
 - b. Provide corrosion resistance finish.
 - 2. Cover And Curb:
 - a. Cover: 11 ga (3.2 mm) mill finish aluminum.
 - b. Cover Lining: 18 ga (1.3 mm) mill finish aluminum cover liner.
 - c. Curb Height: 12 inches (300 mm) with 3-1/2 inch (89 mm) flange for mounting, with integral cap flashing.
 - d. Insulate curb and cover with one inch rigid insulation.
 - 3. Performance Standard: Bilco S-50.

2.03 ACCESSORIES

- A. Roof Hatch Safety Railing:
 - 1. Description:
 - a. OSHA compliant Safety Railing for new and retrofit applications.

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- b. Safety railing mounts to new or existing roof hatch curb counterflashing without penetrating membrane.
 - 2. Design Criteria:
 - a. Compliance: OSHA 29 CFR1910.23 for guarding floor and wall openings and holes.
 - b. Self-Closing Gate.
 - 3. Basis of Design: Babcock-Davis model BSRCA 36x30 FG.
- B. Safety Post For Fixed Ladders:
 - 1. Description:
 - a. Safety post for fixed vertical ladders used with roof hatches.
 - b. Telescoping post permanently mounts to top two (2) rungs of fixed ladder providing positive hand-hold and enabling user to enter or exit roof hatch in upright and balanced position.
 - c. Post locks automatically when fully extended.
 - 2. Comply with requirements of Regulatory Agency Sustainability Approvals as specified in Quality Assurance in Part 1 of this specification.
 - 3. Finish: Hot dip galvanized or mill finish aluminum.
 - 4. Type One Acceptable Manufacturers:
 - a. Safety Post by Babcock-Davis Hatchways Inc, Arlington, MA www.babcock-davis.com.
 - b. LadderUP Safety Post (Model LU-4) by The Bilco Company, New Haven, CT www.bilco.com.
 - c. Extend-A-Rail (Model ER-1) by Precision Ladders, LLC, Morristown, TN www.precisionladders.com.
 - d. Equal as approved by Architect before bidding. See Section 01 6200.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions:
 - 1. Verify areas and conditions under which roof hatches is to be located and identify conditions detrimental to proper or timely completion.
 - 2. Verify deck, cubs, roof membrane, base flashing and other items affecting Work of this section are in place and positioned correctly.
 - 3. Verify dimensions and tolerances.
 - a. Report unsatisfactory conditions in writing to Architect.
 - b. Commencement of Work by installer is considered acceptance of substrate.

3.02 INSTALLATION

- A. Follow Manufacturer's instructions for installing Roof Hatch, Safety Post, and related accessories and attachments.

3.03 ADJUSTING

- A. Test-operate roof hatch with operable components. Clean and lubricate joints and hardware. Adjust for proper operation.

3.04 CLEANING

- A. General:
 - 1. Clean exposed surfaces per manufacture's written instructions. Touch up damaged metal coatings.
- B. Waste Management:
 - 1. Disposal:
 - a. Remove debris resulting from work of this Section from roof and site in approved waste receptacle.

END OF SECTION

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**SECTION 07 8400
FIRESTOPPING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Firestopping systems.
- B. Firestopping of joints and penetrations in fire resistance rated and smoke resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.02 REFERENCE STANDARDS

- A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems 2013a (Reapproved 2017).
- B. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems 2015 (Reapproved 2019).
- C. ASTM E2174 - Standard Practice for On-Site Inspection of Installed Firestop Systems 2020a.
- D. ASTM E2393 - Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers 2020.
- E. ASTM E2307 - Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-story Test Apparatus 2020.
- F. ASTM E2837 - Standard Test Method for Determining the Fire Resistance of Continuity Head-of-Wall Joint Systems Installed Between Rated Wall Assemblies and Nonrated Horizontal Assemblies 2013 (Reapproved 2017).
- G. ITS (DIR) - Directory of Listed Products current edition.
- H. FM (AG) - FM Approval Guide current edition.
- I. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems Current Edition, Including All Revisions.
- J. UL (DIR) - Online Certifications Directory Current Edition.
- K. UL (FRD) - Fire Resistance Directory Current Edition.
- L. UL 263 - Standard for Fire Tests of Building Construction and Materials Current Edition, Including All Revisions.
- M. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.
- B. Identify locations where each type of Penetration Firestop System is to be installed.
- C. Product Data: Provide data on product characteristics, performance ratings, and limitations.
- D. Installer Qualification: Submit qualification statements for installing mechanics.

1.04 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Conform to applicable building codes for fire resistance ratings.
 - 2. Comply with installation requirements and protocol outlined in Firestop Contractors International Association 'FICIA 'Manual of Practice' handbook.
 - 3. Each Penetration Firestop System shall be UL/ULC listed for that type of penetration occurring on Project.
 - 4. Ratings shall be in accordance with ASTM E814, UL 1479, or IBC Section 703, "Fire-Resistance Ratings And Fire Tests' as acceptable to local code authority.

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- a. Provide Firestop Systems with F Ratings not less than Fire-Resistance Rating of Constructions penetrated.
 - b. Provide Firestop Systems with T and F Ratings, as determined per ASTM E814.
 - c. Provide Joint Sealants with Fire-Resistance Ratings as determined per ASTM E119.
 - d. Provide Products with Flame-Spread values of less than 25 and smoke developed values of less than 450, as determined per ASTM E84.
 - e. Surface burning characteristics (per ASTM E84): 25 or less. Tested in accordance with UL 1479 or ASTM E814.
- B. Coordination:
1. Coordinate construction of openings and penetrating items to ensure that firestopping assemblies are installed in compliance with specific requirements.
 2. Coordinate sizes of sleeves, openings, core drilled holes, or cut openings to accommodate through-penetration firestop systems.
- C. Sequencing:
1. Perform work of this section in proper sequence to prevent damage to firestop system and to ensure installation will occur prior to enclosing or concealing work. Firestopping shall precede finishing of gypsum board.
 - a. Do not conceal firestopping installations until inspection agency or authorities having jurisdiction, as required, have examined each installation.
- D. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.
- E. Installer Qualifications: Company specializing in performing the work of this section and:
1. Installer who is certified and licensed or qualified by firestopping manufacturer as having been provided necessary training to install firestop products per specified requirements with not less than five (5) years of documented experience.
 2. Trained by manufacturer.
 3. Upon request, submit documentation.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
1. Deliver firestopping materials to Project Site in original, new unopened containers or packages bearing manufacturer's printed labels.
- B. Storage And Handling Requirements:
1. Store and handle firestopping materials in compliance with manufacturers written instructions.
 2. Protect materials from freezing or overheating and to prevent deterioration or damage due to moisture, temperature changes, contaminants or other causes.
 3. Store materials off floor at temperatures between 40 deg F (4.4 deg C) and 90 deg F (32.2 deg C) or as re

1.06 FIELD CONDITIONS

- A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.
- B. Provide ventilation in areas where solvent-cured materials are being installed.

1.07 WARRANTY

- A. Manufacturer Warranty:
1. Firestop materials shall be free from cracking, checking, dusting, flaking, spalling, separation, and blistering for period of 10 years from Date of Substantial Completion. Reinstall or repair such defect or failures at no cost to Owner.

PART 2 PRODUCTS

2.01 MATERIALS

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- A. Acceptable Manufacturers:
 1. Members of International Firestop Council www.firestop.org and member in good standing.
 2. Equal as approved by Architect before installation. See Section 01 6200.
- B. Sealant, packing material, or collar system required by Firestop Manufacturer for Firestop Penetration System to comply with listed design.
- C. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.

2.02 FIRESTOPPING ASSEMBLY REQUIREMENTS

- A. Perimeter Fire Containment Firestopping: Use system that has been tested according to ASTM E2307 to have fire resistance F Rating equal to required fire rating of floor assembly.
 1. Movement: Provide systems that have been tested to show movement capability as indicated.
 2. Temperature Rise: Provide systems that have been tested to show T Rating as indicated.
 3. Air Leakage: Provide systems that have been tested to show L Rating as indicated.
 4. Where floor assembly is not required to have a fire rating, provide systems that have been tested to show L Rating as indicated.
- B. Head-of-Wall Joint System Firestopping at Joints Between Fire-Rated Wall Assemblies and Non-Rated Horizontal Assemblies: Use system that has been tested according to ASTM E2837 to have fire resistance F Rating equal to required fire rating of floor or wall, whichever is greater.
 1. Movement: Provide systems that have been tested to show movement capability as indicated.
- C. Floor-to-Floor, Wall-to-Wall, and Wall-to-Floor Joints, Except Perimeter, Where Both Are Fire-Rated: Use system that has been tested according to ASTM E1966 or UL 2079 to have fire resistance F Rating equal to required fire rating of the assembly in which the joint occurs.
 1. Movement: Provide systems that have been tested to show movement capability as indicated.
 2. Air Leakage: Provide systems that have been tested to show L Rating as indicated.
 3. Watertightness: Provide systems that have been tested to show W Rating as indicated.
 4. Listing by FM (AG), ITS (DIR), UL (DIR), or UL (FRD) in their certification directories will be considered evidence of successful testing.
- D. Through Penetration Firestopping: Use system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.
 1. Temperature Rise: Provide systems that have been tested to show T Rating as indicated.
 2. Air Leakage: Provide systems that have been tested to show L Rating as indicated.
 3. Watertightness: Provide systems that have been tested to show W Rating as indicated.
 4. Listing by FM (AG), ITS (DIR), UL (DIR), or UL (FRD) in their certification directories will be considered evidence of successful testing.
- E. Firestop Tracks (Metal Stud Framing):
 1. Metal Stud Manufacturer's top runner manufactured to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire-resistance-rated assembly by factory applied cured intumescent fire stop material affixed to steel profile; in thickness, not less than indicated for studs and in width to accommodate depth of studs.
 - a. Acceptable Products:
 - 1) BlazeFrame Deflection Track by ClarkDietrich Building Systems.
 - 2) Equal as approved by Architect before bidding. See Section 01 6200.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify openings are ready to receive the work of this section.

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- B. Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.
- C. Verify ducts, piping, equipment, and other similar items that would interfere with application of firestopping shall be in place.
- D. Do not commence Work until unsatisfactory conditions have been corrected.
 - 1. Commencement of installation constitutes acceptance of conditions and responsibility for satisfactory performance.

3.02 PREPARATION

- A. Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.
- B. Use masking tape to prevent firestopping from contacting adjoining surfaces that will remain exposed upon completion of Work. Remove tape as soon as it is possible to do so without disturbing firestopping seal with substrates.
- C. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.
- D. Remove incompatible materials that could adversely affect bond.
- E. Do not apply firestopping materials to surfaces which have been previously painted or treated with sealer, curing compound, water repellent, or other similar coating, unless application has been accepted by manufacturer of firestopping products.
- F. Install backing materials to prevent liquid material from leakage.

3.03 INSTALLATION

- A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.
- B. Do not cover installed firestopping until inspected by Owner's Independent Testing Agency.
- C. Do not cover installed firestopping until inspected by authorities having jurisdiction.
- D. Install labeling required by code.

3.04 FIELD QUALITY CONTROL

- A. Independent Testing Agency: Inspection agency employed and paid by Owner, will examine penetration firestopping in accordance with ASTM E2174, and ASTM E2393.
- B. Repair or replace penetration firestopping and joints at locations where inspection results indicate firestopping or joints do not meet specified requirements.

3.05 CLEANING

- A. Clean off excess fill materials and sealants adjacent to penetrations by methods and cleaning materials recommended by manufacturers of firestopping products and of products in which penetrations occur.

3.06 PROTECTION

- A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

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**SECTION 07 9200
JOINT SEALANTS**

PART 1 GENERAL

1.01 SUMMARY

- A. Includes But Not Limited To:
 - 1. Furnish and install sealants not specified to be furnished and installed under other Sections.
 - 2. Quality of sealants to be used on Project not specified elsewhere, including submittal, material, and installation requirements.
- B. Related Requirements:
 - 1. Removing existing sealants specified in Sections where work required.
 - 2. Furnishing and installing of sealants is specified in Sections specifying work to receive new sealants.
- C. Products Furnished But not Installed Under This Section:
 - 1. Interior Ceramic Tile Joint Sealants:
- D. Related Requirements:
 - 1. Section 09 3000: 'Tiling'.

1.02 REFERENCES

- A. Reference Standards:
 - 1. ASTM International:
 - a. ASTM C920-14a, 'Standard Specification for Elastomeric Joint Sealants'.
 - b. ASTM C1193-16, 'Standard Guide for Use of Joint Sealants'.
 - c. ASTM C1330-02(2013), 'Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants'.
 - d. ASTM C1481-12(2017) 'Standard Guide for Use of Joint Sealants with Exterior Insulation & Finish Systems (EIFS)'.
 - e. ASTM D5893/D5893M-16, 'Standard Specification for Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements'.

1.03 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency current edition.
- B. ASTM C1193 - Standard Guide for Use of Joint Sealants 2016.
- C. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants 2018.
- D. ASTM C1481 - Standard Guide for Use of Joint Sealants with Exterior Insulation and Finish Systems (EIFS) 2012.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2021a.
- F. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements 2009 (Reapproved 2016).
- G. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.
- H. ASTM C834 - Standard Specification for Latex Sealants 2017.
- I. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications 2019.
- J. ASTM C920 - Standard Specification for Elastomeric Joint Sealants 2018.

1.04 ADMINISTRATIVE REQUIREMENTS

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- A. Scheduling:
 1. Schedule work so waterproofing, water repellents and preservative finishes are installed after sealants, unless sealant manufacturer approves otherwise in writing.
 2. Ensure sealants are cured before covering with other materials.

1.05 SUBMITTALS

- A. Action Submittals:
 1. Product Data:
 - a. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.
 - b. Manufacturer's literature for each Product.
 - c. Schedule showing joints requiring sealants. Show also backing and primer to be used.
- B. Informational Submittals:
 1. Certificates:
 - a. Manufacturer's Certificate:
 - 1) Certify products are suitable for intended use and products meet or exceed specified requirements.
 - 2) Certificate from Manufacturer indicating date of manufacture.
 2. Manufacturers' Instructions:
 - a. Manufacturer's installation recommendations for each Product.
 - b. Manufacturer's installation for completing sealant intersections when different materials are joined.
 - c. Manufacturer's installation for removing existing sealants and preparing joints for new sealant.

1.06 QUALITY ASSURANCE

- A. Qualifications:
 1. Manufacturer: Company specializing in manufacturing products specified in this section with minimum ten (10) years documented experience.
 2. Applicator Qualifications:
 - a. Company specializing in performing work of this section.
 - b. Provide if requested, reference of projects with minimum three (3) years documented experience, minimum three (3) successfully completed projects of similar scope and complexity, and approved by manufacturer.
 - c. Designate one (1) individual as project foreman who shall be on site at all times during installation.
- B. Preconstruction Testing:
 1. Pre-construction testing is not required when sealant manufacturer can furnish data acceptable to Architect based on previous testing for materials matching those of the Work.
- C. Mockups:
 1. Provide mockups including sealant and joint accessories to illustrate installation quality and color if requested by Architect or Project Manager.
 - a. Incorporate accepted mockup as part of Work.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Acceptance Requirements:
 1. Deliver and keep in original containers until ready for use.
 2. Inspect for damage or deteriorated materials.
- B. Storage and Handling Requirements:
 1. Handle, store, and apply materials in compliance with applicable regulations and material safety data sheets (MSDS).
 2. Handle to prevent inclusion of foreign matter, damage by water, or breakage.

3. Store in a cool dry location, but never under 40 deg F (4 deg C) or subjected to sustained temperatures exceeding 80 deg F (27 deg C) or as per Manufacturer's written recommendations.
4. Do not use sealants that have exceeded shelf life of product.

1.08 FIELD CONDITIONS

- A. Ambient Conditions:
1. Do not install sealant during inclement weather or when such conditions are expected. Allow wet surfaces to dry.
 2. Follow Manufacturer's temperature recommendations for installing sealants.
 3. Ambient Conditions:
 - a. Do not apply caulking at temperatures below 40 deg F (4 deg C).

1.09 WARRANTY

- A. Manufacturer Warranty:
1. Signed warranties against adhesive and cohesive failure of sealant and against infiltration of water and air through sealed joint for period of three (3) years from date of Substantial Completion.
 - a. Manufacturer's standard warranty covering sealant materials.
 - b. Applicator's standard warranty covering workmanship.

PART 2 PRODUCTS

2.01 SYSTEMS

- A. Manufacturers:
1. Manufacturer Contact List:
 - a. Dow Corning Corp., Midland, MI www.dowcorning.com.
 - b. Franklin International, Inc. Columbus, OH www.titebond.com.
 - c. GE Sealants & Adhesives (see Momentive Performance Materials Inc.).
 - d. Laticrete International Inc., Bethany, CT www.laticrete.com.
 - e. Momentive Performance Materials Inc. (formally GE Sealants & Adhesives), Huntersville, NC www.ge.com/silicones.
 - f. Sherwin-Williams, Cleveland, OH www.sherwin-williams.com.
 - g. Sika Corporation, Lyndhurst, NJ www.sikaconstruction.com or Sika Canada Inc, Pointe Claire, QC www.sika.ca.
 - h. Tremco, Beachwood, OH www.tremcosealants.com or Tremco Ltd, Toronto, ON (800) 363-3213.
- B. Materials:
1. Design Criteria:
 - a. Compliance: Meet or exceed requirements of these standards:
 - 1) ASTM C920: Elastomeric joint sealant performance standard.
 - 2) ASTM D5893/D5893M: Silicone Joint Sealant for Concrete Pavements.
 - b. Comply with Manufacturer's ambient condition requirements.
 - c. Sealants must meet Manufacturer's shelf-life requirements.
 - d. Sealants must adhere to and be compatible with specified substrates.
 - e. Sealants shall be stable when exposed to UV, joint movements, and environment prevailing at project location.
 - f. Primers (Concrete, stone, masonry, and other nonporous surfaces typically do not require a primer. Aluminum and other nonporous surfaces except glass require use of a primer. Installer Option to use Adhesion Test to determine if primer is required or use primer called out in related sections):
 - 1) Adhesion Test:
 - (a) Apply silicone sealant to small area and perform adhesion test to determine if primer is required to achieve adequate adhesion. If necessary, apply

- primer at rate and in accordance with Manufacturer's instructions. See 'Field Quality Control' in Part 3 of this specification for Adhesive Test.
- 2) If Primer required, shall not stain and shall be compatible with substrates.
 - 3) Allow primer to dry before applying sealant.
2. Sealants At Exterior Building Elements:
- a. Description:
 - 1) Weathersealing expansion, contraction, perimeter, and other movement joints which may include all or part of the following for project:
 - (a) Aluminum entrance perimeters and thresholds.
 - (b) Columns.
 - (c) Connections.
 - (d) Curtainwalls.
 - (e) Door frames.
 - (f) EIFS to metal joints.
 - (g) Joints and cracks around windows.
 - (h) Louvers.
 - (i) Masonry.
 - (j) Parapet caps.
 - (k) Wall penetrations.
 - (l) Other joints necessary to seal off building from outside air and moisture.
 - b. Design Criteria:
 - 1) Meet following standards for Sealant:
 - (a) ASTM C920: Type S, Grade NS, Class 50 Use NT, M, G, A.
 - 2) Limitations:
 - (a) Do not use below-grade applications.
 - (b) Do not use on surfaces that are continuously immersed or in contact with water.
 - (c) Do not use on wet, damp, frozen or contaminated surfaces.
 - (d) Do not use on building materials that bleed oils, plasticizers or solvents, green or partially vulcanized rubber gaskets or tapes.
 - 3) Color:
 - (a) Architect to select from Manufacturer's standard colors.
 - (b) Match building elements instead of window (do not use white that shows dirt easily).
 - c. Approved Products. See Section 01 6000:
 - 1) Dow Corning:
 - (a) Primer: 1200 Prime Coat.
 - (b) Sealant: 791 Silicone Weatherproofing Sealant.
 - 2) Momentive Performance Materials (formerly, GE Sealants & Adhesives):
 - (a) Primer: SS4044 Primer.
 - (b) Sealant: GE SCS2000 SilPruf Silicone Sealant & Adhesive.
 - 3) Tremco:
 - (a) Primer:
 - (1) Metal surface: No. 20 primer.
 - (2) Porous surfaces: No. 23 primer.
 - (b) Sealant: Spectrum 1 Silicone Sealant.
3. Sealants At Exterior Sheet Metal And Miscellaneous:
- a. Description:
 - 1) Weathersealing expansion, contraction, perimeter, and other movement joints which may include all or part of the following for project:
 - (a) Flashings.
 - (b) Gutters.
 - (c) Penetrations in soffits and fascias.

- (d) Roof vents and flues.
 - (e) Lightning protection components.
 - b. Design Criteria:
 - 1) Meet following standards for Sealant:
 - (a) ASTM C920: Type S Grade NS, Class 25 (min) Use NT, M, G, A and O.
 - 2) Limitations:
 - (a) Do not use below-grade applications.
 - (b) Do not use on surfaces that are continuously immersed or in contact with water.
 - (c) Do not use on wet, damp, frozen or contaminated surfaces.
 - (d) Do not use on building materials that bleed oils, plasticizers or solvents, green or partially vulcanized rubber gaskets or tapes.
 - c. Approved Products. See Section 01 6000:
 - 1) Dow Corning: 790 Silicone Building Sealant.
 - 2) Momentive Performance Materials (formerly, GE Sealants & Adhesives): GE SCS2350 Silicone Elastomeric Sealant.
 - 3) Tremco: Tremsil 600 Silicone Sealant.
- 4. Sealants At Expansion Joints in Exterior Concrete (Aprons, Entryway Slabs, Mowstrips, Retaining Walls, Sidewalks):
 - a. Expansion Joints:
 - 1) Design Criteria:
 - (a) Meet following standards for Sealant:
 - (1) ASTM C920: Type S, Grade NS, Class 100/50 Use T, NT, M, G, A, and O.
 - 2) Sealant required at expansion for following areas:
 - (a) Between entryway slabs and building foundations.
 - (b) Between sidewalks and building foundations.
 - (c) Miscellaneous vertical applications.
 - 3) Sealant NOT required at expansion joints for following areas:
 - (a) Within aprons and where aprons abut building foundations and sidewalks.
 - (b) Within mowstrips and where mowstrips abut building foundations and sidewalks.
 - (c) Within sidewalks.
 - 4) Approved Products. See Section 01 6000:
 - (a) Dow Corning:
 - (1) Primer: 1200 Prime Coat.
 - (2) Sealant: 790 Silicone Building Sealant.
 - (b) Sika:
 - (1) Primer: Sikasil Primer-2100.
 - (2) Sealant: Sikasil-728 NS Non-Sag Silicone Sealant.
 - b. Penetrations thru Concrete Walls:
 - 1) Design Criteria:
 - (a) Meet following standards for Sealant:
 - (1) ASTM C920: Type S, Grade NS, Class 100/50 Use T, NT, M, G, A, and O.
 - 2) Approved Products. See Section 01 6000:
 - (a) Dow Corning:
 - (1) Primer: 1200 Prime Coat.
 - (2) Sealant: 790 Silicone Building Sealant.
 - (b) Sika:
 - (1) Primer: Sikasil Primer-2100.
 - (2) Sealant: Sikasil-728 NS Non-Sag Silicone Sealant.

5. Sealants At Control Joints in Exterior Concrete (Aprons, Entryway Slabs, Mowstrips, Retaining Walls, Sidewalks):
 - a. Control Joints:
 - 1) Design Criteria:
 - (a) Meet following standards for Sealant:
 - (1) ASTM C920, Type S, Grade P, Class 100/50; Use T, M, G, A, O.
 - 2) Sealant required at control joints in following areas:
 - (a) Retaining walls.
 - (b) Miscellaneous vertical applications.
 - 3) Sealant is NOT required at control joints, unless needed to protect moisture sensitive soils or by Contract Drawings, in following areas:
 - (a) Within aprons.
 - (b) Within mowstrips.
 - (c) Within sidewalks.
 - (d) Within entryway slabs.
 - 4) Approved Products. See Section 01 6000:
 - (a) Dow Corning:
 - (1) Primer: 1200 Prime Coat.
 - (2) Sealant: 890-SL Silicone Building Sealant.
 - (b) Sika:
 - (1) Primer: Primer: Sikasil Primer-2100.
 - (2) Sealant: Sikasil-728 SL Self-leveling Silicone Sealant.
6. Sealants At Exterior Concrete Waterways - Flat Drainage Structures (Waterways):
 - a. Expansion Joints and Control Joints:
 - 1) Description:
 - (a) One component (part) self-leveling silicon material that cures to ultra-low modulus silicone rubber upon exposure to atmospheric moisture.
 - (b) Cured silicone rubber remains flexible over entire temperature range expected in pavement applications.
 - 2) Design Criteria:
 - (a) Sealant is required at following areas:
 - (1) Within flat drainage structures and at joints between flat drainage structures and other concrete elements.
 - (b) Meet following standards for Sealant: Self-leveling: ASTM D-5893; ASTM C920, Type S, Grade P, Class 100/50; Use T, M, G, A, O.
 - 3) Approved Products. See Section 01 6200:
 - (a) Dow Corning:
 - (1) Primer: 1200 Prime Coat.
 - (2) Sealant: 890-SL Silicone Building Sealant.
 - (b) Sika:
 - (1) Primer: Primer: Sikasil Primer-2100.
 - (2) Sealant: Sikasil-728 SL Self-leveling Silicone Sealant.
7. Sealants At Curbs And Gutters:
 - a. Expansion Joints and Control Joints:
 - 1) Description:
 - (a) Effective for sealing transverse contraction and expansion joints, longitudinal, center line and shoulder joints in Portland cement concrete.
 - (b) One component (part) non-sag silicone material that cures to low modulus, silicone rubber upon exposure to atmospheric moisture. May be applied over wide temperature range.
 - 2) Design Criteria:
 - (a) Expansion joint sealant is required in following areas:
 - (1) Within curbs and gutters at approved layout locations.

- (b) Meet following standards for Sealant: Non-sag: ASTM C920: Type S, Grade NS, Class 100/50, Use T, NT.
 - 3) Approved Products. See Section 01 6000:
 - (a) Dow Corning:
 - (1) Primer: 1200 Prime Coat.
 - (2) Sealant: 888 Silicone Joint Sealant.
 - (b) Sika:
 - (1) Primer: Primer: Sikasil Primer-2100.
 - (2) Sikasil-728 NS Non-Sag Silicone Sealant.
- 8. Sealants At Concrete Paving:
 - a. Expansion Joints and Control Joints (as required in Section 32 1313):
 - 1) Description:
 - (a) One component (part) self-leveling silicon material that cures to ultra-low modulus silicone rubber upon exposure to atmospheric moisture.
 - (b) Cured silicone rubber remains flexible over entire temperature range expected in pavement applications.
 - 2) Design Criteria:
 - (a) Sealant is required at approved layout locations.
 - (b) Meet following standards for Sealant: Self-leveling: ASTM C920, Type S, Grade P, Class 100/50; Use T.
 - 3) Approved Products. See Section 01 6000:
 - (a) Dow Corning:
 - (1) Primer: 1200 Prime Coat.
 - (2) Sealant: 890-SL Silicone Building Sealant.
 - (b) Sika:
 - (1) Primer: Primer: Sikasil Primer-2100.
 - (2) Sealant: Sikasil-728 SL Self-leveling Silicone Sealant.
- 9. General Interior Sealants:
 - a. General:
 - 1) Inside jambs and heads of exterior door frames.
 - 2) Both sides of interior door frames.
 - 3) Inside perimeters of windows.
 - 4) Miscellaneous gaps between substrates.
 - b. Design Criteria:
 - 1) Meet ASTM C920, Type S, Grade NS, NT, and Class 25 test requirements.
 - 2) 100 percent silicone sealant.
 - c. VOC Content of Interior Sealants:
 - 1) Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - (a) Architectural Sealants: 250 g/L.
 - (b) Sealant Primers for Nonporous Substrates: 250 g/L.
 - (c) Sealant Primers for Porous Substrates: 775 g/L.
 - d. Non-Paintable Sealant (Installer Option A):
 - 1) Approved Product. See Section 01 6000:
 - (a) Dow Corning: Tub, Tile, And Ceramic Silicone Sealant.
 - (b) Laticrete: Latacil Silicone Sealant.
 - (c) Momentive Performance Materials (formerly, GE Sealants & Adhesives): GE SCS2800 SilGlaze II Silicone Sealant.
 - (d) Sherwin Williams: White Lightning Silicone Ultra Low Odor Window and Door Sealant.
 - (e) Tremco: Tremsil 200 Silicone Sealant.

- (f) Franklin International: Titebond 2601 (White) 2611 (Clear) 100% Silicone Sealant.
 - e. Paintable Sealant (Installer Option B):
 - 1) Approved Product. See Section 01 6000:
 - (a) Momentive Performance Materials (formerly, GE Sealants & Adhesives): GE SCS7000 Paintable Silicone Sealant.
- 10. Sealants For Interior Joints:
 - a. General:
 - 1) Countertops and backsplash to wall.
 - 2) Sinks and lavatories to countertops.
 - 3) Joints between plumbing fixtures and other substrates.
 - b. Interior Ceramic Tile Joints are furnished in Section 07 9200 and installed in Section 09 3000 - Tiling including the following:
 - 1) Ceramic tile inside corners.
 - 2) Ceramic tile and paver tile joints.
 - c. Description:
 - 1) One-part acetoxy cure silicone sealant with fungicides to resist mold and mildew.
 - d. Design Criteria:
 - 1) Meet ASTM C920, Type S, Grade NS, NT, and Class 25 test requirements.
 - 2) 100 percent silicone sealant.
 - e. VOC Content of Interior Sealants:
 - 1) Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - (a) Architectural Sealants: 250 g/L.
 - (b) Sealant Primers for Nonporous Substrates: 250 g/L.
 - (c) Sealant Primers for Porous Substrates: 775 g/L.
 - f. Color: As selected by Architect from Manufacturer's standard colors.
 - g. Approved Products. See Section 01 6000:
 - 1) Dow Corning: Tub, Tile, And Ceramic Silicone Sealant.
 - 2) Laticrete: Latasil Tile and Stone Silicone Sealant.
 - 3) Momentive Performance Materials (formerly, GE Sealants & Adhesives): GE SCS1700 Sanitary Silicone Sealant.
 - 4) Tremco: Tremsil 200 Silicone Sealant.
- C. Acoustical Joint Sealants:
 - 1. Design Criteria:
 - a. Meet requirements of ASTM C834.
 - b. Meet Class A flame spread rating.
 - 2. Approved Products. See Section 01 6000:
 - a. OSI Pro-Series SC-175 Draft & Acoustical Sound Sealant by OSI Sealants Inc, Mentor, OH www.osisealants.com.
 - b. QuietZone Acoustic Caulk by Owens Corning, Toledo, OH www.owenscorning.com.
 - c. Acoustical Sealant by Tremco, Beachwood, OH www.tremcosealants.com or Toronto, ON (800) 363-3213.
 - d. Acoustical Sound Sealant by Titebond.
 - e. Acoustical Sealant by U S Gypsum, Chicago, IL www.usg.com.

2.02 ACCESSORIES

- A. Bond Breaker Tape:
 - 1. Pressure sensitive tape as by Sealant Manufacturer to suit application.
 - 2. Provide tape to prevent adhesion to joint fillers or joint surfaces at back of joint and allow sealant movement.

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- B. Joint Backing:
 1. Comply with ASTM C1330.
 2. Flexible closed cell, non-gassing polyurethane or polyolefin rod or bond breaker tape as recommended by Sealant Manufacturer for joints being sealed.
 3. Oversized 25 to 50 percent larger than joint width.
- C. Joint Cleaner:
 1. Non-corrosive and non-staining type as recommended by Sealant Manufacturer, compatible with joint forming materials.
- D. Masking Tape:
 1. Non-staining, non-absorbent tape product compatible with joint sealants and adjacent joint surfaces.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification Of Conditions:
 1. Examine substrate surfaces and joint openings are ready to receive Work.
 - a. Verify each sealant is compatible for use with joint substrates.
 - b. Verify joint surfaces are clean and dry.
 - c. Ensure concrete surfaces are fully cured.
 2. Sealants provided shall meet Manufacturer's shelf-life requirements.
 3. Notify Architect of unsuitable conditions in writing.
 - a. Do not proceed until unsatisfactory conditions are corrected.
 4. Commencement of Work by installer is considered acceptance of substrate.

3.02 PREPARATION

- A. Surface Preparation:
 1. Surfaces shall be clean, dry, free of dust, oil, grease, dew, frost or incompatible sealers, paints or coatings that may interfere with adhesion. Prepare substrates in accordance with Manufacturer's instructions:
 - a. Porous surfaces: Clean by mechanical methods to expose sound surface free of contamination and laitance followed by blasting with oil-free compressed air.
 - b. Nonporous surfaces: Use two-cloth solvent wipe in accordance with ASTM C1193. Allow solvent to evaporate prior to sealant application.
 - c. High-pressure water cleaning: Exercise care that water does not enter through failed joints.
 - d. Primers:
 - 1) Primers enhance adhesion ability.
 - 2) Use of primers is not a substitution for poor joint preparation.
 - 3) Primers should be used always in horizontal application where there is ponding water.
 2. Field test joints in inconspicuous location.
 - a. Verify joint preparation and primer required to obtain optimum adhesion of sealants to joint substrate.
 - b. When test indicates sealant adhesion failure, modify joint preparation primer, or both and retest until joint passes sealant adhesion test.
 3. Masking: Apply masking tape as required to protect adjacent surfaces and to ensure straight bead line and facilitate cleaning.
- B. Joints:
 1. Prepare joints in accordance with ASTM C1193.
 - a. Clean joint surfaces of contaminants capable of affecting sealant bond to joint surface using Manufacturer's recommended instructions for joint preparation methods.
 - b. Remove dirt, dust, oils, wax, paints, and contamination capable of affecting primer and sealant bond.

- c. Clean concrete joint surfaces to remove curing agents and form release agents.

C. Protection:

- 1. Protect elements surrounding the Work of this section from damage or disfiguration.

3.03 APPLICATION

A. General:

- 1. Apply silicone sealant in accordance with Manufacturer's instructions.
- 2. Do not use damaged or deteriorated materials.
- 3. Install primer and sealants in accordance with ASTM C1193 and Manufacturer's instructions.
- 4. Apply primer where required for sealant adhesion.
- 5. Install sealants immediately after joint preparation.
- 6. Do not use silicone sealant as per the following:
 - a. Apply caulking/sealant at temperatures below 40 deg F (4 deg C).
 - b. Below-grade applications.
 - c. Brass and copper surfaces.
 - d. Materials bleeding oils, plasticizers, and solvents.
 - e. Structural glazing and adhesive.
 - f. Surfaces to be immersed in water for prolonged time.

B. Joint Backing:

- 1. Install joint backing to maintain sealant joint ratios recommended by Manufacturer.
- 2. Install without gaps, twisting, stretching, or puncturing backing material. Use gage to ensure uniform depth to achieve correct profile, coverage, and performance.
- 3. Rod for open joints shall be at least 1-1/2 times width of open joint and of thickness to give solid backing. Backing shall fill up joint so depth of sealant bite is no more than 3/8 inch (9.5 mm) deep.

C. Bond Breaker:

- 1. Install bond breaker where joint backing is not used or where backing is not feasible.
 - a. Apply bond-breaker tape in shallow joints as recommended by Sealant Manufacturer.

D. Sealant:

- 1. Apply sealant with hand-caulking gun with nozzle of proper size to fit joints. Use sufficient pressure to insure full contact to both sides of joint to full depth of joint. Apply sealants in vertical joints from bottom to top.
- 2. Fill joint opening to full and proper configuration.
- 3. Apply in continuous operation.
- 4. Tool joints immediately after application of sealant if required to achieve full bedding to substrate or to achieve smooth sealant surface. Tool joints in opposite direction from application direction, i.e., in vertical joints, from the top down. Do not 'wet tool' sealants.
- 5. Depth of sealant bite shall be 1/4 inch (6 mm) minimum and 1/2 inch (12.7 mm) maximum, but never more than one half or less than one fourth joint width.

- E. Install at perimeter joints and mechanical and electrical penetrations in sound insulated rooms. Apply sealant with hand-caulking gun with nozzle of proper size to fit joints. Use sufficient pressure to insure full contact to both sides of joint to full depth of joint.

- F. Tool joints immediately after application of sealant if required to achieve full bedding to substrate or to achieve smooth sealant surface.

- G. Caulk gaps between painted or coated substrates and unfinished or pre-finished substrates. Caulk gaps larger than 3/16 inch (5 mm) between painted or coated substrates.

3.04 TOLERANCES

- A. Provide joint tolerances in accordance with Manufacturer's printed instructions.

3.05 FIELD QUALITY CONTROL

- A. Inspection:

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1. Examine sealant joints to verify compliance with Contract Document requirements.
- B. Non-Conforming Work. Non-conforming work as covered in the General Conditions applies, but is not limited to the following:
 1. Sealant material found to be contaminated or damaged or inadequate preparation of substrate results in deficiencies in joint sealant adhesion is considered defective or not complying with Contract Document requirements.
 2. Correct any work found defective or not-complying with Contract Document requirements at no additional cost to Owner.
- C. Adhesion Test (Installer Option to use adhesion test to determine if primer is required).
 1. Perform adhesion tests in accordance with Manufacturer's instructions and ASTM C1193, Method A, Field-Applied Sealant joint Hand-Pull Tab:
 - a. Perform five (5) tests for first 1,000 linear feet (300 meters) of applied silicone sealant and one (1) test for each 1,000 linear feet (300 meters) seal thereafter or perform one (1) test per floor per building elevation minimum.
 - b. For sealants applied between dissimilar materials, test both sides of joints.
 2. Sealants failing adhesion test shall be removed, substrates cleaned, sealants re-installed, and re-testing performed.
 3. Maintain test log and submit report to Architect indicating tests, locations, dates, results, and remedial actions.

3.06 CLEANING

- A. Remove sealant from adjacent surfaces in accordance with Sealant Manufacturer and Substrate Manufacturer recommendations as work progresses.
- B. Remove masking tape and excess sealant.
- C. Clean adjacent materials, which have been soiled, immediately (before setting) as recommended by Manufacturer.
- D. Waste Management: Dispose of products in accordance with manufacturer's recommendation.

END OF SECTION

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**SECTION 08 0671
HARDWARE GROUP AND KEYING SCHEDULES**

PART 1 GENERAL**1.01 SUMMARY**

- A. Includes But Not Limited To:
1. Furnish and install door hardware and keying as described in Contract Documents.

1.02 REFERENCES

- A. Definitions:
1. Builders Hardware Manufacturer's Association (BHMA) Hardware Functions:
 - a. F22 Mortised Privacy Lock: Latch bolt operated by lever from either side. Outside lever locked by thumb turn inside and unlocked by emergency key from outside or rotating lever from inside. Closing the door unlocks outside trim.
 - 1) Include occupancy indicators as noted in Section 08 7100 Door Hardware.
 - b. F75 Passage Latch: Latch bolt operated by lever from either side at all times.
 - c. F86 Utility Space Door Lock: Dead locking latch bolt operated by key in outside lever or by rotating inside lever. Outside lever is always fixed.
 - d. F109 Entrance Lock: Turn/push button locking: Pushing and turning button disengages outside lever, requiring using of key until button is manually unlocked. Push-button locking: Pushing button disengages outside lever until unlocked by key or by turning inside lever. Disengages outside spindle from latch when locked.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
1. Materials shall be delivered in original, unopened packages with labels intact.

PART 2 HARDWARE GROUPS**2.01 STOREFRONT ENTRY DOORS**

- A. Group ST1:
1. 1 set: Pivots.
 2. 1 set: Weatherstrip.
 3. 1 each: Closer.
 4. 1 each: Entry Door Exit Device.
 5. 1 each: Kick Plate.
 6. 1 each: Pull.
 7. 1 each: Threshold.
- B. Group ST1A:
1. 1 set: Pivots.
 2. 1 set: Weatherstrip.
 3. 1 each: Closer.
 4. 1 each: Entry Door Exit Device.
 5. 1 each: Kick Plate.
 6. 1 each: Low-Energy Swing Door Operator.
 7. 1 each: Pull.
 8. 1 each: Threshold.
- C. Group ST1B:
1. 1 set: Pivots.
 2. 1 set: Weatherstrip.
 3. 1 each: Closer.
 4. 1 each: Access Door Exit Device.
 5. 1 each: Kick Plate.

- 6. 1 each: Pull.
- 7. 1 each: Threshold.
- D. Group ST3:
 - 1. 1 set: Pivots.
 - 2. 1 set: Weatherstrip.
 - 3. 1 each: Closer.
 - 4. 1 each: Kick Plate.
 - 5. 1 each: Pull.
 - 6. 1 each: Push.
 - 7. 1 each: Stop.
- E. Group ST3A:
 - 1. 1 set: Pivots.
 - 2. 1 set: Weatherstrip.
 - 3. 1 each: Closer.
 - 4. 1 each: Kick Plate.
 - 5. 1 each: Low-Energy Swing Door Operator.
 - 6. 1 each: Pull.
 - 7. 1 each: Push.
 - 8. 1 each: Threshold.

2.02 EXTERIOR DOORS

- A. Group 3:
 - 1. 1 set: Weatherstrip.
 - 2. 4 each: Hinges.
 - 3. 1 each: Lockset Function F86.
 - 4. 1 each: Threshold.
 - 5. 1 each: Stop.

2.03 INTERIOR DOORS

- A. Group 20A:
 - 1. 1 set: Smoke Gaskets.
 - 2. 3 each: Hinges.
 - 3. 1 each: Latchset Function F75.
 - 4. 1 each: Stop.
- B. Group 20C:
 - 1. 1 set: Smoke Gaskets.
 - 2. 3 each: Hinges.
 - 3. 1 each: Latchset Function F75.
 - 4. 1 each: Stop.
 - 5. 1 each: Kick Plate.
- C. Group 26:
 - 1. 1 set: Smoke Gaskets.
 - 2. 1 each: Acoustic Seal.
 - 3. 3 each: Hinges.
 - 4. 1 each: Lockset Function F109.
 - 5. 1 each: Stop.
 - 6. 1 each: Threshold.
- D. Group 26A:
 - 1. 1 set: Smoke Gaskets.
 - 2. 3 each: Hinges.

3. 1 each: Lockset Function F109.
 4. 1 each: Stop.
- E. Group 26B:
1. 1 set: Smoke Gaskets.
 2. 1 each: Closer.
 3. 3 each: Hinges.
 4. 1 each: Lockset Function F109.
- F. Group 26C:
1. 1 set: Smoke Gaskets.
 2. 1 each: Closer.
 3. 3 each: Hinges.
 4. 1 each: Lockset Function F109.
 5. 1 each: Kick Plate.
- G. Group 26D:
1. 1 set: Smoke Gaskets.
 2. 4 each: Hinges.
 3. 1 each: Lockset Function F109.
 4. 1 each: Stop.
- H. Group 30:
1. 1 set: Smoke Gaskets.
 2. 1 each: Closer.
 3. 3 each: Hinges.
 4. 1 each: Kick Plate.
 5. 1 each: Pull.
 6. 1 each: Push.
 7. 1 each: Stop.
- I. Group 32:
1. 1 set: Smoke Gaskets.
 2. 1 each: Closer.
 3. 3 each: Hinges.
 4. 1 each: Mortised Privacy Lockset, Function F22.
 5. 1 each: Stop.
- J. Group 32A:
1. 1 set: Smoke Gaskets.
 2. 1 each: Closer.
 3. 3 each: Hinges.
 4. 1 each: Classroom Security Exit Device.
 5. 1 each: Stop.
 6. 1 each: Kick Plate

PART 3 KEYING SCHEDULE FOR FINISH HARDWARE

3.01 KEYING SCHEDULE

- A. Cylinders shall be furnished and installed by the Owner.
- B. Keying shall be furnished and installed by the Owner.

END OF SECTION

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**SECTION 08 1113
HOLLOW METAL DOORS AND FRAMES**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Hollow metal frames for wood doors.
- B. Thermally insulated hollow metal doors with frames.
- C. Accessories.

1.02 REFERENCE STANDARDS

- A. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors 2011.
- B. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames 2003 (R2009).
- C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100) 2017.
- D. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames 2011.
- E. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames 2012.
- F. ASTM A568/A568M - Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements For 2019a.
- G. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.
- H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2020.
- I. NAAMM HMMA 840 - Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames 2007.
- J. NAAMM HMMA 860 - Guide Specifications for Hollow Metal Doors and Frames 2018.
- K. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames 2014.
- L. NFPA 80 - Standard for Fire Doors and Other Opening Protectives 2019.
- M. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies 2022.
- N. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames 2013.
- O. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.
- B. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.
- C. Copy of SDI A250.11.

1.04 QUALITY ASSURANCE

- A. Maintain at project site copies of reference standards relating to installation of products specified.
- B. Pre-Installation Conference.
 - 1. Participate in pre-installation conference.
 - 2. In addition to agenda items specified in Section 01 3100, review following:

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- a. Schedule conference after hardware has been delivered to site and organized into hardware groups by door, but before installation of hardware.
- b. Check for appropriate blocking and for correct hardware models and fasteners for substrates.
- c. Review submittals and set of Manufacturer's installation, adjustment, and maintenance instructions submitted under Section 08 7101.
- d. Review use of crowbar or other prying devices are not permitted to be used to set door frame into wall opening.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
- B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.01 SUPPLIERS

- A. Architectural Building Supply, Salt Lake City, UT www.cookandboardman.com:
 1. Contact Information: Russ Farley: phone (800) 574-4369, fax 801-484-6817, or e-mail russf@absdoors.com.
- B. Beacon Metals Inc, Salt Lake City, UT www.beacon-metals.com:
 1. Contact Information: Jared Butler: phone (801) 486-4884, cell (435) 216-2297, FAX 801-485-7647, or e-mail Jared@beacon-metals.com.
- C. Midwest D-Vision Solutions, Salt Lake City, UT www.mwdsutah.com.
 1. Contact Information: Dan Mercer, office (801) 377-4355, cell (801) 618-9456, e-mail danm@mwdsutah.com.

2.02 MANUFACTURERS

- A. Hollow Metal Frames:
 1. Any current member of Steel Door Institute.

2.03 PERFORMANCE REQUIREMENTS

- A. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.04 HOLLOW METAL DOORS

- A. Doors:
 1. Meet one of following requirements:
 - a. Meet requirements of Steel Door Institute ANSI / SDI A250.8.
 - b. Commercial grade steel meeting requirements of ASTM A568/A568M, Class 1:
 - 1) Grade II for interior doors, Grade III for exterior doors.
 - 2) Model 1 Full Flush or Model 2 Seamless designs at Manufacturer's option.
 - 3) Type F and G as required.
 - 4) Finish:
 - (a) Interior doors primed or galvanized as per ASTM A653/A653M.
 - (b) Exterior doors galvanized and primed as per ASTM A653/A653M.
- B. Exterior Doors: Thermally insulated.
 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 2 - Heavy-duty.
 - b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 1 - Full Flush or 2 - Seamless.

- d. Zinc Coating: A60/ZF180 galvanized coating; ASTM A653/A653M.
- 2. Door Core Material: Polystyrene 1 lbs/cu ft minimum density.
 - a. Foam Plastic Insulation: Manufacturer's standard board insulation with maximum flame spread index (FSI) of 75, and maximum smoke developed index (SDI) of 450 in accordance with ASTM E84, and completely enclosed within interior of door.
- 3. Door Thermal Resistance: R-Value of 6.0 minimum, for installed thickness of polystyrene.
- 4. Door Face Sheets: Flush.
- 5. Door Finish: Factory primed and field finished.
- C. Fabrication:
 - 1. General:
 - a. Mortise and reinforce doors for hinges and locks.
 - b. Reinforce doors for closers and other surface applied hardware.
 - c. Drill and tap on job.
 - d. Seams along vertical edges of door need not be filled.
 - e. Do not extend hinge cut out full width of door unless fill strip is inserted, weld filled, and ground smooth so no seam appears on back face plate.

2.05 HOLLOW METAL FRAMES

- A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.
- B. Exterior Door Frames: Full profile/continuously welded type. Cold rolled furniture steel
 - 1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvanized) in accordance with ASTM A653/A653M, with A40/ZF120 coating.
 - 2. Frame Metal Thickness: 14 gage, 0.067 inch, minimum.
 - 3. Frame Finish: Factory primed and field finished.
 - 4. Provide labeled frame to match fire rating of door.
 - 5. Anchors: 16 US ga (1.6 mm) minimum meeting UL or other code acceptable requirements for door rating involved.
- C. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type. Cold rolled furniture steel
 - 1. Prime surfaces with rust inhibiting primer.
 - 2. Frame Metal Thickness: 16 gage, 0.053 inch, minimum.
 - 3. Frame Finish: Factory primed and field finished.
 - 4. Provide labeled frame to match fire rating of door.
 - 5. Anchors: 16 US ga (1.6 mm) minimum meeting UL or other code acceptable requirements for door rating involved.
- D. Frames for Wood Doors: Comply with frame requirements in accordance with corresponding door.
- E. Fabrication:
 - 1. General Requirements:
 - a. Provide temporary spreader on each welded frame.
 - b. Provide Manufacturer's gauge label for each item.
 - c. Make breaks, arrises, and angles uniform, straight, and true. Accurately fit corners.
 - 2. Frame width dimension:
 - a. Fabricate frame 1/8 inch wider than finished wall thickness as described in Contract Documents.
 - 3. Provide mortar guards at strikes and hinges.
 - 4. Anchors:
 - a. Provide three jamb anchors minimum for each jamb. On hinge side, install one anchor at each hinge location. On strike side, install one anchor at strike level and anchors at same level as top and bottom hinges. Tack weld anchors on frames intended for installation in framed walls.

- b. Frames installed before walls are constructed shall be provided with extended base anchors in addition to other specified anchors.
- c. Anchor types and configurations shall meet wall conditions.

2.06 FINISHES

- A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.
- B. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15 mil, 0.015 inch dry film thickness (DFT) per coat; provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.07 SOURCE QUALITY CONTROL

- A. Tests:
 - 1. Verification of Performance:
 - a. Label each door as conforming to above required standards.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

- A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.03 INSTALLATION

- A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.
- B. Install prefinished frames after painting and wall finishes are complete.
- C. Install fire rated units in accordance with NFPA 80.
- D. Coordinate frame anchor placement with wall construction.
- E. Set frame in location and level head.
 - 1. Use of crowbar or other prying device to set door frame into wall opening will damage door frames and are not permitted to be used.
- F. Equalize with adjustable floor anchor.
- G. Set spreaders and fasten jambs to floor and wall.
 - 1. Wood spreaders shall be square, fabricated from lumber one inch minimum thick, be same length as door opening at header, and same depth as frame.
 - 2. Cut notches for frame stops.
 - 3. Do not remove spreaders until frames are permanently anchored in wall.
 - 4. Use one spreader at base of frame and another at strike level.
 - 5. Do not use temporary spreaders welded to base of jambs during installation of frame.
- H. Fill gap between frame and framing with urethane foam or tightly-packed fiberglass insulation. If urethane foam is used, foam interior of frames before installing frame. Trim excess before installation of frame.
- I. Caulking:
 - 1. Caulk around both sides of frames of doors receiving acoustical seals with specified sealant.
 - 2. Caulk around both sides of frames installed in exposed masonry walls with specified sealant.
- J. Install door hardware as specified in Section 08 7100.

1. Comply with recommended practice for hardware placement of doors and frames in accordance with ANSI/SDI A250.6 or NAAMM HMMA 861.
- K. Comply with glazing installation requirements of Section 08 8000.
- L. Coordinate installation of electrical connections to electrical hardware items.
- M. Touch up damaged factory finishes.

3.04 TOLERANCES

- A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.
- B. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.
- C. Site Tolerances:
 1. Squareness: 1/16 inch from top edge to opposite top edge.
 2. Plumbness: 1/16 inch from top of jamb to bottom of jamb.
 3. Alignment: 1/16 inch from plane of left side face of jamb to right side face of jamb.
 4. Twist: 1/16 inch across throat of jamb plane measured across each face to plane of opposite jamb throat.
 5. Finished Clearance Between Door And Frame:
 - a. 1/16 inch at head and hinge jamb plus 1/16 inch maximum 2) 1/8 inch at strike jamb plus or minus 1/16 inch maximum.
 - b. 1/2 inch to top of finished floor surface or 1/4 inch to top of threshold, plus or minus 1/16 inch maximum.

3.05 ADJUSTING

- A. Adjust for smooth and balanced door movement.
- B. Adjust sound control doors so that seals are fully engaged when door is closed.
- C. Test sound control doors for force to close, latch, and unlatch; adjust as necessary in compliance with requirements.
- D. When Project is completed, doors shall not bind, stick, or be mounted so as to cause future hardware difficulties.
- E. Do not impair utility or structural strength of door in fitting of door, applying hardware, or cutting and altering door louvers, panels, or other special details.

3.06 FIELD QUALITY CONTROL

- A. Field Tests:
 1. Arrange to have keys brought to Project site and, in meeting attended by local representatives and Architect, test every new key and locking mechanism.
- B. Non-Conforming Work: Non-conforming work as covered in the General Conditions applies, but is not limited to the following:
 1. Correct any work found defective or not complying with contract document requirements at no additional cost to the Owner.
 2. Door frames:
 - a. Door frames damaged by use of crowbar or other prying devices to set door frames shall be repaired or replaced at no additional cost to Owner.

3.07 CLOSEOUT ACTIVITIES

- A. Instruction of Owner:
 1. Using Owner's Operations And Maintenance Manual, explain keying systems at same time keys and locking mechanisms are tested.
- B. Key Delivery:
 1. Immediately before Final Acceptance Meeting, turn change keys over to Owner properly organized, tagged, and placed in new key cabinet.

3.08 SCHEDULE

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A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION

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**SECTION 08 1416
FLUSH WOOD DOORS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Flush wood doors; flush and flush glazed configuration; non-rated, and acoustical.

1.02 RELATED REQUIREMENTS

- A. Section 06 2000 - Finish Carpentry: Wood door frames.
 B. Section 08 1113 - Hollow Metal Doors and Frames.
 C. Section 08 7100 - Door Hardware.
 D. Section 08 8000 - Glazing.

1.03 REFERENCE STANDARDS

- A. References
 B. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for Windows, Doors, and Skylights 2017.
 C. ASTM C1036 - Standard Specification for Flat Glass 2021.
 D. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards 2014, with Errata (2018).
 E. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1 2017, with Errata (2019).
 F. CPA (Composite Panel Association) - Standard Publications 2016.
 G. CPSC (Consumer Products Safety Commission - Safety Standard for Architectural Glazing Materials 16 CFR, Part 1201 CAT 1 and 11.
 H. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood 2016.
 I. NFPA 101-2018 - Life Safety Code 2018.
 J. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies 2022.
 K. UL 10B - Standard for Fire Tests of Door Assemblies Current Edition, Including All Revisions.
 L. UL 9 - Standard for Fire Tests of Window Assemblies Current Edition, Including All Revisions.

1.04 DEFINITIONS

1. Book-Match: Matching between adjacent veneer leaves on one panel face. Every other piece of veneer is turned over so that the adjacent leaves are "opened" as two pages in a book. The fibers of the wood, slanting in opposite directions in the adjacent leaves, create a characteristic light and dark effect when the surface is seen from an angle.
2. Fire-rated: Fire-retardant particleboard with an Underwriters' Laboratory (UL) stamp for Class 1 fire rating (Flame Spread 20, Smoke Developed 25). Fire-rated doors are available with particleboard and mineral cores for ratings up to 1-1/2 hours.
3. Fire-rated Door: A door made of fire-resistant material that can be closed to prevent the spread of fire and can be rated as resisting fire for 20 minutes (1/3 hour), 30 minutes (1/2 hour), 45 minutes (3/4 hour) (C), 1 hour (B), or 1-1/2 hours (B). The door must be tested and carry an identifying label from a qualified testing and inspection agency.
4. Grade: Unless otherwise noted, this term means Grade rules for Economy, Custom, and/or Premium Grade.
 - a. Custom Grade: Typically specified for and adequately covers most high-quality architectural woodwork, providing a well-defined degree of control over a project's quality of materials, workmanship, or installation.
 - b. Premium Grade: The highest Grade available in both material and workmanship where the highest level of quality, materials, workmanship, and installation is required.

5. Running Match: Each panel face is assembled from as many veneer leaves as necessary. Any portion left over from one panel may be used to start the next.

1.05 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference.
 1. Participate in pre-installation conference.
 2. In addition to agenda items specified in Section 01 3000, review following:
 - a. Schedule conference after hardware has been delivered to site and organized into hardware groups by door, but before installation of hardware.
 - b. Check for appropriate blocking and for correct hardware models and fasteners for substrates.
 - c. Review submittals and set of Manufacturer's installation, adjustment, and maintenance instructions submitted under Section 008 7100.
 - d. Review use of crowbar or other prying devices are not permitted to be used to set door frame into wall opening.

1.06 SUBMITTALS

- A. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.
- B. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.
 1. Provide information as required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).
 2. Indicate factory finish color and type.
- C. Certificate: Submit labels and certificates required by quality assurance and quality control programs.
- D. Samples:
 1. Provide 8 inch by 10 inch (200 mm by 255 mm) sample.
- E. Manufacturer's Installation Instructions: Indicate special installation instructions.
- F. Manufacturer's Qualification Statement.
- G. Warranty executed in Owner's name.
- H. Closeout Submittals:
 1. Include following information in Operations And Maintenance Manuals specified in Section 01 7800:
 - a. Record Documentation:
 - 1) Manufacturers Documentation:
 - (a) Manufacturer's product literature on doors and factory finish.
 - (b) Maintenance and repair instructions.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver in clean truck and, in wet weather, under cover.
- B. Deliver to building site only after plaster, cement, and taping compound are completed and dry and after interior painting operations have been completed.
- C. Individually wrap in polyethylene bags for shipment and storage.
- D. Store doors in a space having controlled temperature and humidity range between 25 and 55 percent.
- E. Accept doors on site in manufacturer's packaging and inspect for damage.
- F. Store flat on a level surface in a dry, well ventilated building.
- G. Cover to keep clean but allow air circulation.
- H. Handle with clean gloves and do not drag doors across one another or across other surfaces.
- I. Do not subject doors to abnormal heat, dryness, or humidity or sudden changes therein.

- J. Condition doors to average prevailing humidity of locality before hanging.

1.08 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Interior Doors: Provide manufacturer's warranty for the life of the installation.
1. Warranty shall include finishing, hanging, and installing hardware if manufacturing defect was discovered after door was finished and installed.
 2. Include coverage for delamination in any degree, warping or twisting of 1/4 inch or more in door panel at time of one-year warranty inspection, and telegraphing of core assembly: Variation of 1/100 inch or more in 3 inch span.

PART 2 PRODUCTS

2.01 SUPPLIERS

- A. Architectural Building Supply, Salt Lake City, UT www.cookandboardman.com:
1. Contact Information: Russ Farley: phone (800) 574-4369, fax 801-484-6817, or e-mail russf@absdoors.com.
- B. Beacon Metals Inc, Salt Lake City, UT www.beacon-metals.com:
1. Contact Information: Jared Butler: phone (801) 486-4884, cell (435) 216-2297, FAX 801-485-7647, or e-mail Jared@beacon-metals.com.
- C. Midwest D-Vision Solutions, Salt Lake City, UT www.mwdsutah.com.
1. Contact Information: Dan Mercer, office (801) 377-4355, cell (801) 618-9456, e-mail danm@mwdsutah.com.

2.02 APPROVED MANUFACTURERS

- A. Wood Veneer Faced Doors:
1. Graham Wood Doors, Mason City, IA.
 2. Marshfield Door Systems Inc, Marshfield, WI.
 3. VT Industries, Holstein, IA.

2.03 DOORS

- A. Wood Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
1. Type: AWS PC-5ME or FD-5ME.
 2. Grade: AWS Premium, except face veneer.
 3. Fully Type I Construction: Adhere all glue lines with Type I adhesive, including veneer lay-up.
 4. Face Veneer:
 - a. White maple meeting requirements of AWS Grade A, 1/50 inch (0.5 mm) thick minimum immediately before finishing.
 - b. Color: Clear white maple.
 - c. Face veneers shall be running book matched.
- B. Core:
1. Fully bonded to stiles and rails and sanded as a unit before applying veneers.
 2. Non-Rated:
 - a. 32 lb density meeting requirements of ANSI A208.1 Mat Formed Wood Particle Board, Grade 1-L-1 minimum.
 - b. Stiles:
 - 1) 1-3/8 inches deep minimum before fitting.
 - 2) Stile face to be hardwood matching face veneer material, thickness manufacturer's standard.
 - c. Rails:
 - 1) 1-1/8 inches
 - 2) Manufacturer's option.
- C. Glazing Configurations:

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1. Glazing (non-fire-rated openings): Tempered glazing meeting requirements of ASTM C1048, Kind FT, Condition A, Type I, Class I, Quality q3. Thickness 1/4 inch.
2. Lite Kit:
 - a. Design Criteria: Pre-finished wood or wood veneer frames.
3. Approved Product.
 - a. Profile M6G by Graham.
 - b. Profile W6 by Marshfield.
 - c. Profile VT1 by VT Industries.

2.04 DOOR CONSTRUCTION

- A. Cores Constructed with stiles and rails:
 1. Provide solid blocks at lock edge for hardware reinforcement.
 2. Provide solid blocking for other through bolted hardware.
- B. Where supplementary protective edge trim is required, install trim after veneer facing has been applied full-width.
- C. Glazed Openings: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.
- D. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.
- E. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.
- F. Cut and configure exterior door edge to receive recessed weatherstripping devices.
- G. Provide edge clearances in accordance with the quality standard specified.

2.05 FINISHES - WOOD VENEER DOORS

- A. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
 1. Transparent:
 - a. Applied by Door Manufacturer before leaving factory.

2.06 SOURCE QUALITY CONTROL

- A. Inspections:
 1. Verification of Performance:
 - a. Doors shall have following information permanently affixed on top of door:
 - 1) Manufacturer:
 - 2) Door designation or model.
 - 3) Veneer species.
 - 4) Factory finish.
 2. Clear Finished Hardwood:
 - a. Conform to National Fire Protection Standards, NFPA 80, for fire-rated doors.
 - 1) Required fire-rated doors shall bear approved labels of UL, Warnock Hersey International, or other code acceptable agency.
 - 2) Machining for hardware shall be complete before application of label.

PART 3 EXECUTION

3.01 CLOSEOUT ACTIVITIES

- A. Instruction of Owner:
 1. Using Owner's Operations and Maintenance Manual, explain keying systems at same time keys and locking mechanisms are tested.
- B. Key Delivery:
 1. Immediately before Final Acceptance Meeting, turn change keys over to Owner properly organized, tagged, and placed in new or existing key cabinet.

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END OF SECTION

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**SECTION 08 3100
ACCESS DOORS AND PANELS**

A. PART 1 GENERAL

I. SECTION INCLUDES

1. Wall and ceiling mounted access units.

II. SUBMITTALS

1. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.
2. Shop Drawings: Indicate exact position of each access door and/or panel unit.
3. Manufacturer's Installation Instructions: Indicate installation requirements.

B. PART 2 PRODUCTS

I. MANUFACTURED UNITS

1. Acceptable Manufacturers:
 - a. Babcock-Davis, Minneapolis, MN www.babcock-davis.com.
 - b. The Bilco Company, New Haven, CT www.bilco.com or Bilco Canada, London, ON (519) 659-7331.
 - c. Dur-Red Products, Cudahy, CA www.dur-red.com.
 - d. Elmdor Stoneman, City of Industry, CA www.elmdorstoneman.com.
 - e. Jensen Industries, Los Angeles, CA www.jensen-ind.com.
 - f. Karp Associates Inc, Maspeth, NY www.karpinc.com.
 - g. Larsen's Manufacturing Co, Minneapolis, MN www.larsensmfg.com.
 - h. Mifab Manufacturing Co, Minneapolis, MN www.mifab.com.
 - i. Milcor, Bensenville, IL www.milcorinc.com.
 - j. Nystrom Inc, Brooklyn Park, MN www.nystrom.com.
 - k. Williams Brothers Corporation of America, Reno, NV www.wbdoors.com.
 - l. Equal as approved by Architect before bidding. See Section 01 6200.

II. ACCESS DOORS AND PANELS ASSEMBLIES

1. Wall and Ceiling Mounted Units:
 - a. Location: As indicated on drawings.
 - b. Material: Steel; factory powder-coated finish.
 - c. Door/Panel: Continuous piano hinged, standard duty, manually operated with single key-operated lock, interior latch release, and continuous piano hinge hardware.
 - d. Wall Mounting Criteria: Provide surface-mounted face frame and door surface flush with frame surface.
2. Non-Fire-Rated Access panel, Class Two Quality Standards:
 - a. Material: Steel; factory powder-coated finish.
 - b. Acoustical Tile: DSC-210 by Karp.
 - c. Plaster: DSC-210 PL by Karp.
 - d. Drywall: KDW or Sesame (KSTDW or KSTE) by Karp.
 - e. Masonry: DSC-214M by Karp.
3. Non-Fire-Rated Insulated Door, Class Two Quality Standard:
 - a. Material: Steel; factory powder-coated finish.
 - b. KRP-150 FR or KRP-350.FR by Karp.

C. PART 3 EXECUTION

I. INSTALLATION

1. Install units in accordance with manufacturer's instructions.
2. Install frames plumb and level in openings, and secure units rigidly in place.

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3. Position units to provide convenient access to concealed equipment when necessary.

END OF SECTION

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**SECTION 08 4313
ALUMINUM-FRAMED STOREFRONTS**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Aluminum-framed storefront, with vision glass.
- B. Aluminum doors and frames.
- C. Aluminum-framed windows.
- D. Weatherstripping.
- E. Door hardware.

1.02 RELATED REQUIREMENTS

- A. Section 08 7100 - Door Hardware: Hardware items other than specified in this section.

1.03 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency current edition.
- B. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site 2015.
- C. AAMA SFM-1 - Aluminum Storefront & Entrance Manual Current.
- D. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems 2015.
- E. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document) 2015.
- F. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum 2014 (2015 Errata).
- G. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix) 2017a.
- H. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes 2014.
- I. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric) 2013.
- J. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium 2017.
- K. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel 2019.
- L. ASTM C1184 - Standard Specification for Structural Silicone Sealants 2018, with Editorial Revision.
- M. ASTM C920 - Standard Specification for Elastomeric Joint Sealants 2018.
- N. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen 2004 (Reapproved 2012).
- O. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference 2014.
- P. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference 2000 (Reapproved 2016).
- Q. ASTM E1886 - Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials 2019.

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- R. ASTM E1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes 2020.
- S. BHMA A156.19 - American National Standard for Power Assist and Low Energy Power Operated Doors 2013.
- T. ICC (IBC)-2018 - International Building Code 2018.
- U. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.
- V. NFRC 100 - Procedure for Determining Fenestration Product U-factors 2020.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate with installation of other components that comprise the exterior enclosure.
- B. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.
- C. Participate in MANDATORY pre-installation conference as specified in Section 06 1100.
 - 1. Schedule pre-installation conference one (1) week before scheduled installation of storefront system.
 - 2. In addition to requirements of Section 01 3000, review following:
 - a. Review rough opening requirements:
 - 1) Make certain rough openings are within tolerances required for installation of factory-fabricated frames.
 - 2) These dimensions have been agreed upon between Owner and Manufacturer and are shown on Standard Plan Drawings.
 - b. Review installation scheduling, coordination, placement of doors.
 - c. Review low-energy door operator location and requirements.
 - d. Review emergency locking locations and requirements.
 - e. Review the owner-furnished and owner-installed high security cylinder location and requirements.
 - f. Review the owner-furnished and owner-installed access control system locations and requirements.
 - g. Review location of signage on entrance doors.
 - h. Review delivery, storage, and handling requirements.
 - i. Review safety issues.
 - j. Review 'Finish' door and hardware requirements.
 - k. Review 'Protection' responsibilities.
 - l. Review 'Cleaning' responsibilities.

1.05 SUBMITTALS

- A. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, internal drainage details, color and finishes, storefront entry system and low-energy door operators.
- B. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.
 - 1. Include design engineer's stamp or seal on shop drawings for attachments and anchors.
 - 2. Show exact dimensions of factory-fabricated frames and required tolerances for rough openings. Submit shop drawings in time for Pre-Installation Conference specified in Section 06 1100.
 - 3. Show locations, sizes, etc, of hardware reinforcing.
 - 4. Show wind loads and engineering for Project conditions.
 - 5. Clearly mark components to identify their location in Project.
- C. Samples: Provide 12 inch long piece of window storefront frame to the architect for review of the color and finish.
- D. Informational Submittals:

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1. Qualification Statement:
 - a. Installer:
 - 1) Provide Qualification documentation if requested by Architect or Owner.
- E. Closeout Submittals:
 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Operations and Maintenance Data:
 - 1) Maintenance, adjustment, and repair instructions.
 - b. Warranty Documentation:
 - 1) Final, executed copy of Warranty.
 - (a) Storefront warranty.
 - (b) Storefront closers.
 - (c) Low-energy door operator.
 - c. Record Documentation:
 - 1) Manufacturers documentation:
 - (a) Manufacturer's literature or cut sheets for storefront system and for each item of hardware.
 - (b) Manufacturer's literature of cut sheets for low-energy door operators.
 - (c) Color and finish selections.
 - (d) Parts lists.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.
 1. Provide aluminum entrances and storefront systems produced by firm experienced in manufacturing systems that are similar to those indicated for this project and have record of successful in-service performance.
 2. Provide certified glass products through ANSI accredited certifications that include plant audits and independent laboratory performance testing.
 - a. Insulating Glass Certification Council (IGCC).
 - b. Safety Glazing Certification Council (SGCC).
- B. Fabricator Qualifications:
 1. Provide aluminum entrances and storefront systems fabricated by a firm experienced in producing systems that are similar to those indicated for this Project, and have record of successful in-service performance.
 2. Fabricator shall have sufficient production capacity to produce components required without causing delay in progress of the Work.
- C. Installer Qualifications:
 1. Minimum three (3) years experience in storefront installations.
 2. Minimum five (5) satisfactorily completed projects of comparable quality, similar size, and complexity in past three (3) years before bidding.
 3. Upon request, submit documentation.
- D. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.
 1. Provide company, field supervisors, and installers that hold active ANSI accredited certifications in appropriate categories for work specified.
 - a. North American Contractor Certification (NACC) for glazing contractors.
 - b. Equivalent independent third-party ANSI accredited certification.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Handle products of this section in accordance with AAMA CW-10.
- B. Deliver all parts of door, together with hardware, in original, unopened packages with labels intact to Project at same time.

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- C. Store in clean, dry location, indoors in Manufacturer's unopened packaging until ready for installation and in accordance with Manufacturer's instructions.
- D. Stack framing components in a manner that will prevent bending and avoid significant or permanent damage.
- E. Protect materials and finish from damage during storage, handling and installation.
- F. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.08 FIELD CONDITIONS

- A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.09 WARRANTY

- A. Manufacturer Warranty:
 - 1. Storefront Entrances:
 - a. Manufacturer's Warranty to be free of defects in material and workmanship.
 - b. Manufacturer's Warranty against deterioration or fading.
 - c. Manufacturer's Lifetime Warranty for Door Construction for normal use.
 - 2. Closers:
 - a. Closer Manufacturer's standard warranty, 10 years minimum.
 - 3. Low-Energy Door Operator:
 - a. Manufacturer's standard warranty.
- B. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.
- C. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 ASSEMBLIES

- A. Manufacturers:
 - 1. Arcadia Inc., Vernon CA www.arcadiainc.com.
 - a. Contact Information: Ken Martinek, (602) 734-5327 kmartinek@arcadiainc.com.
 - 2. Kawneer North America, Norcross, GA, www.kawneer.com/kawneer/north_america.
 - a. Contact Information: Bart Daniels cell (385) 214-4650 bart.daniels@alcoa.com.
- B. General:
 - 1. In addition to requirements shown or specified, comply with:
 - a. Applicable provisions of AAMA SFM 1, 'Aluminum Store Front and Entrance Manual' for design, materials, fabrication and installation of component parts.
- C. Design Criteria:
 - 1. Storefront System suitable for outside or inside glazing.

2.02 FRAMING COMPONENTS AND ACCESSORIES

- A. Aluminum Extrusions:
 - 1. 6063-T6 aluminum alloy or meet requirements of ASTM B221, alloy GS 10a T6.
 - 2. Anchors, Clips, and Accessories:
 - a. Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated (properly isolated steel from aluminum).
 - 3. Fasteners:
 - a. Aluminum, nonmagnetic stainless steel or other materials to be non-corrosive and compatible with aluminum window members, trim hardware, anchors, and other components.

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4. Glazing Gasket:
 - a. Compression-type design with replaceable extruded EPDM rubber.
 5. Reinforcing Members:
 - a. Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.
 - b. Mullion:
 - 1) Steel reinforced or heavy duty as necessary to prevent lateral flexing of mullion.
 6. Sills:
 - a. As shown on Drawings.
 7. Sealant:
 - a. Structural Sealant meeting requirements of ASTM C1184 for fabrication within storefront system:
 - 1) Permanently elastic, non-shrinking, and non-migrating type for joint size and movement.
 - 2) Single-component neutral-curing silicone formulation compatible with system components specifically formulated and tested for use as structural sealant and approved by structural-sealant manufacturer for use in aluminum-framed systems indicated.
 - 3) Color: Black.
 - b. Joint Sealants used at perimeter of storefront framing system: Elastomeric Sealant as specified in Section 07 9200.
 - c. Provide sealants for use inside of the weatherproofing system that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - d. Provide sealants for use inside of the weatherproofing system that have a VOC content of 250 g/L or less when required by local codes or AHJ.
 8. Tolerances:
 - a. Tolerances for wall thickness and other cross-sectional dimensions of storefront members in compliance with AA Aluminum Standards and Data.
- B. Storefront Framing System:
1. Brackets and Reinforcements:
 - a. Manufacturer's standard high-strength aluminum with non-staining, nonferrous shims for aligning system components.
 2. Fasteners and Accessories:
 - a. Manufacturer's standard corrosion-resistant, non-staining, non-bleeding fasteners and accessories compatible with adjacent materials.
 3. Perimeter Anchors:
 - a. When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.
- C. Finish:
1. Match doors.
- D. Approved Products See Section 01 6000 :
1. Non-Thermal, 2 inch (50 mm) Sightline:
 - a. Double Stack header at exterior doors only if shown on Contract Drawings.
 - b. Single Glazed:
 - 1) AR450 by Arcadia.
 - 2) Trifab VG 450 by Kawneer.
 - c. Double Glazed:
 - 1) AG451 by Arcadia.
 - 2) Trifab VG 451 by Kawneer.

- E. Approved Products -HVHZ:
1. Non-Thermal:
 - a. Single Glazed:
 - 1) IP2550 by Arcadia.
 - 2) IR 500 by Kawneer.
 - b. Double Glazed:
 - 1) IP2551 by Arcadia.
 - 2) IR 501 by Kawneer.

2.03 STOREFRONT SYSTEM PERFORMANCE REQUIREMENTS

- A. Provide test reports from AAMA accredited laboratories certifying performances if requested:
1. Air Leakage: Meet requirements of ASTM E283.
 2. Limit air leakage through assembly to 0.06 CFM/min/sq ft (.00003 m³/sm²) of wall area at 6.24 PSF (300 Pa) as measured in accordance with ASTM E283.
 3. Water Resistance: No water leakage when measured in accordance with ASTM E331 with static test pressure of 8PSF (384 Pa) as defined by AAMA 501.
 4. Dynamic Water Resistance: No water leakage, when measured in accordance with AAMA 501 with dynamic test pressure of 8 PSF (384 Pa).
 5. Limit mullion wind load deflection of L/175 with full recovery of glazing materials, when measured in accordance with ASTM E330/E330M.
 6. System shall not deflect more than 1/8 inch (3 mm) at center point, or 1/16 inch (1.58 mm) at enter point of horizontal member, once dead load points have been established.
 7. System shall accommodate expansion and contraction movement due to surface temperature differential of 180 deg F (82 deg C).
 8. Seismic testing shall conform to AAMA recommended static test method for evaluating performance of curtain walls and storefront wall systems due to horizontal displacements associated with seismic movements and building sway.

2.04 MANUALLY OPERATED DOORS

- A. Aluminum:
1. 6063-T6 aluminum alloy or meet requirements of ASTM B221, alloy GS 10a T6.
- B. Stiles:
1. 3-1/2 inches by 1-3/4 inches by 0.125 inches (89 mm by 45 mm by 3.175 mm) thick nominal.
- C. Top Rails:
1. 3-1/2 inches minimum by 1-3/4 inches by 0.125 inches (89 mm minimum by 45 mm by 3.175 mm) thick nominal.
- D. Bottom Rails:
1. 10 inches minimum by 1-3/4 inches by 0.125 inches (254 mm minimum by 45 mm by 3.175 mm) thick nominal.
- E. Construction:
1. Manufacturer's standard.
- F. Glazing Stops:
1. Snap-in type with neoprene bulb-type glazing. Units shall be glazed from exterior side.
- G. Weatherstripping:
1. Neoprene bulb-type.
 2. Approved Products. See Section 01 6000 :
 - a. Peri-Plus Seal (PPS) by Arcadia.
 - b. Sealair by Kawneer.
- H. Framing System Gaskets and Sealants:
1. Manufacturer's standard, recommended by manufacturer for joint type:
 2. Sealants: As specified in Framing Components and Accessories.

- I. Factory Finishing:
 - 1. Fluorocarbon Carbon: Comply with AAMA 2605:
 - a. Class I Color Anodic Finish: AA-M12C22A42/44 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; integrally colored or electrolytically deposited color coating 0.70 mils (0.01778 mm) or thicker), complying with AAMA 611.
 - b. Approved Colors:
 - 1) Dark Bronze or Extra Dark Bronze as selected by architect.
 - c. Approved Manufacturers. See Section 01 6000 :
 - 1) BASF.
 - 2) PPG Industries, Inc.
 - 3) Valspar Corporation.
 - d. Approved Products. See Section 01 6200 :
 - 1) Non-Thermal:
 - (a) MS362 Medium Stile by Arcadia.
 - (b) 350 Medium Stile by Kawneer.
 - e. Approved Products - HVHZ. See Section 01 6200:
 - 1) Single Glazed:
 - (a) MS362IP Medium Stile by Arcadia.
 - (b) 350 IR by Kawneer.

2.05 GLAZING

- A. Glazing as specified in Section 08 8000: 'Glass Glazing'.
- B. Glazing Gaskets:
 - 1. Compression-type design with replaceable extruded EPDM rubber.
- C. Spacers and Setting Blocks: Elastomeric.
- D. Bond-Breaker (Sealer) Tape: Standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.
- E. Glazing Sealant:
 - 1. Structural Sealant meeting requirements of ASTM C1184:
 - a. Permanently elastic, non-shrinking, and non-migrating type for joint size and movement.
 - b. Single-component neutral-curing silicone formulation compatible with system components specifically formulated and tested for use as structural sealant and approved by structural-sealant manufacturer for use in aluminum-framed systems indicated.
 - c. Color: Black.
 - 2. Weather Sealant:
 - a. ASTM C920 for Type S, Grade NS, Class 25, Uses NT, G, A, and O; single component neutral-curing formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weather seal sealant, and aluminum-framed-system manufacturers for this use.
 - b. Color: Match structural sealant.

2.06 HARDWARE

- A. Hinging:
 - 1. Top and bottom offset, ball bearing pivots per door leaf.
 - 2. Color: Dark Bronze Anodized or Extra Dark Bronze Anodized as selected by architect.
- B. Overhead Door Closers:
 - 1. Provide parallel arms on closers unless door position requires otherwise.
 - 2. Refer to Contract Drawings for the required opening degrees of the closer arm and the use of the arm as a stop, where required.

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3. Adjust closers to provide maximum opening force as required by governing code authority.
 4. Closers shall have following features:
 - a. Surface mounted.
 - b. Adjustable sweep speed.
 - c. Adjustable backcheck.
 - d. Non-handed, non-sized.
 - e. Cush arm by LCN or equal by Norton.
 - f. Color: Dark Bronze Anodized or Extra Dark Bronze Anodized as selected by architect.
 5. Approved Products. See Section 01 6000 .
 - a. 4041 Series parallel arm by LCN.
 - b. 7500 Series Parallel arm by Norton.
- C. Exit Devices:
1. Entry Doors:
 - a. Operation:
 - 1) Entry shall be by key or access control system as noted on the Construction Drawings.
 - (a) At keyed doors, device shall be locked by cylinder from outside. Key shall be removable when cylinder is in locked or unlocked position.
 - (b) At access control doors, provide electric strike to facilitate access control system. Coordinate wiring requirements with the manufacturer.
 - 2) Dogging operation shall be by manufacturer's accessible thumbturn cylinder function.
 - 3) Exterior Trim: Lever Handle or Pull equal to Kawneer CO-9 or Arcadia OPR- 9.
 - 4) Types:
 - (a) Rim Type.
 - (1) All Entry Doors except as otherwise noted in the Hardware Groups Section of this Specification.
 - (2) Provide type of strike that will allow installation of specified panic devices on storefront system specified.
 - (b) Approved Products. See Section 01 6200:
 - (1) Apex Series by Precision.
 - (2) 8600 Series by Sargent.
 - (3) 98 or 99 Rim Series by Von Duprin.
 2. Access Doors:
 - a. Operation:
 - 1) Access accomplished by dogging device. Dogging operation shall be by accessible, permanent knob, not by removable allen wrench devices.
 - 2) Exterior Trim: Match Entry Doors.
 - 3) Types:
 - (a) Rim Type.
 - (1) All Access Doors except as otherwise noted in the Hardware Groups Section of this Specification.
 - (2) Provide type of strike that will allow installation of specified panic devices on storefront system specified.
 - (b) Approved Products. See Section 01 6200:
 - (1) Apex Series by Precision.
 - (2) 8600 Series by Sargent.
 - (3) 98 or 99 Rim Series by Von Duprin.
 3. Color: Dark Bronze Anodized or Extra Dark Bronze Anodized as selected by architect.
- D. Low-Energy Swing Door Operator:
1. Meet requirements of ICC/ANSI 117.1 and BHMA A156.19.
 2. Wall-mounted push button operation.

3. Solid state electronic control.
 4. Adjustable closing speed and hold-open range.
 5. Automatic and manual operating modes.
 6. Metal cover finished to match door.
 7. Approved Products. See Section 01 6000 :
 - a. Besam SW100 by Besam (subsidiary of ASSA ABLOY) US-Monroe, NC
www.besam.us.
 - b. Horton Series 7100 Low Energy by Horton Automatics (Division of Overhead Door Corp.), Corpus Christi, TX www.hortondoors.com.
 - c. Record 6100 Series Low Energy Swing Door Operator by Record-USA, Monroe, NC
www.record-usa.com.
 - d. Stanley Magic-Force by Stanley Access Technologies, Farmington, CT
www.stanleyaccesstechnologies.com.
- E. Thresholds:
1. Exterior:
 - a. Design Criteria: Meet handicap accessibility requirements.
 - b. Exterior to Paver Tile on Setting Bed: Manufacturer's standard.
 - c. Exterior to Thin-Set Paver Tile: Similar to Pemko 253, 254, or 255 Profile.
 - d. Exterior to Carpet Tile: Similar to Pemko 273 Profile.
 - e. At Vestibule with Paver Tile on Setting Bed: Manufacturer's standard.
 - f. At Vestibule with Floor Mat: Acceptable Manufacturers:
 - 1) Half Saddle Model 254A by Pemko, Ventura, CA www.pemko.com.
 - 2) Equal as approved by Architect before installation. See Section 01 6200.
 - g. All Others: Manufacturer's standard.
 2. Interior:
 - a. Design Criteria: Meet handicap accessibility requirements.
 - b. Carpet Tile / Carpet to Carpet: Similar to Pemko 236.
 3. Color: Mill finish aluminum.
- F. Sweep Strips:
1. Quality Standard:
 - a. Entrance Manufacturer's standard (cover cap with no exposed fasteners).
 - b. Pemko 293100 ND DB (dark bronze).
- G. Push / Pulls:
1. Approved Products. See Section 01 6000:
 - a. PBR and OPR-9 by Arcadia.
 - b. Kawneer CP and CO-9
 2. Color: Dark Bronze Anodized or Extra Dark Bronze Anodized as selected by architect.
- H. ASSA Instacores with ASSA Profile 62 key system (furnished and installed by Owner). Verify manufacturer and keyway with FM Group:
1. Church And Factory Authorized Distributor:
 - a. Clark Security Products, 135 West 2950 South, Salt Lake City, UT.
 - 1) Local: (801) 487-3227.
 - 2) Other: (800) 453-6430.
 - 3) FAX: (801) 487-3254.
- I. Access Control System
1. Furnished and Installed by the Contractor.
 2. Approved Manufacturer:
 - a. Kindoo Access Control system.
 3. Approved Installers:
 - a. Troy Muir
Everest Contracting

(801) 550-9933
trm.everest@gmail.com

- b. Other authorized suppliers and installers as authorized by the manufacturer and approved by the architect prior to bidding.
- J. Emergency Lock
 - 1. Activated by switch at Support Specialist's desk.
 - a. System is deactivated by default.
 - b. System is only activated by switch as described above.
 - 2. System:
 - a. Electric strike installed at each door noted on the Door Schedule.
- K. Kick Plates:
 - 1. Push side of Door only.
 - 2. 8 inches (254 mm) high by width of door less 3/4 inch (19 mm) on each side. Verify that the height of the kick plates is 2" less in height than the height of the bottom rail of the door.
 - 3. Material: 0.050 inch (1.27 mm) thick Stainless Steel.
 - 4. Finish: 695 / US10BE Dark Bronze Powder Coated.
 - 5. Acceptable Manufacturers:
 - a. Glynn-Johnson, Indianapolis, IN www.glynn-johnson.com.
 - b. Hager, St Louis, MO (800) 255-3590 or (314) 772-4400 www.hagerhinge.com.
 - c. Ives, Wallingford, CT www.iveshardware.com.
 - d. Rockwood Manufacturing Co, Rockwood, PA www.rockwoodmfg.com.
 - e. Equal as approved by Architect before bidding. See Section 01 6000.

2.07 FABRICATION

- A. Construction shall meet Manufacturer's recommendations.
- B. Fabricate components that, when assembled, have following characteristics:
 - 1. Profiles sharp, straight, and free of defects or deformations.
 - 2. Accurately fit joints; make joints flush, hairline and weatherproof.
 - 3. Means to drain water passing joints, condensation within framing members, and moisture migrating within system to exterior.
 - 4. Physical and thermal isolation of glazing from framing members.
 - 5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 - 6. Provisions for field replacement of glazing.
 - 7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
 - 8. Framing members shall be internally reinforced and secured at head and sill as necessary for structural performance requirements and for hardware attachment.
- C. Fabricate in factory to dimensions required to fit framed openings detailed on Contract Documents. Joints shall be tightly closed.
- D. Mortise in manner to give maximum hardware-door connection strength and neatness of appearance. Adequately reinforce with back plates or rivets to hold pivots and closers.
- E. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
- F. Structural-Sealant-Glazed Framing Members: Include accommodations for using temporary support device to retain glazing in place while structural sealant cures.
- G. Storefront Framing: Fabricate components for assembly using manufactures standard installation instructions.
- H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.08 HARDWARE FINISHES

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- A. Finishes for steel, brass, or bronze hardware items shall be satin chromium plated.
- B. Materials other than steel, brass, or bronze shall be finished to match the appearance of satin chromium plated.

PART 3 EXECUTION

3.01 INSTALLERS

- A. Performance Standard Installers: See Section 01 6200 for definitions of Categories. See Section 01 4301 and 'Quality Assurance' in Part 1 'General' for Installer Qualifications of this specification:
 - 1. General Contractor responsible for Installer(s), verification of qualifications, and performance. Contact Approved Manufacturer's Representative specified in Part 2 'Products' of this specification for potential installers if desired.

3.02 EXAMINATION

- A. Verify dimensions, tolerances, and method of attachment with other work.
- B. Verify that wall openings and adjoining air and vapor seal materials are ready to receive work of this section.
- C. Verify that framed openings comply with Contract Document requirements.
- D. Verify floor is level across entire width of automatic door opening.
- E. Verify sill conditions are level and/or sloped away from openings as specified.
- F. Verify wall framing is dry, clean, sound, and free of voids and offsets, construction debris, sharp edges or anything that will prevent a successful installation of storefront system.
- G. Notify Architect and Owner in writing if framed openings are not as agreed upon.
 - 1. Do not install storefront entry and window frames until deficiencies in framed openings have been corrected to allow installation of standard entries and windows.
 - 2. Commencement of Work by installer is considered acceptance of substrate.

3.03 INSTALLATION

- A. Install wall system in accordance with manufacturer's instructions.
- 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. Turn up ends and edges; seal to adjacent work to form water tight dam.
- G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.
- H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- I. Install doors without warp or rack. Adjust doors and hardware to provide ninety (90) degree operation, tight fit at contact points and smooth operation.
- J. Install exterior window units with through wall sill flashing.
- K. Thresholds:
 - 1. Accurately cut thresholds to fit profile of storefront frame. Bed exterior thresholds in specified sealant at contact points with floor and make watertight.
- L. Sealants:
 - 1. Apply in accordance with Section 07 9213 'Elastomeric Joint Sealant' requirements.

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2. Caulk joints between frames and walls, both interior and exterior to provide weather tight installation.
- M. Glazing Characteristics:
1. Interior Vestibule Glazing: Clear.
 2. Exterior Storefront Doors And Windows:
 - a. Clear interior pane and clear exterior pane with Low E treatment on surface 2.
 - b. Obscure glazing at restroom windows with Low E treatment on surface 2.
- N. Set thresholds in bed of sealant and secure.
- O. Install hardware using templates provided.
1. See Section 08 7100 for hardware installation requirements.
- P. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.04 TOLERANCES

- A. Maximum Variation from Plumb: 0.06 inch per 3 feet non-cumulative or 0.06 inch per 10 feet, whichever is less.
- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.
- C. Set plumb, square, level, and in correct alignment and securely anchor to following tolerances:
1. Variation from plane: Limit to 1/8 inch (3 mm) in 12 feet (3.6 meters); 1/4 inch (6 mm) over total length.
 2. Offset from Alignment: For surfaces abutting in line, limit offset to 1/16 inch (1.6 mm).
 3. Offset at Corners: For surfaces meeting at corner, limit offset to 1/32 inch (0.8 mm).
 4. Diagonal measurements: Limit difference between diagonal measurements to 1/8 inch (3 mm).
 5. Sidelites: Line up horizontal rail in sidelight with door rail.

3.05 FIELD QUALITY CONTROL

- A. Provide services of storefront manufacturer's field representative to observe for proper installation of system and submit report.
- B. Field Tests and Inspections:
1. Pull test doors, especially pairs of single doors separated by permanent mullions, to ensure security of opening.
 2. Make all necessary final adjustments to attain normal operation of each door and its mechanical hardware.
- C. Non-Conforming Work: Non-conforming work as covered in the General Conditions applies, but is not limited to the following:
1. Correct any work found defective or not complying with contract document requirements including removal and replacement of glass that has been broken, chipped, cracked, abraded, or damaged during construction period at no additional cost to the Owner.

3.06 ADJUSTING

- A. Adjust operating hardware and sash for smooth operation.
- B. Adjust swing doors for proper operation after glazing entry. After repeated operation of completed installation, re-adjust door for optimum operating condition and safety if required.

3.07 CLEANING

- A. Follow Manufacturer's written recommendations for cleaning and maintenance or guidelines of AAMA 609 & 610 'Cleaning and Maintenance Guide for Architecturally Finished Aluminum' (combined documents). Avoid damaging protective coatings and finishes.
- B. Remove protective material from pre-finished aluminum surfaces.
- C. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, and take care to remove dirt from corners and to wipe surfaces clean.

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- D. Upon completion of installation, thoroughly clean aluminum surfaces in accordance with AAMA 609 & 610.
- E. Remove nonpermanent labels, protective films, and clean surfaces following recommended procedures.
 - 1. Do not remove permanent AAMA/CSA or NFRC labels.
- F. Waste Management:
 - 1. Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

3.08 PROTECTION

- A. During Installation:
 - 1. Installer's Responsibility:
 - a. During installation, all adjacent work shall be protected from damage.
- B. After Installation:
 - 1. General Contractor's Responsibility:
 - a. Institute protective measures required throughout remainder of construction period to ensure that aluminum entrances and storefronts will be without damage or deterioration, other than normal weathering, at time of acceptance.

END OF SECTION

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**SECTION 08 7100
DOOR HARDWARE**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Hardware for wood, aluminum, and hollow metal doors.
- B. Thresholds.
- C. Weatherstripping and gasketing.

1.02 RELATED REQUIREMENTS

- A. Section 07 9200 - Joint Sealants: Sealants for setting exterior door thresholds.
- B. Section 08 0671 - Door Hardware Schedule: Schedule of door hardware sets.

1.03 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.
- B. BHMA A156.2 - American National Standard for Bored and Preassembled Locks & Latches 2017.
- C. BHMA A156.16 - American National Standard for Auxiliary Hardware 2018.
- D. BHMA A156.28 - American National Standard for Recommended Practices for Mechanical Keying Systems 2018.
- E. DHI (H&S) - Sequence and Format for the Hardware Schedule 1996.
- F. NFPA 80 - Standard for Fire Doors and Other Opening Protectives 2019.
- G. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives 2019.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the manufacture, fabrication, and installation of products that door hardware is installed on.
- B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.
- C. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.
- D. Provide hardware templates to Sections 08 1213, 08 1313, and 08 1429 within fourteen (14) days after Architect approves hardware schedule.
- E. Supply necessary hardware installation templates to Section 06 2024 before pre-installation conference.

1.05 SUBMITTALS

- A. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.
 - 1. Manufacturer's cut sheets.
 - 2. Two (2) copies of Manufacturer's installation, adjustment, and maintenance instructions for each piece of hardware. Include one (1) set in 'Operations And Maintenance Manual' and send one (1) set with hardware when delivered.
 - 3. Copy of hardware schedule.
 - 4. Written copy of keying system explanation.
- B. Shop Drawings - Door Hardware Schedule: Submit detailed listing that includes each item of hardware to be installed on each door. Use door numbering scheme as included in Contract Documents.
 - 1. Submit hardware schedule indicating hardware to be supplied.

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2. Schedule shall indicate details such as proper type of strikeplates, spindle lengths, hand, backset, and bevel of locks, hand and degree opening of closer, length of kickplates, length of rods and flushbolts, type of door stop, and other necessary information necessary to determine exact hardware requirements.
 3. Prepared by or under supervision of Architectural Hardware Consultant (AHC).
 4. Comply with DHI (H&S) using door numbers and hardware set numbers as indicated in construction documents.
 5. List groups and suffixes in proper sequence.
 6. Provide complete description for each door listed.
 7. Provide manufacturer's and product names, and catalog numbers; include functions, types, styles, sizes and finishes of each item.
 8. Include account of abbreviations and symbols used in schedule.
- C. Closeout Submittals:
1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Operations and Maintenance Data:
 - 1) Manufacturer's installation, adjustment, and maintenance instructions for each piece of hardware.
 - b. Record Documentation:
 - 1) Manufacturers documentation:
 - (a) Manufacturer's literature and/or cut sheets.
 - (b) Include keying plan and bitting schedule.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing work of the type specified for commercial door hardware with at least three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Neatly and securely package hardware items by hardware group and identify for individual door with specified group number and set number used on Supplier's hardware schedule.
- B. Include fasteners and accessories necessary for installation and operation of finish hardware in same package.

PART 2 PRODUCTS

2.01 SUPPLIERS

- A. Approved Suppliers.
1. Architectural Building Supply, Salt Lake City, UT www.cookandboardman.com:
 - a. Contact Information: Russ Farley, phone (800) 574-4369, fax 801-484-6817, or e-mail russf@absdoors.com.
 2. Beacon Metals Inc, Salt Lake City, UT www.beacon-metals.com:
 - a. Contact Information: Jared Butler, phone (801) 486-4884, cell (435) 216-2297, FAX 801- 485-7647, or e-mail Jared@beacon-metals.com.
 3. Midwest D-Vision Solutions, Salt Lake City, UT www.mwdsutah.com.
 - a. Contact Information: Dan Mercer, office (801) 377-4355, cell (801) 618-9456, e-mail danm@mwdsutah.com.

2.02 DESIGN AND PERFORMANCE CRITERIA

- A. Fasteners:
1. Provide fasteners of proper type, size, quantity, and finish that comply with commercially recognized standards for proposed applications.
 - a. Aluminum fasteners are not permitted.
 - b. Provide phillips flat-head screws with heads finished to match door surface hardware unless otherwise indicated.
 2. Provide machine screws for attachment to reinforced hollow metal and aluminum frames.
 - a. Self-drilling (Tek) type screws are not permitted.

3. Provide stainless steel machine screws and lead expansion shields for concrete and masonry substrates.
4. Provide wall grip inserts for hollow wall construction.
5. Provide spacers or sex bolts with sleeves for through bolting of hollow metal doors and frames.
6. Fire-Rated Applications: Comply with NFPA 80.
 - a. Provide wood or machine screws for hinges mortised to doors or frames, strike plates to frames, and closers to doors and frames.
 - b. Provide steel through bolts for attachment of surface mounted closers, hinges, or exit devices to door panels unless proper door blocking is provided.
7. Concealed Fasteners: Do not use through or sex bolt type fasteners on door panel sides indicated as concealed fastener locations, unless otherwise indicated.

2.03 FINISHES

- A. Hardware Finishes:
 1. Interior Door Hardware:
 - a. Finishes for brass or bronze hardware items shall be:
 - 1) ANSI / BHMA Finish Code 626.
 - (a) Description: Satin Chromium Plated.
 - (b) Base Metal: Brass. Bronze.
 - b. Finishes for flat goods items may be:
 - 1) ANSI / BHMA Finish Code 630.
 - (a) Description: Satin Stainless Steel.
 - (b) Base Metal: Stainless Steel (300 Series).
 - c. Materials other than steel, brass, or bronze shall be finished to match appearance satin chromium plated, except flat goods which shall be satin stainless steel.
 2. Exterior Door Hardware:
 - a. Finishes for brass or bronze hardware items shall be:
 - 1) Description: Dark Bronze to match exterior storefront hardware.
 - 2) Base Metal: Brass. Bronze.
 - b. Finishes for flat goods items may be:
 - 1) Description: Dark Bronze to match exterior storefront hardware.
 - 2) Base Metal: Stainless Steel (300 Series).
 - c. Materials other than steel, brass, or bronze shall be finished to match appearance satin chromium plated, except flat goods which shall be satin stainless steel.

2.04 HINGES

- A. Manufacturer Contact List:
 1. Hager Companies, St Louis, MO www.hagerhinge.com.
 2. Ives, New Haven, CT www.iveshardware.com.
 3. McKinney, Scranton, PA www.mckinneyhinge.com.
 4. PBB, Ontario, CA www.pbbinc.com.
 5. Stanley (dormakaba Americas), Indianapolis IN www.stanleyhardwarefordoors.com/products/.
- B. Hinges:
 1. Doors:
 - a. Sizes:
 - 1) Non-Fire-Rated Doors:
 - (a) 1-3/4 inch 44.5 mm non-fire-rated wood doors in wood frames: 4 inches by 4 inches.
 2. Use non-removable pins on exterior opening doors.
 3. Hinges on exterior doors shall be solid brass, plated to achieve specified finish.
 4. Approved Products.
 - a. Interior:

- 1) Hager: BB 1279.
 - 2) Ives: 5BBI.
 - 3) McKinney: TA 2714.
 - 4) MacPro / McKinney: MPB79.
 - 5) PBB: BB81.
 - 6) Stanley: FBB 179.
- b. Exterior:
- 1) Hager: BB 1191.
 - 2) Ives: 5BBI.
 - 3) McKinney: TA 2314.
 - 4) PBB: BB21.
 - 5) Stanley: FBB 191.

2.05 SECURING DEVICES

A. Definitions:

1. Grade 2 Standard Duty Key-In Lever Cylindrical Lockset:
 - a. Performance Features:
 - 1) Exceeds 400,000 ANSI cycles.
 - 2) Single motion egress provides easy emergency exit.
 - 3) Full 1 inch (25 mm) throwbolt with saw resistant hardened steel roller pin.
 - 4) Anti-drill design deadbolt. Two (2) ball bearings inserted to prevent drill attacks.
 - 5) ADA-compliant thumbturn.

B. Manufacturers:

1. Manufacturer List:
 - a. Precision Hardware, Romulus, MI www.precisionhardware.com.
 - b. Rockwood, Manufacturing Co, Rockwood, PA www.rockwoodmfg.com.
 - c. Sargent, New Haven, CT www.sargentlock.com.
 - d. Schlage, Colorado Springs, CO www.schlage.com.
 - e. Von Duprin, Indianapolis, IN www.vonduprin.com.
 - f. Yale Commercial Locks, Lenoir City, TN www.yalecommercial.com.

C. General:

1. Backsets shall be 2-3/4 inches (70 mm).

D. Locksets And Latchsets:

1. Design Criteria:
 - a. Grade 2 Standard Duty Key-In Lever Cylindrical Lockset:
 - 1) ANSI/BHMA A156.2 Series 4000 Grade 2.
 - 2) Meet UL 3 hour fire rating.
 - 3) Meet ADA Compliant ANSI A117.1 Accessibility Code.
 - 4) Door Lever:
 - (a) Meet California code for 1/2 inch (12.7 mm) or less return to door.
 - b. Vandlgard setting.
2. Lever Operated:
 - a. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) 7K Series Best Lock with 15D Lever by Stanley standard cylinders.
 - 2) 175 Series with American Lever by Marks USA.
 - 3) 7 Line Series with L Lever by Sargent.
 - 4) AL Series with Saturn (SAT) Lever by Schlage.
 - 5) 5300LN Series with Augusta (AU) Lever by Yale.

E. Mortised Privacy Locksets:

1. Design Criteria:
 - a. Grade 1 Mortised Privacy Lockset:
 - 1) ANSI/BHMA A156.13 Series 1000 Operational Grade 1.

- 2) Meet UL 3 hour fire rating.
 - 3) Meet ADA Compliant ANSI A117.1 Accessibility Code.
 - 4) Green "Available" and Red "Occupied" occupancy indicator on both exterior and interior escutcheon trim.
 - 5) Laser engraved interior escutcheon to indicate the direction of locking.
 - 6) Function as defined in Section 08 0671 Hardware Group and Keying Schedules.
 - 7) Lever handle design shall match other door lever handles.
 - 8) Exterior operated by emergency key.
2. Lever Operated:
- a. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) 7800 / 8200 Series Mortise Locks by Sargent.
 - (a) VN1 Escutcheon Design, both sides of door.
 - 2) L Series Mechanical Mortise Locks by Schlage.
 - (a) N Escutcheon Indicators, both sides of door.
 - 3) Equal as approved by the Architect prior to bidding.
- F. Deadbolts:
1. Category Four Approved Products. See Section 01 6000 for definitions of Categories:
 - a. Match manufacturer of locksets.
- G. Cylinders:
1. Owner will furnish and install cylinders and keying. Verify type, keyway, and other requirements with the Church FM Group.
- H. Classroom Security Exit Devices:
1. Locking exit device with locking indicator on the inside trim.
 - a. Thumbturn locking functionality on the inside.
 - b. Key-operated cylinder from the outside.
 - c. Vandlgard setting.
 2. Use operable lever trim.
 3. Approved Products.
 - a. 8816 or 8866 Series by Sargent.
 - b. 99 or 98 Series by Von Duprin.
 - c. Equal as approved by the Architect prior to bidding.

2.06 DOOR PULLS AND PUSH BARS

- A. Standard Door Push / Pulls:
1. Size: 15 inches (380 mm) by 3-1/2 inch (89 mm).
 2. Acceptable Products:
 - a. PS3515, PL3515 / 80301 by Glynn-Johnson, Indianapolis, IN www.glynn-johnson.com.
 - b. 39E, 30S by Hager, St Louis, MO www.hagerhinge.com.
 - c. 8200, 8302 by Ives, Wallingford, CT www.iveshardware.com.
 - d. 70B, 105x70B by Rockwood Manufacturing Co, Rockwood, PA www.rockwoodmfg.com.
 - e. Equal as approved by Architect before installation. See Section 01 6000.

2.07 CLOSERS

- A. Approved Manufacturers.
1. 8900 Series by Dorma Architectural Hardware, Reamstown, PA www.dorma.com/usa.
 2. 1461 Series by LCN Closers, Princeton, IL www.lcnclosers.com.
 3. 8501 Series by Norton Door Controls, Charlotte, NC www.nortondoорcontrols.com.
 4. 1431 Series by Sargent, New Haven, CT www.sargentlock.com.
 5. D-3550/D-3551 Series by Stanley (dormakaba Americas), Indianapolis IN www.stanleyhardwarefordoors.com/products/.
- B. Surface-Mounted Overhead Door Closers:

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1. Closers provided under this Section shall be from same Manufacturer.
2. Provide parallel arms on closers unless door position in relation to adjacent wall requires otherwise. Provide covers.
3. Door Closers on doors that swing 180 degree as shown on Contract Documents:
 - a. Closers shall allow for 180 degree opening without engaging stop function. Wall stop or Floor stop is specified in Door Schedule and Section 08 7108, 'Stops And Holders'.
 - b. Closers shall have following features:
 - 1) Adjustable sweep speed.
 - 2) Adjustable backcheck.
 - 3) Non-handed, non-sized.
 - 4) Hold open arm function (Friction Hold Open) (Non-Fire-Rated Corridors).
 - 5) Delayed action closing where noted on Door Schedule.
4. Door Closers on doors that swing 90 degree as shown on Contract Documents:
 - a. Closers shall allow for 100 degree opening with engaging stop function.
 - b. Closers shall have following features:
 - 1) Adjustable sweep speed.
 - 2) Adjustable backcheck.
 - 3) Non-handed, non-sized.
 - 4) Hold open arm function with thumb turn or handle control (Cush And Hold).
 - 5) Delayed action closing where noted on Door Schedule.

2.08 KICK PLATES

- A. Acceptable Manufacturers:
 1. Glynn-Johnson, Indianapolis, IN www.glynn-johnson.com.
 2. Hager, St Louis, MO (800) 255-3590 or (314) 772-4400 www.hagerhinge.com.
 3. Ives, Wallingford, CT www.iveshardware.com.
 4. Rockwood Manufacturing Co, Rockwood, PA www.rockwoodmfg.com.
- B. Kick Plates: Provide along bottom edge of push side of every door with closer, except aluminum storefront and glass entry doors, unless otherwise indicated.
 1. Material: 0.050 inch thick stainless steel.
 2. Size: 10 inch high by 2 inch less door width (LDW) on push side of door.

2.09 STOPS AND HOLDERS

- A. Manufacturers:
 1. Manufacturer Contact List:
 - a. Glynn-Johnson, Indianapolis, IN www.glynn-johnson.com.
 - b. Hager, St Louis, MO www.hagerhinge.com.
 - c. Ives, Wallingford, CT www.iveshardware.com.
 - d. Rockwood Manufacturing Co, Rockwood, PA www.rockwoodmfg.com.
 - e. Sargent, New Haven, CT (800) 906-6606 or (203) 562-2151 www.sargentlock.com.
- B. Stops:
 1. Use wall type stops unless indicated otherwise on Door Schedule.
 2. Provide model appropriate for substrate. Wall stops may be either cast or wrought.
 3. Acceptable Products:
 - a. Interior Wall Exterior Wall Floor Mount Overhead.
 - b. Hager 236W 255W 243F
 - c. Ives WS407CCV WS447 FS438
 - d. Rockwood 409 474 / 475 440 / 441
 - e. Glynn Johnson GJ 90S
 - f. Sargent 590S Series

2.10 ACCESSORIES

- A. Manufacturers:

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1. Manufacturer Contact List:
 - a. Hager, St Louis, MO www.hagerhinge.com.
 - b. Ives, Wallingford, CT www.iveshardware.com.
 - c. NGP - National Guard Products, Memphis, TN www.ngpinc.com.
 - d. Pemko Manufacturing, Ventura, CA www.pemko.com.
- B. Acoustical Seals:
 1. Color as selected by Architect.
 2. Acceptable Products:
 - a. Door Bottom Shoe for Wood Door:
 - 1) 13VDkB by NGP.
 - 2) 211AV by Pemko.
 - b. Door Bottom Shoe for Metal Door:
 - 1) 779S-A by Hager.
 - 2) 35EV by NGP.
 - 3) 217AV by Pemko.
- C. Smoke Gaskets:
 1. Color as selected by Architect.
 2. Acceptable Products:
 - a. 726 by Hager.
 - b. 5050 by NGP.
 - c. PK 55 by Pemko.
- D. Sweepstrip (metal door bottom):
 1. Clear anodized aluminum with black neoprene insert.
 2. Reduce infiltration of air, wind, dust, rain, and snow.
 3. Meet UL requirements.
 4. For use with saddle thresholds.
 5. Acceptable Products:
 - a. 750S CLR by Hager.
 - b. 198N A by NGP.
 - c. 321 CN by Pemko.
 - d. Equal as approved by Architect before bidding. See Section 01 6000.
- E. Thresholds:
 1. Acceptable Products:
 - a. Design Criteria:
 - 1) Meet handicap accessibility requirements (ADA):
 - b. Interior Doors at Acoustic Seals, Approved Products:
 - 1) Carpet threshold (carpet to carpet):
 - (a) 505S DBA by Hager.
 - (b) 414 DKB by NGP.
 - (c) 236 D by Pemko.
 - 2) Carpet threshold (carpet to concrete, wood, synthetic, or resilient flooring):
 - (a) 417 DKB by NGP.
 - (b) 174 D by Pemko.
 - 3) Saddle threshold:
 - (a) 418S DBA by Hager.
 - (b) 411 DKB by NGP.
 - (c) 151 D by Pemko.
 - c. Out swinging metal exterior doors (from occupied rooms):
 - 1) 8426 by NGP.
 - 2) 253 x 3 FG by Pemko.
 - d. Out swinging metal exterior doors (exterior Utility Rooms only):

- 1) 891 V by NGP.
- 2) 185 V by Pemko.

2.11 WEATHERSTRIPPING AND GASKETING

- A. Weatherstripping:
 1. Acceptable Products:
 - a. Finish: clear anodized aluminum.
 - b. Perimeter:
 - 1) 800S by Hager.
 - 2) A625 A by NGP.
 - 3) 35041 CP by Pemko.
 - c. Equal as approved by Architect before bidding. See Section 01 6000.
 - d. Bottom (see Sweepstrip).

2.12 KEY CABINET

- A. Key Cabinet: Sheet steel construction, piano hinged door with key lock; BHMA A156.28.
 1. Mounting: Wall-mounted.
 2. Capacity: 60 hooks minimum.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that doors and frames are ready to receive this work; labeled, fire-rated doors and frames are properly installed, and dimensions are as indicated on shop drawings.
- B. Verify that electric power is available to power operated devices and of correct characteristics.

3.02 INSTALLATION

- A. Install hardware in accordance with manufacturer's instructions and applicable codes.
- B. Install hardware on fire-rated doors and frames in accordance with applicable codes and NFPA 80.
- C. Install hardware for smoke and draft control doors in accordance with NFPA 105.
- D. Use templates provided by hardware item manufacturer.
- E. Do not install surface mounted items until application of finishes to substrate are fully completed.
- F. Door Hardware Mounting Heights: Distance from finished floor to center line of hardware item. As indicated in following list; unless noted otherwise in Door Hardware Schedule or on drawings.
 1. Mounting heights in compliance with ADA Standards:
 - a. Locksets: 40-5/16 inch.
 - b. Push Plates/Pull Bars: 42 inch.
 - c. Deadlocks (Deadbolts): 48 inch.
 - d. Exit Devices: 40-5/16 inch.
- G. Install smoke gaskets and acoustical seals in manner to give continuous air-tight fit.
 1. Install smoke gaskets as per Manufacturer's installation requirements:
 - a. Hinge Jamb: Install smoke gaskets on jamb face of door frame so door will compress smoke gasket.
 - b. Header and Strike Jamb: Install smoke gaskets on face of stop of door frame so door will compress smoke gasket.
 2. Install acoustical seal with seal under door.
- H. Set exterior door thresholds with full-width bead of elastomeric sealant at each point of contact with floor providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws.
 1. Refer to Section 07 9200 for additional requirements.

- I. Turn key cabinet over to Owner's designated representative at Substantial Completion with all keys required for every locking device on Project identified by tags and on hooks. Owner will be responsible for installation.

3.03 FIELD QUALITY CONTROL

- A. Provide an Architectural Hardware Consultant (AHC) to inspect installation and certify that hardware and installation has been furnished and installed in accordance with manufacturer's instructions and as specified.
- B. Owner's Instructions:
 - 1. Before Final Acceptance Meeting, send master keys to [Insert Person to Receive Keys].

3.04 ADJUSTING

- A. Adjust hardware for smooth operation.
- B. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.
- C. Adjust closers to provide maximum opening force as required by governing code authority and proper backcheck and sweep speed.

3.05 CLEANING

- A. Clean finished hardware in accordance with manufacturer's written instructions after final adjustments have been made.
- B. Clean adjacent surfaces soiled by hardware installation.
- C. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.

3.06 PROTECTION

- A. Do not permit adjacent work to damage hardware or finish.

END OF SECTION

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**SECTION 08 8000
GLAZING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Insulating glass units.
- B. Glazing units.
- C. Glazing compounds and accessories.

1.02 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials Current Edition.
- B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test 2015.
- C. ASTM C1036 - Standard Specification for Flat Glass 2016.
- D. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass 2018.
- E. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass 2014.
- F. ASTM C1193 - Standard Guide for Use of Joint Sealants 2016.
- G. ASTM C1281 - Standard Specification for Preformed Tape Sealants for Glazing Applications 2016.
- H. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass 2015.
- I. GANA (GM) - GANA Glazing Manual 2008.
- J. GANA (SM) - GANA Sealant Manual 2008.
- K. GANA (LGRM) - Laminated Glazing Reference Manual 2009.
- L. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use 1990 (2016).

1.03 SUBMITTALS

- A. Product Data on Insulating Glass Unit, Glazing Unit, and Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.
- B. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.
- C. Samples: Submit two samples 12 by 12 inch in size of glass units.
- D. Installer's Qualification Statement.
- E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

- A. Perform Work in accordance with GANA (GM), GANA (SM), GANA (LGRM), IGMA TM-3000, or glazing installation methods. Maintain one copy on site.
- B. Installer Qualifications:
 - 1. Installer: Requirements of Section 01 4301 applies, but not limited to following:
 - a. Satisfactorily completed at least three (3) installations of similar size, scope, and complexity in each of past two (2) years and be approved by glass product Manufacturer before bidding.
 - b. Upon request, submit documentation.

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C. Certifications:

1. Labels showing strength, grade, thickness, type, and quality are required on each piece of glass.
2. Manufacturers/Fabricators certifying products furnished comply with project requirements.
3. Insulating-Glass Certification Program: Indicate compliance with requirements of Insulating Glass Certification Council on applicable glazing products.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Delivery And Acceptance Requirements:

1. Follow Manufacturer's instruction for receiving, handling, and protecting glass & glazing materials to prevent breakage scratching, damage to seals, or other visible damage.
2. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

B. Storage And Handling Requirements:

1. Follow Manufacturer's instruction for storing and protecting glass & glazing materials.
2. Store materials protected from exposure to harmful environmental conditions and at temperatures and humidity conditions recommended by Manufacturer.
3. Protect edge damage to glass, and damage/deterioration to coating on glass.

1.06 FIELD CONDITIONS

- A. Do not install glazing when ambient temperature is less than 40 degrees F.
- B. Do not proceed with glazing when ambient and substrate temperature conditions are outside the limits permitted by glazing material manufacturer or when joint substrates are wet due to rain, frost, condensation or other causes.

1.07 WARRANTY

- A. Insulating Glass Units: Provide a ten (10) year manufacturer warranty, signed by insulating-glass Manufacturer/Fabricator, agreeing to replace insulating-glass units to include coverage for seal failure, moisture, interpane dusting or misting, including providing products to replace failed units from date of installation.
- B. Laminated Glass: Provide a ten (10) year manufacturer warranty to include coverage for delamination, including providing products to replace failed units from date of installation.
- C. Installer's Warranty:
 1. Form acceptable to Owner, signed by glass product Installer, agreeing to replace glass products that deteriorate, or that exhibit damage or deterioration of glass or glazing products due to faulty installation, for two (2) years from date of installation.
- D. Heat Soaked Tempered Glass: Provide a five (5) year manufacturer warranty to include coverage for spontaneous breakage of fully tempered glass caused by nickel sulfide (NiS) inclusions.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

A. Manufacturer Contact List for Low E Glazing:

1. AGC Flat glass North America, Kingsport, TN www.us.agc.com.
2. Carlex (subsidiary of Central Glass Co., Ltd., Nashville, TN www.carlex.com).
3. Guardian Industries Corp., Auburn Hills, MI www.guardian.com.
4. Oldcastle Building Envelope, Santa Monica, CA www.oldcastlebe.com
5. Pilkington North America Inc., Toledo, OH www.pilkington.com.
6. Vitro Architectural Glass (formerly PPG glass), Cheswick, PA www.ppgglass.com or PPG Canada Ltd, Glass Division, Toronto, ON (416) 789-3331.

2.02 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

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- A. Glass units for exterior fixed windows, monumental and vent sash window units shall have U Factor of 0.34 and SHGC of 0.33. Provide written Manufacturer's confirmation with glazing submittal.
- B. Exterior Window Glazing:
1. Thickness: 1/8 inch (3 mm) minimum, Double Strength (Insulated Glass).
 2. Glazing shall have following characteristics:
 - a. Low-Emissivity (or Low E):
 - 1) Design Criteria:
 - (a) Clear:
 - (b) Meet requirements of ASTM C1036, Type I, Class I, Quality Q3.
 - (c) Location: Surface 2.
 - 2) Low-Emissivity (or Low E) Acceptable Product:
 - (a) Performance Standard:
 - (b) 70 percent Visible Light Transmission (VLT).
 - (c) 0.29 U-value winter.
 - (d) 0.27 U-value summer.
 - (e) 0.38 Solar Heat Gain Coefficient (SHGC).
 - (f) 0.44 Shading Coefficient.
 - (g) 11 percent Visible Light Reflectance.
 - (h) Quality Standard:
 - (i) Cardinal LoE³-366.
 - (j) Solarban 70 XL.
 - (k) Other low E glazing system standard with window manufacturer that meets or exceeds performance characteristics of specified glazing is acceptable as approved by Architect before bidding. See Section 01 6000.
 - 3) Acceptable Manufacturers:
 - (a) AGC.
 - (b) Guardian.
 - (c) Vitro Architectural Glass.
 - (d) Equal as approved by Architect before bidding. See Section 01 6000.
 - b. Obscure:
 - 1) Design Criteria:
 - (a) Meet requirements of ASTM C1036, Type II, Class I, Form 3, Quality Q8, Pattern - #62.
 - c. Glazing in Windows within 24 inches (600 mm) of Exterior Doors:
 - 1) Design Criteria:
 - (a) Tempered.
 - (b) Meet requirements of ASTM C1048, Kind FT, Condition A, Type I, Class I, Quality Q3.
- C. Storefront Glazing:
1. Thickness: 1/4 inch (6 mm).
 2. Glazing shall have following characteristics:
 - a. Low-Emissivity (or Low E):
 - 1) Design Criteria:
 - (a) Clear.
 - (b) Insulated Glass: 1 inch (25 mm) units with 1/2 inch (13 mm) airspace and two (2) 1/4 inch (6 mm) lites.
 - (c) Meet requirements of ASTM C1036, Type I, Class I, Quality Q3.
 - (d) Location: Surface 2.
 - 2) Low-Emissivity (or Low E) Acceptable Product:
 - (a) Performance Standard:
 - (b) 64 percent Visible Light Transmission (VLT).

- (c) 0.28 U-value winter.
 - (d) 0.26 U-value summer.
 - (e) 0.27 Solar Heat Gain Coefficient (SHGC).
 - (f) 0.32 Shading Coefficient.
 - (g) 12 percent Visible Light Reflectance.
 - (h) Quality Standard:
 - (i) Cardinal LoE³-366.
 - (j) Solarban 70 XL.
 - (k) Equal product by Acceptable Manufacturer as approved by Architect before bidding. See Section 01 6000.
- 3) Acceptable Manufacturers:
- (a) AGC.
 - (b) Guardian.
 - (c) Vitro Architectural Glass.
 - (d) Equal as approved by Architect before bidding. See Section 01 6000.
- b. Obscure:
- 1) Design Criteria:
 - (a) Meet requirements of ASTM C1036, Type II, Class I, Form 3, Quality Q8, Pattern - #62.
- c. Glazing Below Door Height:
- 1) Design Criteria:
 - (a) Tempered.
 - (b) Meet requirements of ASTM C1048, Kind FT, Condition A, Type I, Class I, Quality Q3.
- D. Fabrication:
- 1. Except where glass exceeds 66 inches (1 675 mm) in width, cut clear glass so any wave will run horizontally when glazed.
 - 2. Sealed, Insulating Glazing Units:
 - a. Double pane, sealed insulating glass units. Install at exterior windows and exterior aluminum-framed storefront.
 - b. Unit Thickness: 5/8 inch (16 mm) minimum, one inch (25 mm) maximum.
 - c. Insulated obscure units shall consist of one pane of specified obscure glass and one pane of standard glass.
 - d. Type Seal:
 - 1) Metal-to-glass bond and separated by 1/2 inch (12.7 mm) dehydrated air space.
 - 2) Use non-hardening sealants.
 - e. Approved Fabricators. See Section 01 6000
 - 1) Members of the Insulating Glass Manufacturers Alliance (IGMA).

2.03 ACCESSORIES

- A. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- B. Glazing Tape: Butyl-based elastomeric tape with integral resilient tube spacer, 10 to 15 Shore A durometer hardness, black color, coiled on release paper; widths required for specified installation, complying with ASTM C1281 and AAMA 800 for application
- C. 3M Sun Control Window Film Night Vision NV-25: -DI retail windows and vestibule windows only by Owner approval.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

- A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.
- B. Verify that the minimum required face and edge clearances are being provided.

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- C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.
- D. Verify that sealing between joints of glass framing members has been completed effectively.
- E. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.
- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION, GENERAL

- A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.
- B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.
- C. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.
- D. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.
- E. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.
- F. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, etc.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.
- C. Monitor and report installation procedures and unacceptable conditions.

3.05 CLEANING

- A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.
- B. Remove non-permanent labels immediately after glazing installation is complete.
- C. Clean glass and adjacent surfaces after sealants are fully cured.

3.06 PROTECTION

- A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.
- B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

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**SECTION 09 0561
COMMON WORK RESULTS FOR FLOORING PREPARATION**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. This section applies to floors identified in Contract Documents that are receiving the following types of floor coverings:
 - 1. Broadloom carpet.
 - 2. Carpet tile.
 - 3. Thin-set ceramic tile and stone tile.
 - 4. Coordination and scheduling of Owner Furnished Field Testing for Alkalinity and Concrete Moisture Vapor Emission Rate (MVER) of concrete slab before flooring installation (except carpet) as described in Contract Documents.
 - 5. Preparing floor substrate to receive flooring as described in Contract Documents.
- B. Preparation of new and existing concrete floor slabs for installation of floor coverings.
- C. Testing of concrete floor slabs for moisture and alkalinity (pH) (See form below).
- D. Remediation of concrete floor slabs due to unsatisfactory moisture or alkalinity (pH) conditions.
 - 1. Contractor shall perform all specified remediation of concrete floor slabs. If such remediation is indicated by testing agency's report and is due to a condition not under Contractor's control or could not have been predicted by examination prior to entering into the contract, a contract modification will be issued.

1.02 REFERENCE STANDARDS

- A. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring 2019, with Editorial Revision (2020).
- B. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride 2016a.
- C. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes 2019a.
- D. ICRI - Concrete Slab Moisture Testing Program Current.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate scheduling of cleaning and testing, so that preliminary cleaning has been completed for at least 24 hours prior to testing.
- B. Participate in MANDATORY pre-installation conference held jointly if possible for all related Division 09 6000 'Flooring' used for Project.
- C. Schedule conference after substrate preparation and before installation of all flooring systems included for Project at same time if schedule permits.
- D. Schedule conference after substrate preparation and before installation of flooring system. (If more than one (1) flooring system is included for project, hold conference at same time if schedule permits).
- E. Conference may be held at project site or another convenient site. Participants may also attend by video or audio conference if approved by Project Manager.
- F. In addition to agenda items specified in Section 01 3000, review following:
 - 1. Review condition of floor with regards to compliance with concrete installation tolerances and other work necessary to prepare floors for installation of flooring.
 - 2. Review Testing Agency testing report of Concrete Moisture of concrete:
 - a. Installer may verify Concrete Moisture of concrete.
- G. Review condition of floor regarding compliance with concrete installation tolerances and other work necessary to prepare floors for installation of flooring.

- H. Review additional agenda items all related flooring sections.
- I. Scheduling:
1. Concrete Moisture Testing:
 - a. General Contractor Responsibility to provide:
 - 1) Maintain ambient temperatures and relative humidity conditions as specified in Field Conditions in Part 1 of this specification before Moisture Testing Agency will test for concrete moisture.
 - 2) Notify Owner to contact Moisture Testing Agency when building is enclosed and temperature and relative humidity meet requirements for testing.
 - 3) Provide access for and cooperate with Moisture Testing Agency.
 - b. Owner's Representative Responsibility to provide:
 - 1) Provide following information to Moisture Testing Agency at time of notification:
 - (a) Digital copy of floor plan(s).
 - (b) Indicate different flooring material areas and which rooms on floor plan(s) and finish schedule requiring additional tests if required.
 - (c) Digital copy of Specification Section 09 0561 (this specification) and Section 01 4523 'Testing And Inspecting Services' from Contract Documents for this Project.
 - 2) Carpet Flooring:
 - (a) Carpet Installer at his/her discretion may test concrete slab for Alkalinity and Concrete Moisture Vapor Emission Rate (MVER) before installation of Owner Furnished carpet.
 - (b) If carpet area is tested, Installer to coordinate with Owner's Representative for following:
 - (1) Scheduling and coordination for maintain ambient temperatures and relative humidity conditions required before Moisture Testing of concrete moisture.
 - (2) Access to Building for concrete moisture testing.

1.04 SUBMITTALS

- A. Informational Submittals:
1. Certificates:
 - a. Concrete Slab Moisture Technician:
 - 1) Provide current ICRI 'Concrete Slab Moisture Testing Technician, Tier 2, Grade 1' Certification.
 - b. Certified Standard Moisture Testing Report:
 - 1) Report to include following:
 - (a) Available to Testing Agency from Owner's Representative:
 - (1) Project Name.
 - (2) Property Number.
 - (b) Test date.
 - (c) Executive summary.
 - (d) Certified Moisture and Alkalinity (pH) Test Report.
 - (e) Project floor plan.
 - (f) Project photographs including following information on each photograph:
 - (1) Site location.
 - (2) Test hole number.
 - (3) Serial number probe.
 - (4) Relative Humidity (RH), Alkalinity (pH) and temperature reading.
 - (5) Property number.
 - (g) Outlier Test (As specified in Field Quality Control Testing in Part 3 of this specification:
 - (1) Note test as Outlier Test for which hole number was conducted.
 - (2) Site location.

- (3) Test hole number.
 - (4) Serial number probe.
 - (5) Relative Humidity (RH), Alkalinity (pH) and temperature reading.
 - (6) Property number.
 - 2) At completion of testing, Testing Agency shall submit Concrete Moisture Test Report for each flooring system included for project to following:
 - (a) One (1) copy to Owner's Representative.
- c. Certified Comprehensive Moisture Testing Report:
 - 1) Report to include following:
 - (a) Available to Testing Agency from Owner's Representative:
 - (1) Project Name.
 - (2) Property Number.
 - (b) Test date.
 - (c) Executive summary.
 - (d) Certified Moisture and Alkalinity (pH) Test Report.
 - (e) Project floor plan.
 - (f) Test results mapping diagrams.
 - (g) Project photographs including following information on each photograph:
 - (1) Site location.
 - (2) Test hole number.
 - (3) Serial number probe.
 - (4) Relative Humidity (RH), Calcium Chloride (CaCl₂), Alkalinity (pH) and temperature reading.
 - (5) Property number.
 - 2) At completion of testing, Testing Agency shall submit Concrete Moisture Test Report for each flooring system included for project to following:
 - (a) One (1) copy to Owner's Representative.
- 2. Special Procedure Submittals:
 - a. 'Concrete Moisture Testing Request and Proposal':
 - 1) Provided by Owner's Representative for each project to Testing Agency:
 - (a) Testing Agency to fill out form with following information and return as instructed:
 - (1) Review request information.
 - (2) Add information as requested.
 - (3) Sign form.
 - (4) E-mail form back to Owner's Representative.
 - b. Certified Moisture Testing Report Distribution:
 - 1) Owner's Representative responsibilities after receiving Concrete Moisture Test Report:
 - (a) Provide copies to following:
 - (1) One (1) copy to Architect.
 - (2) One (1) copy to Contractor.
 - 2) General Contractor responsibilities after receiving Concrete Moisture Test Report from Owner's Representative:
 - (a) Provide copies to following:
 - (1) One (1) copy to Wood Athletic Flooring Manufacturer.
- B. Qualification Statement:
 - 1. Concrete Slab Moisture Technician:
 - a. Provide Qualification documentation if requested by Architect or Owner.
- C. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Record Documentation:

- 1) Testing and Inspection Reports:
 - (a) Testing Agency Testing Reports of Alkalinity and Concrete Moisture testing.

1.05 QUALITY ASSURANCE

- A. Owner will provide Field Testing for Alkalinity and Concrete Moisture Vapor Emission Rate (MVER) of concrete slab before flooring (except carpet) installation as specified in Field Quality Control in Part 3 of this specifications:
 1. See Section 01 1000: 'Multiple Contract Summary'.
 2. See Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
- B. Acceptable Testing Agency:
 1. See 'Agreement Between Owner And Testing Agency For Testing And Inspection Services (U.S.)' or 'Agreement Between Owner And Testing Agency For Testing And Inspection Services (Canada)'.
 - a. Equal as approved by Architect or Owner's Representative before bidding. See Section 01 6000.
- C. Testing Agency Qualifications: Independent testing agency experienced in the types of testing specified.
 1. Submit evidence of experience consisting of at least 3 test reports of the type required, with project Owner's project contact information.
 2. ICRI 'Concrete Slab Moisture Testing Technician, Tier 2, Grade 1' Certification:
 - a. Certification includes three (3) hour education session, written exam, and field testing performance exam based on ASTM standards.
 - b. Certification valid for period of five (5) years from date of testing completion.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, handle, and protect products in accordance with manufacturer's instructions and recommendations.
- B. Deliver materials in manufacturer's packaging; include installation instructions.
- C. Keep materials from freezing.

1.07 FIELD CONDITIONS

- A. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F or more than 85 degrees F.
- B. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PREPARATION

- A. Flooring Preparation:
 1. General:
 - a. Prepare floor substrate in accordance with ASTM F710, 'Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring' (This standard is used for preparing concrete floors for all flooring).
 - 1) Required RH test and alkalinity test of concrete slab has been performed.
 - b. Concrete floor slab patching:
 - 1) Cracks, chips and joints must be properly patched or repaired.
 - c. Concrete surface cured, clean, dry, and free of dirt, dust, grease, wax, and other foreign substances that will compromise flooring installations.
 - 1) Removal of curing compounds.
 - 2) Remove paint, sealer, grease, oil, silicone sealants, and other materials incompatible with flooring adhesives.

- 3) Removal of overspray from painted walls (essential so glue will stick).
- d. Vacuum and damp mop floor areas to receive flooring before flooring installation.
- 2. Carpeted floor areas:
 - a. Prepare floor substrate in accordance with Carpet And Rug Institute (CRI) best practices to receive carpet installation and to provide installation that meets Carpet Manufacturer's warranty requirements.
- 3. Carpet Accessories:
 - a. Sundry items, such as adhesives, shall be conditioned to building ambient conditions before use.

3.02 FIELD QUALITY CONTROL

- A. Field Tests:
 - 1. General:
 - a. Owner is responsible for Quality Assurance. Quality assurance performed by Owner will be used to validate Quality Control performed by Contractor.
 - b. Quality Control is sole responsibility of Contractor as specified in Section 01 4523 'Testing And Inspection Services'.
 - 2. Concrete Moisture and Alkalinity:
 - a. Testing Agency will test interior concrete slabs before installation of floor coverings as directed by Architect and will include following:
 - 1) Interior concrete slab areas to be tested:
 - (a) All areas with moisture sensitive flooring.
 - 2) Standard Moisture Testing required of interior concrete slabs on grade:
 - (a) General:
 - (1) Testing for concrete moisture shall be taken at concrete slab substrates scheduled to receive flooring as specified in Contract Drawings for complete flooring installation.
 - (2) Outlier Test: If one (1) test is abnormally different from other moisture tests, then additional test should be done. Outlier will be defined in this specification as moisture test that is at least fifteen (15) percent higher or lower than other tests at project building completed same day:
 - (3) Retesting should be done within 5 feet (1.50 m) feet of original test hole.
 - (4) Contact Owner's Representative for the need to outlier test and additional testing fees will apply.
 - (5) Include required tests for carpeting and additional tests at each different type of flooring system included for project.
 - (6) Provide additional testing as directed by Architect if necessary.
 - 3) Comprehensive Moisture Testing: Test for moisture in concrete slab when known moisture problems exist such as high-water table, or when RH testing alone does not provide adequate understanding of concrete slab moisture conditions that may adversely affect flooring material:
 - (a) Contact Owner's Representative before conducting additional testing stating why need for addition testing and to approve additional fees to testing.
 - (b) Perform Comprehensive Moisture Testing where floor coverings will be installed including following tests:
 - (1) Calcium Chloride Testing referencing ASTM F1869.
 - (2) Relative Humidity In-Situ Probe Testing referencing ASTM F2170.
 - (c) Number of tests to be determined by Testing Agency.
 - 4) Calcium Chloride Vapor Emission CaCl₂ Moisture Vapor Emission Test (MVER) (test used only with Comprehensive Moisture Testing):
 - (a) Surface (MVER) testing shall be performed in accordance with ASTM F1869:

- (1) Anhydrous Calcium Chloride (CaCl₂) Moisture Vapor Emission Test requires 60 to 72 hours to complete.
 - (2) Prior to placement of anhydrous calcium chloride tests, actual test area shall be clean and free of all foreign substances.
 - (3) At start of testing, weigh dish of anhydrous calcium chloride, including tape used to seal container, container lid, and label which should be affixed to lid. Record weight to nearest 0.1 g on container label along with starting time to nearest $\pm 1/4$ hour.
 - (4) Lightly grind 20 in x 20 in (508 mm x 508 mm) area to produce surface profile equal to International Concrete Repair Institute (ICRI) surface profile CSP-1 to CSP-2.
 - (5) At end of testing, weigh dish of anhydrous calcium chloride, including tape used to seal container, container lid, and label which should be affixed to lid. Record weight to nearest 0.1 g on container label along with ending time to nearest $\pm 1/4$ hour.
- (b) Test Report shall be submitted as specified in Informational Submittals in Part 1 of this specification.
- 5) Alkalinity Testing (pH) Test:
- (a) Testing shall be performed in accordance with ASTM F710.
 - (b) Test with pH meter or pH paper.
 - (c) Testing shall be taken at every location and at each time concrete moisture test is performed at those locations.
 - (d) Clean floor to remove all oil, dirt, dust and any floor coating or sealer.
 - (e) Lightly grind, sand, or bead blasting. Do not remove more than 1/8 inch (3 mm) of concrete.
 - (f) Removal of more than 1/8 inch (3 mm) may give high pH reading.
 - (g) Failure to remove laitance will produce low, inaccurate pH reading.
 - (h) Place several drops of water on clean surface, forming puddle approximately 1 inch (25 mm):
 - (i) Allow puddle to set for sixty (60) \pm five (5) seconds, then dip pH paper or meter into water.
 - (j) Remove immediately and record test result.
 - (k) Testing to be performed concurrently with concrete moisture testing.
 - (l) Test Report shall be submitted as specified in Informational Submittals in Part 1 of this specification.
- B. Approved Concrete Moisture Tests:
1. Concrete Moisture Test (test used with Standard Moisture and Comprehensive Moisture Testing if included for project). See Section 01 6200:
 - a. Relative Humidity (RH) testing using in-situ probes in accordance with ASTM F2170 testing requirements:
 - 1) Check calibration of measuring instrument.
 - 2) Building ambient conditions are met before testing.
 - 3) Drill Hole:
 - (a) Drill and prepare test holes as per ASTM F2170 (correct hole-depth and hole diameter are required).
 - (b) Drill holes equal to forty (40) percent of slab's thickness for concrete slabs on grade and twenty (20) percent of slab's thickness for suspended concrete slabs (hole must be perpendicular (90 deg) to surface).
 - 4) Clean Hole:
 - (a) Follow Manufacturer's installation instructions for cleaning holes and inserting sensor.
 - 5) Insert Sensor:
 - (a) Follow Manufacturer's installation instructions for inserting sensor.
 - 6) Readings:

- (a) Follow Manufacturer's installation instructions for taking readings.
- (b) Two (2) hours after installation of sensor, RH reading will be recorded. (Two (2) hour read is in lieu of the seventy-two (72) hour ASTM standard)
- 7) Future Testing:
 - (a) For future readings, replace protective cap by snapping it back into sensor.
- 8) Test Report shall be submitted as specified in Informational Submittals in Part 1 of this specification.
 - (a) For future readings, replace protective cap by snapping it back into sensor.
 - (b) Approved Products. See Section 01 6200:
 - (1) Concrete moisture testing meter: Rapid RH 4.0 EX with Touch-n-Sense Technology and Rapid RH EX Smart Sensors by Wagner Meters, Rogue River, OR www.wagnermeters.com.

3.03 PROTECTION

- A. Cover prepared floors with building paper or other durable covering.
- B. Concrete testing proposal

Concrete Moisture Testing Request and Proposal

Owner's Representative to complete Concrete Moisture Testing Request section below. Send completed form to Testing Agency. Testing Agency will complete Concrete Moisture Testing Proposal section and submit to Owner's Representative.
 Agreement Between Owner And Testing Agency For Testing And Inspection Services (U.S.) and (Canada)

Project Information

Project Name:		Date:
Project Address:		Property Number:
City:		Plan Type (New Construction Only):
State:	Zip Code:	Project Type: New Construction <input type="checkbox"/> Existing <input type="checkbox"/>
Facility Type: <input type="checkbox"/> Meetinghouse <input type="checkbox"/> CES/S&I <input type="checkbox"/> Temple <input type="checkbox"/> Residential <input type="checkbox"/> Family History <input type="checkbox"/> Higher Education <input type="checkbox"/> Welfare Facility		
Type of New Flooring to be Installed (check all that apply): <input type="checkbox"/> Wood Athletic Flooring <input type="checkbox"/> Resilient Tile <input type="checkbox"/> Resinous Flooring <input type="checkbox"/> Seamless Flooring <input type="checkbox"/> Synthetic Athletic Flooring		
Type of Concrete Slab: <input type="checkbox"/> Below grade <input type="checkbox"/> On grade <input type="checkbox"/> Above Grade / Suspended		Age of Slab? <input type="checkbox"/> Years <input type="checkbox"/> Months

Billing and Owner Contact Information (Owner's Representative)

Submit Quote and Report to: Project Manager <input type="checkbox"/> Facilities Manager <input type="checkbox"/>		
Project Manager:	Phone:	E-mail:
Facilities Manager:	Phone:	E-mail:
Billing Address (Send Report to this Address):		Street Address:
City:	State:	Zip Code:

Documents Provided to Testing Agency (Owner's Representative to provide the following to Testing Agency):
 > Digital copy of floor plans(s) indicating different flooring material areas.
 > Indicate which areas on floor plans(s) and/or finish schedule requiring additional tests (if required).
 > Digital copy of Specification Section 09 0503 'Flooring Substrate Preparation' and Section 01 4523 'Testing And Inspection' from Contract Documents for this project.

New Construction (Large Meetinghouse and Welfare Projects): Allow thirty (30) days for testing agency to schedule testing. Testing and report to be completed 30 days prior to flooring installation.	Carpet Installation Date	Rush Service Requested Yes <input type="checkbox"/> No <input type="checkbox"/>
	Proposed Testing Date	Number of Tests (Section 09 0503)
New Construction (Small Meetinghouse, R&I, and Projects with Existing Concrete Slab): Allow thirty (30) days for testing agency to schedule testing. Testing and report to be completed 15-10 days prior to flooring installation.		

Reference information:
 Testing specified in Section 09 0503 'Flooring Substrate Preparation' for floor preparation and ambient condition requirements to be performed prior to flooring insulation and Section 01 4523 'Testing And Inspection' for administrative requirements.

Concrete Moisture Testing Proposal Proposal #:

Testing Agency Contact Information		Phone:
Testing Agency Name:	Contact:	Fax:
Address:	E-mail:	

Directions: Use this document to provide proposal for testing by doing following:
 Review request information above. Email proposal to Owner's Representative.

Scope of Work	Comments	Cost
Standard Testing		\$
Outlier Test		\$
Comprehensive Moisture Testing		\$
Additional Testing (if requested by Owner or Architect)		\$
Total		\$

Signatures - This form must be signed before testing can proceed.

Testing Agency:	Owner's Representative:
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END OF SECTION

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**SECTION 09 2116
GYPSUM BOARD ASSEMBLIES**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Performance criteria for gypsum board assemblies.
- B. Acoustic insulation.
- C. Gypsum wallboard.
- D. Joint treatment and accessories.
- E. Textured finish system.

1.02 RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Building framing and sheathing.
- B. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.

1.03 REFERENCE STANDARDS

- A. ASTM C11 - Standard Terminology Relating to Gypsum and Related Building Materials and Systems 2018b.
- B. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board 2017.
- C. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members 2018.
- D. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing 2017.
- E. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products 2020.
- F. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board 2019b.
- G. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications 2019.
- H. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness 2018.
- I. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs 2018.
- J. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base 2019.
- K. ASTM C1178/C1178M - Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel 2018.
- L. ASTM C1396/C1396M - Standard Specification for Gypsum Board 2017.
- M. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2020.
- N. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements 2009 (Reapproved 2016).
- O. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials 2020.
- P. ASTM E413 - Classification for Rating Sound Insulation 2016.
- Q. GA-214 - Recommended Levels of Finish - Gypsum Board, Glass Mat and Fiber-Reinforced Gypsum Panels 2015.
- R. GA-216 - Application and Finishing of Gypsum Panel Products 2016.

- S. GA-600 - Fire Resistance Design Manual 2015.
- T. GA-801 - Handling and Storage of Gypsum Panel Products: A Guide for Distributors, Retailers, and Contractors 2017.
- U. UL 263 - Standard for Fire Tests of Building Construction and Materials Current Edition, Including All Revisions.
- V. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.
 - 1. Schedule MANDATORY pre-installation conference immediately before installation of gypsum wallboard.
 - 2. In addition to agenda items specified in Section 01 3000, review following:
 - a. Finish requirements necessary for installation of finish materials over gypsum wallboard, and location and installation of ceramic tile backerboard.

1.05 SUBMITTALS

- A. Shop Drawings: Indicate special details associated with fireproofing and acoustic seals.
- B. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system.
- C. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.
- D. Test Reports: For stud framing products that do not comply with ASTM C645 or ASTM C754, provide independent laboratory reports showing maximum stud heights at required spacings and deflections. Also provide fire test results or assembly diagrams and numbers confirming products used will provide required fire ratings with installation configurations used.
- E. Samples: Submit two samples of predecorated gypsum board, 12 by 12 inches in size, illustrating finish color and texture.
 - 1. Holey Smooth Wall Texture:
 - a. Provide minimum of three (3) 48 inch square control samples on primed gypsum wallboard of texture to show possible variations.
 - 2. Light Skip Trowel Ceiling Texture:
 - a. Provide minimum of three (3) 48 inch square control samples on primed gypsum wallboard of texture to show possible variations.
- F. Field Samples:
 - 1. Before performing work of this Section, prepare control samples.
 - 2. Architect will inspect control sample at pre-installation conference following preparation of control sample. When sample is approved, work of this Section may proceed. Approved samples will be kept at site at all times work of this section is being performed.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to project site in unopened containers clearly labeled with manufacturer's name and identification of contents.
- B. Follow recommendations of GA-801 Guide for Handling and Storage of Gypsum Panel Products unless local, state or federal laws or agency rules differing from the recommendations shall take precedence.
- C. Store materials in dry and clean location until needed for installation. During installation, handle in a manner that will prevent marring and soiling of finished surfaces.
- D. Store material under roof and keep dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack gypsum board flat to prevent sagging.

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1.07 FIELD CONDITIONS**A. Ambient Conditions:**

1. Comply with ASTM C840 or GA-216 requirements, whichever are more stringent:
 - a. Do not install interior products until installation areas are enclosed and conditioned.
 - 1) Temperature shall be 50 deg F (10 deg C) and 95 deg F (35 deg C) maximum day and night during entire joint operation and until execution of Certificate of Substantial Completion.
 - 2) Provide ventilation to eliminate excessive moisture.
 - 3) Avoid hot air drafts that will cause too rapid drying.
 - b. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

PART 2 PRODUCTS**2.01 GYPSUM BOARD ASSEMBLIES**

- A. Provide completed assemblies complying with ASTM C840 and GA-216.
 1. See PART 3 for finishing requirements.

2.02 BOARD MATERIALS**A. Manufacturers - Gypsum-Based Board:**

1. American Gypsum Company: www.americangypsum.com/#sle.
2. CertainTeed Corporation: www.certainteed.com/#sle.
3. Georgia-Pacific Gypsum: www.gpgypsum.com/#sle.
4. National Gypsum Company: www.nationalgypsum.com/#sle.
5. PABCO Gypsum: www.pabcogypsum.com/#sle.
6. USG Corporation: www.usg.com/#sle.

B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut, long edges tapered.

1. General:
 - a. Size:
 - 1) Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.
 - b. Quality Standard:
 - 1) Core: Fire-resistant rated gypsum core.
 - 2) Complies with Type X requirements of ASTM C1396/C1396M (Section 5).
 - 3) Surface paper: Face paper suitable for painting.
 - 4) Long edges: Tapered edge.
2. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
3. At Assemblies Indicated with Fire-Resistance Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
4. Thickness:
 - a. Vertical Surfaces: 5/8 inch.
 - b. Ceilings: 5/8 inch.
5. Paper-Faced Products:
 - a. American Gypsum Company; LightRoc Gypsum Wallboard: www.americangypsum.com/#sle.
 - b. American Gypsum Company; FireBloc Type X Gypsum Wallboard: www.americangypsum.com/#sle.
 - c. CertainTeed Corporation; Type X Drywall: www.certainteed.com/#sle.
 - d. Georgia-Pacific Gypsum; ToughRock: www.gpgypsum.com/#sle.
 - e. Georgia-Pacific Gypsum; ToughRock Fireguard X: www.gpgypsum.com/#sle.
 - f. National Gypsum Company; Gold Bond BRAND Fire-Shield Gypsum Board: www.nationalgypsum.com/#sle.

C. Backing Board For Wet Areas:

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1. Glass Mat Faced Board: Coated glass mat water-resistant gypsum backing panel as defined in ASTM C1178/C1178M.
 - a. Fire-Resistance-Rated Type: Type X core, thickness 5/8 inch.
 - b. Square edges.
 - c. Products:
 - 1) DensShield Fireguard Type X by Georgia Pacific.
 - 2) GlasRoc Tilebacker Type X by CertainTeed.

2.03 GYPSUM WALLBOARD ACCESSORIES

- A. Manufacturers:
 1. Manufacturer Contact List:
 - a. Kinetics Noise Control, Dublin, OH www.kineticsnoise.com.
 - b. Magnum Products, Lenaxa, KS www.levelcoat.com.
 - c. National Gypsum, Charlotte, NC www.nationalgypsum.com.
 - d. Soundproofing Co, San Marcos, CA www.soundproofing.org.
 - e. United States Gypsum Co, Chicago, IL www.usg.com.
 - f. Westpac Materials Inc, Orange, CA www.westpacmaterials.com.
 - g. Wm. Zinsser & Co, Somerset, NJ www.zinsser.com.
- B. Corner And Edge Trim:
 1. Metal, paper-faced metal, paper-faced plastic, or solid vinyl meeting requirements of ASTM C1047. Surfaces to receive bedding cement treated for maximum bonding.
- C. Control Joint:
 1. Bent zinc sheet with V-shaped slot, perforated flanges, covered with plastic tape meeting requirements of ASTM C1047.
- D. Furring Channels:
 1. Quality Standards:
 - a. Walls: Galvanized DWFC-25.
 - b. Ceilings: Galvanized DWFC-20.
 2. Accessories as required by Manufacturer's fire tests to provide necessary fire ratings.
- E. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced. Thickness: 2 inch.
- F. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant. Supplied and installed in accordance with ASTM Standards. Including but not limited to ASTM C919-19; do not use solvent-based non-curing butyl sealant.
- G. Finishing Accessories: ASTM C1047, galvanized steel or rolled zinc, unless noted otherwise.
 1. Types: As detailed or required for finished appearance.
 2. Special Shapes: In addition to conventional corner bead and control joints, provide U-bead at exposed panel edges.
- H. Beads, Joint Accessories, and Other Trim: ASTM C1047, rigid plastic, galvanized steel, or rolled zinc, unless noted otherwise.
 1. Expansion Joints:
 - a. Type: V-shaped metal with factory-installed protective tape.
- I. Joint Materials: Best grade or ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
 1. Paper Tape: 2 inch wide, creased paper tape for joints and corners, except as otherwise indicated.
 2. Joint Reinforcing:
 - a. Paper reinforcing tape acceptable to Gypsum Board Manufacturer.
 3. Joint Compound: Drying type, vinyl-based, ready-mixed. Best grade or type recommended by Board Manufacturer and meeting requirements of ASTM C475/C475M.
 - a. Use Taping Compound for first coat to embed tape and accessories.

- b. Use Taping Compound or All-Purpose Compound for subsequent coats except final coat.
 - c. Use Finishing Compound for final coat and for skim coat.
- J. Finishing Compound: Surface coat and primer, takes the place of skim coating.
- K. High Build Drywall Surfer: Vinyl acrylic latex-based coating for spray application, designed to take the place of skim coating and separate paint primer in achieving Level 5 finish.
 - 1. Products:
 - a. Sheetrock First Coat by USG.
 - b. Prep Coat by Westpac Materials.
 - c. Level Coat by Magnum Products.
 - d. Equal as approved by Architect before bidding. See Section 01 6200.
- L. Primer On Surfaces To Receive Wallcovering:
 - 1. White, self-sizing, water based, all purpose wallcovering primer.
 - 2. Acceptable Products:
 - a. Shieldz Universal Pre-Wallcovering Primer by Wm. Zinsser and Company.
- M. Primer / Surfer On Surfaces To Receive Texturing:
 - 1. Acceptable Products:
 - a. Sheetrock First Coat by USG.
 - b. Prep Coat by Westpac Materials.
 - c. Level Coat by Magnum Products.
 - d. Equal as approved by Architect before bidding. See Section 01 6200.
- N. Textured Finish Materials: Latex-based compound; plain.
 - 1. Products:
 - a. ProForm Perfect Spray EM/HF by National Gypsum.
 - b. Sheetrock Wall & Ceiling Texture by US Gypsum.
- O. Fasteners:
 - 1. Bugle head screws meeting requirements of ASTM C1002:
 - a. Gypsum Board:
 - 1) Type W: For fastening gypsum board to wood members, of length to penetrate wood framing 5/8 inch (15.9 mm) minimum.
 - 2) Type S: For fastening gypsum board to steel framing and ceiling suspension members, of length to penetrate steel framing 3/8 inch (9.5 mm) minimum.
 - b. Glass Mat Gypsum Tile Backer:
 - 1) Wood Framing: 11 ga (0.1233 in) (3.1318 mm), galvanized with 7/16 inch (11 mm) head, hot dipped. Screws: Type W or Type S Hi-Lo, bugle head, rust resistant.
 - 2) Light-gauge metal framing: Type S Hi-Lo, bugle or wafer head, self-tapping, rust resistant. Hi-Lo screws.
 - 3) Heavy-gauge metal framing: Type S-12 Hi-Lo, bugle or wafer head, rust resistant.
- P. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.
- Q. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion-resistant.
- R. Screws for Fastening Gypsum Sheathing: Bugle head screws as recommended by Sheathing Manufacturer and meeting requirements of ASTM C1002, corrosion resistant treated.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that project conditions are appropriate for work of this section to commence.

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- B. Examine gypsum board before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Notify Architect of unsuitable conditions in writing.
 - 1. Do not install board over unsuitable conditions.
- D. Commencement of Work by installer is considered acceptance of substrate.

3.02 ACOUSTIC ACCESSORIES INSTALLATION

- A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.
- B. Sound Isolation Tape: Apply to vertical studs and top and bottom tracks/runners in accordance with manufacturer's instructions.
- C. Acoustic Sealant: Install in accordance with manufacturer's instructions.
 - 1. Place one bead continuously on substrate before installation of perimeter framing members.
 - 2. Place continuous bead at perimeter of each layer of gypsum board.
 - 3. Seal around all penetrations by conduit, pipe, ducts, and rough-in boxes, except where firestopping is provided.
- D. Acoustical Shielding: Install in accordance with manufacturer's instructions for application between studs and gypsum board.
- E. Installation shall comply with ASTM C919-19

3.03 BOARD INSTALLATION

- A. Interface With Other Work:
 - 1. Coordinate with Division 06 for location of backblocking for edges and ends of gypsum board and for blocking required for installation of equipment and building specialties.
 - 2. Do not install gypsum board until required blocking is in place.
- B. General: Install and finish as recommended in ASTM C840 or GA-216 unless specified otherwise in this Section.
- C. Mounting Accessories:
 - 1. Furring Channels: Apply with screws through flanges into each framing member.
- D. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.
- E. Single-Layer Nonrated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.
 - 1. Exception: Tapered edges to receive joint treatment at right angles to framing.
- F. Fire-Resistance-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.
- G. Exposed Gypsum Board in Interior Wet Areas: Seal joints, cut edges, and holes with water-resistant sealant.
- H. Interior Gypsum Board:
 - 1. General:
 - a. Install so trim and reinforcing tape are fully backed by gypsum board. No hollow spaces between pieces of gypsum board over 1/8 inch (3 mm) wide before taping are acceptable.
 - b. Rout out backside of gypsum board to accommodate items that extend beyond face of framing, but do not penetrate face of gypsum board, such as metal door frame mounting brackets, etc.
 - c. On walls over 108 inches (2 700 mm) high, apply board perpendicular to support.
 - d. Butt edges in moderate contact. Do not force in place. Shim to level.
 - e. Leave facings true with joint, finishing flush. Vertical work shall be plumb and ceiling surfaces level.

- f. Scribe work closely:
 - 1) Keep joints as far from openings as possible.
 - 2) If joints occur near an opening, apply board so vertical joints are centered over openings.
 - 3) No vertical joints shall occur within 8 inches (200 mm) of external corners or openings.
- g. Install board tight against support with joints even and true. Tighten loose screws.
- h. Caulk perimeter joints in sound insulated rooms with specified acoustical sealant.
- 2. Ceilings:
 - a. Apply ceilings first using minimum of two (2) workers.
 - b. Use board of length to give minimum number of joints.
 - c. Apply board perpendicular to support.
- 3. Fastening:
 - a. Apply from center of board towards ends and edges.
 - b. Apply screws 3/8 inch (9.5 mm) minimum from ends and edges, one inch (25 mm) maximum from edges, and 1/2 inch (13 mm) maximum from ends.
 - c. Spacing:
 - 1) Ends: Screws not over 7 inches (175 mm) on center at edges where blocking or framing occurs.
 - 2) Wood Framed Walls And Ceilings: Screws 7 inches (175 mm) on center in panel field.
 - 3) Metal Framed Walls: Screws 12 inches (300 mm) on center in panel field.
 - d. Set screw heads 1/32 inch (0.8 mm) below plane of board, but do not break face paper. If face is accidentally broken, apply additional screw 2 inches (50 mm) away.
 - e. Screws on adjacent ends or edges shall be opposite each other.
 - f. Drive screws with shank perpendicular to face of board.
- 4. Trim:
 - a. Corner Beads:
 - 1) Attach corner beads to outside corners.
 - (a) Attach metal corner bead with staples spaced 4 inches (100 mm) on center maximum and flat taped over edges of corner bead. Also, apply screw through edge of corner bead where wood trim will overlay corner bead.
 - (b) Set paper-faced trim in solid bed of taping compound.
 - b. Edge Trim: Apply where gypsum board abuts dissimilar material. Hold channel and 'L' trim back from exterior window and door frames 1/8 inch (3 mm) to allow for caulking.
- I. Glass Mat Gypsum Tile Backer:
 - 1. Apply glass mat gypsum tile backer to framing. Attach using specified fasteners spaced 6 inches (150 mm) on center on edges and into all framing members. Drive screws flush with surface of board.
 - 2. Shim board to be plumb and flat or level and flat, depending on location.
 - 3. Apply reinforcing only at joints where abutting different materials.
- J. Installation on Metal Framing: Use screws for attachment of gypsum board except face layer of nonrated double-layer assemblies, which may be installed by means of adhesive lamination.
- K. Installation on Wood Framing: For rated assemblies, comply with requirements of listing authority. For nonrated assemblies, install as follows:
 - 1. Single-Layer Applications: Screw attachment.

3.04 INSTALLATION OF TRIM AND ACCESSORIES

- A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
 - 1. Not more than 30 feet apart on walls and ceilings over 50 feet long.
 - 2. At exterior soffits, not more than 30 feet apart in both directions.
- B. Corner Beads: Install at external corners, using longest practical lengths.

- C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.
- D. Decorative Trim: Install at locations shown on drawings and in accordance with manufacturer's instructions.
- E. Moisture Guard Trim: Install on bottom edge of gypsum board according to manufacturer's instructions and in locations indicated on drawings.
- F. Exterior Soffit Vents: Install according to manufacturer's written instructions and in locations indicated on drawings. Provide vent area specified.

3.05 JOINT TREATMENT

- A. Glass Mat Faced Gypsum Board and Exterior Glass Mat Faced Sheathing: Use fiberglass joint tape, embed and finish with setting type joint compound.
- B. Paper Faced Gypsum Board: Use paper joint tape, embed with drying type joint compound and finish with drying type joint compound.
- C. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
 - 1. Gypsum Board Surfaces not painted or finished:
 - a. GA-214 Level 1: 'All joints and interior angles shall have tape set in joint compound. Surface shall be free of excess joint compound. Tool marks and ridges are acceptable'.
 - 2. Gypsum Board Surfaces to Receive: Painted Texturing - Section 09 9413: 'Interior Textured Finishing':
 - a. GA-214 Level 4: 'All and interior angles shall have tape embedded in joint compound and two separate coats of joint compound applied over all flat joints and one separate coat of joint compound applied over interior angles. Fastener heads and accessories shall be covered with three separate coats of joint compound. All joint compound shall be smooth and free of tool marks and ridges. Coat prepared surface with specified primer'.
 - 3. Gypsum Board Surfaces to Receive: Smooth Gypsum Board Surfaces:
 - a. GA-214 Level 4: 'All and interior angles shall have tape embedded in joint compound and two separate coats of joint compound applied over all flat joints and one separate coat of joint compound applied over interior angles. Fastener heads and accessories shall be covered with three separate coats of joint compound. All joint compound shall be smooth and free of tool marks and ridges. Coat prepared surface with specified primer'.
- D. Finishing:
 - 1. General:
 - a. Tape and finish joints and corners throughout building as specified below to correspond with final finish material to be applied to gypsum board. When sanding, do not raise nap of gypsum board face paper or paper-faced trim.
 - b. First Coat:
 - 1) Apply tape over center of joint in complete, uniform bed of specified taping compound and wipe with a joint knife leaving a thin coating of joint compound. If metal corner bead is used, apply reinforcing tape over flange of metal corner bead and trim so half of tape width is on flange and half is on gypsum board.
 - 2) Completely fill gouges, dents, and fastener dimples.
 - 3) Allow to dry and sand lightly if necessary to eliminate high spots or excessive compound.
 - c. Second Coat:
 - 1) Apply coat of specified joint compound over embedded tape extending 3-1/2 inches (88 mm) on both sides of joint center. Use finishing compound only if applied coat is intended as final coat.
 - 2) Re-coat gouges, dents, and fastener dimples.
 - 3) Allow to dry and sand lightly to eliminate high spots or excessive compound.

- d. Third Coat: Apply same as second coat except extend application 6 inches (150 mm) on both sides of joint center. Allow to dry and sand with fine sandpaper or wipe with damp sponge.
- e. Fourth Coat: Apply same as second coat except extend application 9 inches (425 mm) on both sides of joint center. Allow to dry and sand with fine sandpaper or wipe with damp sponge.

3.06 TEXTURE FINISH

- A. Apply finish texture coating in accordance with manufacturer's instructions and to match approved sample.
- B. Location:
 1. Walls:
 - a. Holey smooth wall texture.
 2. Ceilings:
 - a. Light knockdown texture.
- C. Finishing:
 1. Texture:
 - a. After gypsum board is taped, sanded, and primed, apply texture. Closely match samples accepted by Architect.
 - 1) After wall has been textured, apply priming and paint as specified in Section 09 9123.

3.07 FIELD QUALITY CONTROL

- A. Non-Conforming Work:
 1. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 - a. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - b. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

3.08 TOLERANCES

- A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

3.09 CLEANING

- A. Remove from site debris resulting from work of this Section including taping compound spills.

END OF SECTION

**SECTION 09 2216
NON-STRUCTURAL METAL FRAMING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Metal partition, ceiling, and soffit framing.
- B. Framing accessories.

1.02 REFERENCE STANDARDS

- A. AISI S220 - North American Standard for Cold-Formed Steel Framing - Nonstructural Members 2015.
- B. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures Most Recent Edition Cited by Referring Code or Reference Standard.
- C. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire 2019.
- D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.
- E. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members 2015.
- F. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable 2021a.
- G. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings 2017.
- H. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels 2019.
- I. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members 2018.
- J. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products 2020.
- K. ASTM C841 - Standard Specification for Installation of Interior Lathing and Furring 2003 (Reapproved 2018).
- L. ASTM C1513 - Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections 2018.
- M. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions 2020.
- N. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials 2020.
- O. UL 263 - Standard for Fire Tests of Building Construction and Materials Current Edition, Including All Revisions.
- P. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conferences:
 - 1. Schedule pre-installation conference to be held after submittals have been reviewed and returned by Architect, but before beginning metal framing work.
 - 2. In addition to agenda items specified in Section 01 3000, review following:
 - a. Identify location of required blocking.
- B. Coordination:

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1. Coordinate layout of suspension system with other construction that penetrates ceilings or is supported by them, including drywall furring, light fixtures, HVAC equipment, and fire-suppression systems.
2. All work above ceiling should be completed prior to installing suspended system. There should be no materials resting against or wrapped around suspension system, hanger wires or ties.

1.04 SUBMITTALS

- A. Shop Drawings:
 1. Indicate prefabricated work, component details, stud layout, framed openings, anchorage to structure, acoustic details, type and location of fasteners, accessories, and items of other related work.
 2. Describe method for securing studs to tracks, splicing, and for blocking and reinforcement of framing connections.
 3. Seismic Design Categories D, E and F:
 - a. Manufacturer's details and installation instructions for seismic bracing. If requested, provide copy of code requirements applicable to Project.
- B. Product Data: Provide data describing framing member materials and finish, product criteria, load charts, and limitations.
- C. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.
- D. Product Data: Provide Manufacturer's technical literature on suspension system including listing dimensions, load carrying capacity and standard compliance.
- E. Samples:
 1. Minimum 8 inch long samples of suspension system components, including main runner/tee and cross runner/tee with couplings.
- F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- G. Certificates:
 1. Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards.
 2. Installer's certificates of training.

1.05 QUALITY ASSURANCE

- A. Qualifications. Requirements of Section 01 4301 applies, but not limited to following:
 1. Installer:
 - a. Installer training ('Ceiling Masters' training course or equivalent).
 2. Manufacturer:
 - a. Manufacturer in good standing of CISCA (Ceiling and Interior Systems Construction Association).
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience and approved by manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
 1. Materials shall be delivered in original, unopened packages with labels intact.
- B. Storage And Handling Requirements:
 1. Materials shall be delivered in original, unopened packages with labels intact.
- C. Store material in fully enclosed space protected against damage from moisture, direct sunlight, surface contamination, and general damage.

1.07 WARRANTY

- A. Manufacturer Warranty:

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1. Manufacturer standard ten (10) years warranty on suspension system including repair or replacement of rusting as defined by ASTM D610.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Metal Framing, Connectors, and Accessories:
 1. CEMCO: www.cemcosteel.com/#sle.
 2. ClarkDietrich: www.clarkdietrich.com/#sle.
 3. Any member of Steel Framing Industry Association (SFIA).
 4. Any member of Steel Stud Manufacturer's Association (SSMA).
 5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FRAMING MATERIALS

- A. Framing:
 1. General:
 - a. 20 gauge minimum, unless noted greater on Drawings, meeting requirements of ASTM C645.
 - b. Steel Sheet Components: Comply with ASTM C645 requirements for metal unless otherwise indicated.
 - c. Steel Coating Requirement: Comply with ASTM C645 roll-formed from hot dipped galvanized steel complying with ASTM A1003/A1003M and/or ASTM A653/A653M G40 (Z120) or equivalent corrosion resistant coating. A40 galvanized products are not acceptable.
 - 1) Coatings shall demonstrate equivalent corrosion resistance with evaluation report from approved testing agency.
 2. Steel Studs and Runners: Cold-formed galvanized steel C-studs, as per ASTM C645 for conditions indicated.
 3. Bridging, blocking, strapping, and other accessories shall be as described in Contract Documents or as required by Manufacturer's system.
 4. Acceptable Products:
 - a. 362DS20P by CEMCO.
 - b. ProSTUD 20 by ClarkDietrich Building Systems.
 - c. 20 Ga 3-5/8 SS Series by Steeler Inc.
 - d. Any member of Steel Framing Industry Association (SFIA).
 - e. Any member of Steel Stud Manufacturer's Association (SSMA).
 - f. Equal as approved by Architect before bidding. See Section 01 6200.
- B. Furring Channels:
 1. Hat Shaped Channels: ASTM C645; 25 gauge corrosion resistant steel in sizes shown on Drawings.
 2. 'Z' Shaped Channels: 20 gauge minimum corrosion resistant steel in sizes shown on Drawings.
- C. Firestop Tracks:
 1. Top runner manufactured to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
- D. Headers and Jambs - Heavy-Duty Stud:
 1. Shape used to form header beams and jambs, columns or posts, of web depths indicated, unpunched, with stiffened flanges.
- E. Fasteners:
 1. Corrosion resistant coated, self-drilling, self-threading steel drill screws complying with ASTM C1513.
- F. Non-Loadbearing Framing Accessories:
 1. Sill Sealer: Closed-cell polyethylene foam, 1/4 inch thick by width of plate.

2.03 METAL SUSPENSION SYSTEM

- A. All system components conform to ASTM standards.
- B. Fire-Resistance Rating: UL approved metal suspension system.
- C. Seismic Standard: Acoustical ceilings shall be designed and installed to withstand effects of earthquake motions according to following requirements:
 - 1. CISCA's Recommendations for Acoustical Ceilings: Comply with CISCA's 'Recommendations for Direct-Hung Acoustical Tile and Lay-in Panel Ceilings-Seismic Zones 0-2' (Apply to Seismic Categories A & B).
 - 2. CISCA's Guidelines for Systems Requiring Seismic Restraint: Comply with CISCA's 'Guidelines for Seismic Restraint of Direct-Hung Suspended Ceiling Assemblies-Seismic Zones 3 & 4' (Apply to Seismic Categories C, D, E & F).
 - 3. Seismic Design Categories D, E and F:
 - a. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E580/E580M.
 - b. Meet seismic bracing requirements of ASCE 7, ASTM C635/C635M and ASTM C636/C636M or equivalent governing standard for project site.

2.04 SYSTEMS

- A. Manufacturers:
 - 1. Acceptable Systems:
 - a. Drywall Grid by Armstrong World Industries, Lancaster, PA
www.armstrongceilings.com.
 - b. Drywall Grid System by Chicago Metallic Corporation, Chicago, IL
www.chicagometallic.com.
 - c. Drywall Suspension System - Flat Ceilings by USG, Chicago, IL www.usg.com.
 - d. Equal as approved by Architect before bidding. See Section 01 6000.
- B. Components:
 - 1. Main Runners/Tee and Cross Runners/Tee:
 - a. Heavy-duty in accordance with ASTM C635/C635M.
 - b. Cold-formed from ASTM A653/A653M, CS Type B steel and hot dipped galvanized G-40 coating for interior ceilings.
 - c. Double-Web construction.
 - 2. Wall Track/Molding.
 - 3. Fasteners:
 - a. Nails are not permitted when subjected to direct tension such as installed vertically into bottom of structural member.
 - b. Metal attachment:
 - 1) Acoustical Eye Lag Screws:
 - (a) 1/4 inch (6.4 mm) screws zinc coated with self-drilling or self-piercing sharp point.
 - c. Wood attachment:
 - 1) Acoustical Eye Lag Screws:
 - (a) 3 inch (76 mm) x 1/4 inch (6.4 mm) screws zinc coated for wood joists with Type 17 self-drilling point.
 - d. Wire Tie to Metal Structural Member attachment:
 - 1) Wire wrapped to structural member with pigtail knot with three (3) tight wraps within 3 inch (76 mm) length at top connection.
 - 4. Hanger Wires, Braces, and Ties:
 - a. Zinc-Coated, carbon-steel wire meeting requirements of ASTM A641/A641M, Class 1 zinc coating, soft temper.
 - b. Size:
 - 1) Standard size: 12 gauge (0.105 inch) (2.70 mm) galvanized, soft annealed steel wire.

- 2) Select wire diameter so its stress is less than yield when loaded at three (3) times hanger design load (ASTM C635/C635M), Table 1, 'Direct Hung') will be less than yield stress of wire, but provide not less than 12 gauge (0.105 inch) (2.70 mm).
- c. Protect with rust inhibitive paint.
5. Seismic Joint Clip:
 - a. Required for Seismic Design Categories D, E and F.
 - 1) Quality Standard Product:
 - (a) SJCG by Armstrong.
 - (b) Equal as approved by Architect before bidding. See Section 01 6000.
6. Compression Posts/Struts:
 - a. Required for Seismic Design Categories D, E and F.
 - 1) Meet seismic requirements for Project.

2.05 FABRICATION

- A. Fabricate assemblies of framed sections to sizes and profiles required.
- B. Fit, reinforce, and brace framing members to suit design requirements.
- C. Fit and assemble in largest practical sections for delivery to site, ready for installation.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that rough-in utilities are in proper location.

3.02 INSTALLATION OF STUD FRAMING

- A. Comply with requirements of ASTM C754.
- B. Extend partition framing to structure where indicated and to ceiling in other locations.
- C. Verification Of Conditions:
 1. Inspect area receiving suspension system to identify conditions which will adversely affect installation.
 - a. Work trades work to be thoroughly dry and complete prior to installation.
 - b. Verify weather tightness of area to receive suspension system prior to installation.
 2. Notify Architect of unsuitable conditions in writing.
 - a. Do not install suspension system until adverse conditions have been remedied.

3.03 INSTALLATION

- A. Interface With Other Work:
 1. Coordinate with other Sections to provide blocking necessary for their work.
 2. Coordinate with other Sections for location of blocking required for installation of equipment and building specialties.
- B. Framing:
 1. Installation Standard: ASTM C754.
 2. Specifications of Stud Wall Manufacturer shall govern this work unless more stringent requirements are required by Contract Documents.
 3. Install specified sill sealer under sill plates of exterior walls and of acoustically insulated interior walls.
 4. Stiffen metal-framed walls with 3/4 inch (19 mm) 1-1/2 inches (38 mm) cold formed channels placed horizontally approximately 48 inch (1 200 mm) on center and securely attach to each stud.
 5. Similarly reinforce door and window openings at headers with reinforcing channel extending 18 inches (450 mm) minimum each side of opening.
 6. Apply double framing members at openings. Wrap multiple, adjacent framing members with duct tape or otherwise secure to eliminate 'chattering'.

7. Use grommets at framing penetrations where unsecured items pass through.

3.04 CEILING AND SOFFIT FRAMING AND FURRING

- A. Comply with requirements of ASTM C754.
- B. Install furring after work above ceiling or soffit is complete. Coordinate the location of hangers with other work.
- C. Install furring independent of walls, columns, and above-ceiling work.
- D. Securely anchor hangers to structural members or embed them in structural slab. Space hangers as required to limit deflection to criteria indicated. Use rigid hangers at exterior soffits.

3.05 INSTALLATION OF METAL SUSPENSION SYSTEM

- A. Interface With Other Work:
 - 1. All work above ceiling should be completed prior to installing suspended ceiling system including related work including: drywall furring work, acoustical tile, light fixtures, mechanical systems, electrical systems, and sprinklers.
- B. General:
 - 1. Install suspension system in accordance with Manufacturer's written instructions, and in compliance with ASTM installation standard, and applicable codes as required by AHJ with modifications listed below except where Manufacturer's instructions are more stringent:
 - a. Main runners/tees hanger wires 48 inches (1 200 mm) on center maximum.
 - b. Cross runners/tees hanger wires 24 inches (600 mm) on center maximum.
 - c. Do not kink, twist, or bend hanger wires as a means of leveling assembly.
 - d. Do not attach suspension system to adjustable folding partition headers.
 - 2. Hanger Wires:
 - a. Install hanger wire to structure as required with necessary on center spacing to support expected ceiling load requirements, following local practices, codes and regulations. Attach with pigtail knot with three (3) tight wraps within 3 inch (76 mm) length at each end.
 - b. Provide additional wires at light fixtures, grilles, and access doors where necessary by appropriate method in accordance with industry accepted practice.
 - c. Additional Hanger Wires: Wrapped tightly three (3) full turns within 3 inch (76 mm) length to structure and component at locations where imposed loads could cause deflection exceeding 1/360 span.
- C. Seismic:
 - 1. Required for Seismic Design Categories D, E and F:
 - a. Installation must be in accordance with ASCE 7.

3.06 TOLERANCES

- A. Maximum Variation From True Position: 1/8 inch in 10 feet.
- B. Maximum Variation From Plumb: 1/8 inch in 10 feet.
- C. Distances between parallel walls shall be 1/4 inch (6 mm) maximum along length and height of wall.
- D. Main Runners/Tees:
 - 1. Installed and leveled to meet IBC requirements to within 1/4 inch (6.4 mm) in 10 foot (3.05 m) with supporting wire taut to prevent any subsequent downward movement of main runners when ceiling loads are imposed.
 - 2. At curved ceilings, install faceted main beams with same bend at each joint to achieve consistent ceiling arch across entire ceiling.
- E. Cross Runners/Tees:

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1. Main runners, or other cross runners, must support cross runners to within 1/32 inch (0.8 mm) of required center-to-center spacing. This tolerance must be noncumulative beyond 12 feet (3.60 m).
2. Intersecting runners must be installed to form right angle to supporting members.

3.07 FIELD QUALITY CONTROL

A. Field Inspections:

1. Inspect:
 - a. Suspended ceiling system.
 - b. Hanger wires, braces, ties, anchors and fasteners.
 - c. Curved ceiling framing prior to installation of gypsum board.

B. Non-Conforming Work:

1. Remove and replace defective materials at no additional cost to Owner.

END OF SECTION

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**SECTION 09 3000
TILING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Tile for floor applications.
- B. Tile for wall applications.

1.02 REFERENCE STANDARDS

- A. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile-Setting Epoxy Adhesive 2009 (Revised).
- B. ANSI A108.5 - American National Standard Specifications for Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar 1999 (Reaffirmed 2010).
- C. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy 1999 (Reaffirmed 2010).
- D. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework 2017.
- E. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units 2018.
- F. ANSI A118.3 - American National Standard Specifications for Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive 2013 (Revised).
- G. ANSI A118.4 - American National Standard Specifications for Modified Dry-Set Cement Mortar 2012 (Revised).
- H. ANSI A118.6 - American National Standard Specifications for Standard Cement Grouts for Tile Installation 2010 (Reaffirmed 2016).
- I. ANSI A118.7 - American National Standard Specifications for High Performance Cement Grouts for Tile Installation 2010 (Reaffirmed 2016).
- J. ANSI A118.11 - American National Standard Specifications for EGP (Exterior Glue Plywood) Latex-Portland Cement Mortar 1999 (Reaffirmed 2010).
- K. ANSI A118.12 - American National Standard Specifications for Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation 2014.
- L. ANSI A118.15 - American National Standard Specifications for Improved Modified Dry-Set Cement Mortar 2012.
- M. ANSI A137.1 - American National Standard Specifications for Ceramic Tile 2019.
- N. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar 2018.
- O. ASTM C150/C150M - Standard Specification for Portland Cement 2020.
- P. ASTM C206 - Standard Specification for Finishing Hydrated Lime 2014.
- Q. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes 2018.
- R. ASTM C373 - Standard Test Methods for Determination of Water Absorption and Associated Properties by Vacuum Method for Pressed Ceramic Tiles and Glass Tiles and Boil Method for Extruded Ceramic Tiles and Non-tile Fired Ceramic Whiteware Products 2018.
- S. ASTM C482 - Standard Test Method for Bond Strength of Ceramic Tile to Portland Cement Paste 2020.
- T. ASTM C501 - Standard Test Method for Relative Resistance to Wear of Unglazed Ceramic Tile by the Taber Abraser 1984 (Reapproved 2015).
- U. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation 2019.

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1.03 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by affected installers.
- B. In addition to agenda items specified in Section 01 3000, review following:
 - 1. Review installation scheduling, coordination with related work, and placement of tile.
 - 2. Review Manufacturer's installation requirements, submittals, and Installers requirements to assure issuance of Manufacturer's system warranty.
 - 3. Review surface preparation.
 - 4. Review water-proofing and crack isolation membrane requirements.
 - 5. Review tile base installation requirements.
 - 6. Review floor tile grout thickness requirements.

1.04 SUBMITTALS

- A. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.
- B. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.
- C. Samples: Mount tile and apply grout on two plywood panels, minimum 24 x 24 inches in size illustrating pattern, color variations, and grout joint size variations.
 - 1. One sample of each type of base tile and trim piece to be used on Project.
- D. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.
- E. Source Quality Control Submittals:
 - 1. Provide Manufacturer documentation indicating proposed materials will satisfy requirements for Manufacturer's Warranty.
- F. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Operations and Maintenance Data:
 - 1) Cleaning and maintenance instructions.
 - b. Warranty Documentation:
 - 1) Include copy of final, executed warranty.
 - c. Record Documentation:
 - 1) Manufacturers Documentation:
 - (a) Source Quality Control Submittal documentation showing materials will satisfy requirements for Manufacturer's Warranty.
 - (b) Manufacturer's cut sheets of materials used in installed system.
 - (c) Tile color and pattern selections.

1.05 QUALITY ASSURANCE

- A. Source Of Materials:
 - 1. Provide materials obtained from one (1) source for each type and color of tile, grout, and setting materials for Manufacturer's system warranty.
- B. Installer Qualifications:
 - 1. Company specializing in performing tile installation, with minimum of five years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.07 FIELD CONDITIONS

- A. Do not install solvent-based products in an unventilated environment.

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- B. Maintain ambient and substrate temperature above 50 degrees F and below 100 degrees F during installation and curing of setting materials.

PART 2 PRODUCTS

2.01 TILE

- A. National Contract Suppliers. See Section 01 6000:
1. Contact following suppliers to procure components of tile assembly:
 - a. Daltile And Stone, Salt Lake City, UT:
 - 1) LDS Project Coordinators:
 - (a) Russ Green and Larry McCleary, (801) 487-9901, cell (801) 301-1461, fax (801) 487-0345 larry.mccleary@daltile.com - www.daltileproducts.com or www.daltilegreenworks.com.
- B. Design Criteria:
1. General:
 - a. Ceramic Tile:
 - 1) Tile shall be standard quality, white or off-white body, square or cushion edge, graded in accordance with ANSI A137.1.
 - 2) Square edge, white body, lug type wall tile. Field wall tile shall have two lugs on each edge to assure uniform joint, approximately 0.040 inch (one mm).
 - 3) External and internal corner pieces shall be standard grade.
- C. Description:
1. Ceramic Tile:
 - a. Floor tile:
 - 1) Size: 2 inches by 2 inches.
 - 2) Approved Products. See Section 01 6000:
 - (a) Portfolio 2x2 Glazed Ceramic Mosaic by Daltile.
 - 3) Approved Colors. See Section 01 6000:
 - (a) Ash Grey PF05.
 2. Ceramic Tile:
 - a. Wall Tile:
 - 1) Walls: 8 inches by 24 inches.
 - 2) Approved Products. See Section 01 6200:
 - (a) Color Story Wall Glazed Ceramic by American Olean.
 - 3) Approved Colors. See Section 01 6000:
 - (a) Matte Stable 0052.
 3. Porcelain Tile:
 - a. Floor Tile and Wall Tile (Drinking Fountains and Custodial Room):
 - 1) Tile Size: 12 inches x 24 inches.
 - 2) Approved Products (See Section 01 600):
 - (a) Portfolio by Daltile.
 - 3) Approved Colors (See Section 01 6000):
 - (a) Cream PF07.

2.02 SETTING MATERIALS

- A. Manufacturer's Contact List:
1. Ardex Engineered Cements, Aliquippa, PA www.ArdexAmericas.com.
 - a. Contact Information: Don Richards (206) 979-0401
www.Don.richards@ArdexAmericas.com.
 2. Custom Building Products, Seal Beach, CA www.custombuildingproducts.com.
 - a. Contact Information: John Gallup (206) 718-6024 johng@cbpmail.net.
 3. Dal-Tile Corp., Div. of Mohawk Industries, Dallas, TX www.daltile.com.
 4. Interceramic Inc., Garland, TX www.interceramic.com.
 5. Laticrete International Inc., Bethany, CT www.laticrete.com.

6. Mapei Americas Headquarters, Deerfield Beach, FL www.mapei.com.
 - a. Contact Information: Bart A. Wilde (801) 467-2060 [www.bwilde@mapei.com](mailto:bwilde@mapei.com).
7. Merkrete, by Parex USA, Inc., Anaheim, CA www.merkrete.com.
 - a. Contact Information: Andy Townes (505) 873-1181 andy.townes@parexusa.com.
8. Schluter Systems L.P., Plattsburgh, NY www.schluter.com.

B. Materials:

1. Mortar Bed:
 - a. Portland Cement: Meet requirements of ASTM C150/C150M, Type 1, designation shall appear on bag.
 - b. Hydrated Lime:
 - 1) Meet Requirements of one of following:
 - (a) ASTM C206.
 - (b) ASTM C207, Type S (designation shall appear on bag).
 - c. Sand: Clean, washed, well-graded, meeting requirements of ASTM C144 with gradation of 100 percent passing No. 8 sieve with not over five (5) percent passing No. 100 sieve.
 - d. Latex Additive; in lieu of all water:
 - 1) Design Criteria:
 - (a) Meet material specification requirements of ANSI A118.4 or ANSI A118.11.
 - (b) Meet ANSI installation specification requirements of ANSI A108.5.
 - (c) Expansion joints complies with TCA method EJ171.
 - 2) Acceptable Products:
 - (a) ARDEX: Ardex E 90 Mortar Admix.
 - (b) CUSTOM: Thin-Set Mortar Admix.
 - (c) LATICRETE: 4237 Latex Additive with 211 Powder.
 - (d) MAPEI: Planicrete AC.
 - (e) MERKRETE: 150 Latex Admixture.
2. Metal Trim:
 - a. Approved Products. See Section 01 6200:
 - 1) Tile / Carpet Junction: Schluter-SCHIENE-E45/V4A stainless steel transition strip.
 - 2) Tile / Painted Wall Termination: Schluter-SCHIENE-E45/V4A stainless steel transition strip.
 - 3) Tile Walls / Tile Floors Junction: Schluter-DILEX-HKU stainless steel cove with fabricated end caps and inside corner pieces.
3. Joint Sealants:
 - a. Interior Ceramic Tile Joints are furnished in Section 07 9213 and installed in Section 09 3013 'Ceramic Tiling' including the following:
 - 1) Ceramic tile inside corners.
 - 2) Ceramic tile and metal cove base joints.
4. Backer Board Joint Reinforcing: 2 inch (50 mm) wide glass fiber mesh tape.
5. Tile Setting Products:
 - a. Use only products of same Manufacturer to validate warranty, unless otherwise acceptable to Ceramic Tile Supplier.
 - b. Use only products that meet Mortar Manufacturer's twenty five (25) year system warranty requirements.
 - c. Latex-Portland Cement Mortar For Floors:
 - 1) Design Criteria:
 - (a) Meet ANSI material specification requirements of ANSI A118.4, ANSI A118.11, or ANSI A118.15.
 - (b) Meet ANSI installation specification requirements of ANSI A108.4 or ISO material specification ISO13007 installation material specification and C2ES1P2 performance requirements for adhesive.

- 2) Approved Products. See Section 01 6000:
 - (a) ARDEX: Ardex X77.
 - (b) CUSTOM: Megalite Crack Prevention Mortar or FlexBond Premium Crack Prevention Thin-set Mortar (no additives needed).
 - (c) LATICRETE: 254 Platinum Thinset.
 - (d) MAPEI: Ultraflex 3.
 - (e) MERKRETE: 735 Premium Flex.
- d. Latex/Polymer Modified Portland Cement Mortar For Walls:
 - 1) Design Criteria:
 - (a) Meet ANSI material specification requirements of ANSI A118.4, ANSI A118.11, or ANSI A118.15.
 - (b) Meet ANSI installation specification requirements of ANSI A108.4 or ISO material specification ISO13007 installation material specification and C2ES1P2 performance requirements for adhesive.
 - 2) Approved Products. See Section 01 6000:
 - (a) ARDEX: Ardex X77.
 - (b) CUSTOM: Megalite Thin-Set Mortar or FlexBond Fortified Thin-Set Mortar.
 - (c) LATICRETE: 254 Platinum Thinset.
 - (d) MAPEI: Ultraflex 3.
 - (e) MERKRETE: 735 Premium Flex.
- e. Floor Grout (Epoxy):
 - 1) Design Criteria:
 - (a) Meet ANSI material specification requirements of ANSI A118.3.
 - (b) Meet ANSI installation specification requirements of ANSI A108.6 and ISO material specification ISO13007 RG.
 - 2) Approved Color:
 - (a) MAPEI: No. 11 Sahara Beige.
 - (b) Equal as approved by Architect prior to installation.
- f. Wall Grout (Modified Polymer):
 - 1) Design Criteria:
 - (a) Meet ANSI material specification requirements of ANSI A118.6 or ANSI A118.7.
 - (b) Meet ANSI installation specification requirements of ANSI A108.10 or ISO material specification ISO13007 C2ES1P2.
 - 2) Color:
 - (a) MAPEI: No. 11 Sahara Beige.
 - (b) Equal as approved by Architect prior to installation.
 - 3) Approved Products. See Section 01 6000:
 - (a) ARDEX: Ardex FH.
 - (b) CUSTOM: PolyBlend Non-Sanded Grout or Prism Color Consistent Grout.
 - (c) LATICRETE: 1600 Series Unsanded Dry Set Wall Grout with 1776 Grout Admix Plus additive.
 - (d) MAPEI: Keracolor-U Unsanded Polymer-Modified Grout.
 - (e) MERKRETE: Non-Sanded ColorGrout, latex modified.
- g. Waterproofing Membrane:
 - 1) Design Criteria:
 - (a) Meet ANSI installation specification requirements of ANSI A108.10.
 - (b) ANSI installation specification requirements not required.
 - 2) Approved Products. See Section 01 6000:
 - (a) Troweled applied, cement based:
 - (b) ARDEX: Ardex 8+9.
 - (c) MAPEI: Mapelastic 315.
 - (d) Liquid applied, latex based:

- (e) CUSTOM: RedGuard Waterproofing or Crack Prevention Membrane or FractureFree Crack Prevention Membrane.
 - (f) LATICRETE: Hydro Ban.
 - (g) MAPEI: Mapelastic AquaDefense.
 - (h) MERKRETE: Hydro-Guard SP-1.
 - h. Crack Isolation Membrane:
 - 1) Design Criteria:
 - (a) Meet ANSI installation specification requirements of ANSI A118.12.
 - (b) ANSI installation specification requirements not required.
 - 2) Approved Products. See Section 01 6000:
 - (a) Flexible, thin, load-bearing, fabric-reinforced:
 - (b) ARDEX: Ardex 8+9 with SK Mesh Tape.
 - (c) CUSTOM: Crack Buster Pro Crack Prevention Mat Underlayment, with Peel & Stick Primer.
 - (d) LATICRETE: Blue 92 Anti-Fracture Membrane.
 - (e) MAPEI: Mapeguard 2, and Primer SM.
 - (f) MERKRETE: Hydro-Guard SP-1.
 - (g) Liquid applied, latex based:
 - (h) CUSTOM: RedGuard Waterproofing and Crack Prevention Membrane or FractureFree Crack Prevention Membrane.
 - (i) LATICRETE: Hydro Ban.
 - (j) MAPEI: Mapelastic AquaDefense.
 - (k) MERKRETE: Fracture Guard 5000.
 - i. Stone Thresholds:
 - 1) Texture and color variation shall be within limits established by Architect's approved sample.
 - 2) Free of defects that would materially impair strength, durability, and appearance.
 - 3) Finish: 80 grit exterior hone.
 - 4) White marble, one (1) piece, 7/8 inch (22 mm) thick by 2 1/2 inches (64 mm) by door opening width. Cross-section to meet handicap accessibility requirements.
- C. Mixes:
 - 1. Mortar Beds:
 - a. Floor Mix: One Part Portland Cement, 5 Parts Dry Sand, 4 Part Damp Sand, 1/10 Part hydrated Lime optional.
 - b. Wall Mix: One Part portland cement, 5-1/2 to 7 Parts damp sand, 1/2 Part hydrated lime optional.
 - c. Font One Part portland cement, 4 Parts damp sand. Use waterproofing admixture. Mix dry then add minimum amount of water.

PART 3 EXECUTION

3.01 INSTALLERS

- A. Acceptable Installers:
 - 1. Meet Quality Assurance Installer Qualifications as specified in Part 1 of this specification.

3.02 EXAMINATION

- A. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.
- C. Verify that subfloor surfaces are dust free and free of substances that could impair bonding of setting materials to subfloor surfaces.

- D. Verify that concrete sub-floor surfaces are ready for tile installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by tile manufacturer and setting materials manufacturer.
- E. Verify that required floor-mounted utilities are in correct location.
- F. Notify Architect in writing if surfaces are not acceptable to install tile:
 - 1. Do not lay tile over unsuitable surface.
 - 2. Commencing installation constitutes acceptance of surfaces and approval of existing conditions.

3.03 PREPARATION

- A. Allow concrete to cure for twenty-eight (28) days minimum before application of mortar bed.
- B. Protect surrounding work from damage.
- C. Vacuum clean surfaces and damp clean.
- D. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.
- E. Install backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of setting material to a feather edge.
- F. Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.

3.04 INSTALLATION - GENERAL

- A. Interface with Other Work:
 - 1. Grounds, anchors, plugs, hangers, door frames, electrical, mechanical, and other work in or behind tile shall be installed before tile work is started.
- B. Special Techniques:
 - 1. Install in accordance with following latest TCNA (HB) installation methods:
 - a. Flush Concrete Slabs with crack isolation membrane: TCNA F115.
 - b. Mortar Bed on Concrete Slab: TCNA F111 with reinforcing.
- C. Tolerances:
 - 1. Plane of Vertical Surfaces:
 - a. 1/8 inch in 8 feet (3 mm in 2.450 meters) from required plane shall be plumb and true with square corners.
 - 2. Variation in Slab Grade:
 - a. Plus or minus 1/8 inch (3 mm) in any 10 feet (3.050 m) of floor slab and distance between high point and low point of slab of 1/2 inch (12.7 mm).
 - b. Slab Testing Procedure:
 - 1) Place ends of straightedge on 3/8 inch (10 mm) high shims.
 - 2) Floor is satisfactory if 1/4 inch (6 mm) diameter steel rod rolled under straightedge will not touch anywhere along 10 foot (3.050 m) length and 1/2 inch (12.7 mm) diameter steel rod will not fit under straightedge anywhere along 10 foot (3.050 m) length.
- D. General:
 - 1. Install tile in pattern indicated:
 - a. Align joints when adjoining tiles on floor, base, walls, and trim are same size.
 - b. Adjust to minimize tile cutting and to avoid tile less than half size.
 - c. Center and balance areas of tile.
 - 2. Extend tile into recesses and under equipment and fixtures to form a complete covering without interruption:
 - 3. Maintain heights of tilework in full courses to nearest obtainable dimension where heights are given in feet and inches (meters and millimeters) and are not required to fill vertical spaces exactly.

4. Install cut tile with cuts on outer edges of field:
 - a. Provide straight cuts that align with adjacent materials.
 - b. When possible, smooth cut edges of tile or use appropriate cutter or wet saw to produce smooth cuts.
 - c. Do not install tile with jagged or flaked edges.
 5. Terminate tile neatly at obstructions, edges, and corners, without disruption of pattern or joint alignment:
 - a. Fit tile closely where edges are to be covered by trim, escutcheons, or similar devices.
 6. Provide straight tile joints of uniform width, subject to variance in tolerance allowed in tile size:
 - a. Make joints smooth and even, without voids, cracks, or excess mortar or grout.
 7. Use a beating block and hammer or rubber mallet so faces and edges of individual tiles are flush and level with faces and edges of adjacent tiles, and to reduce lippage.
 8. Accessories in tilework shall be evenly spaced, properly centered with tile joints, and level, plumb, and true to correct projection.
 9. Leave finished installation clean and free of cracked, chipped, broken, unbonded, and otherwise defective tile work.
- E. Application on Concrete Floor:
1. On Mortar Bed:
 - a. Apply mortar bed to depth equal to depression in slab minus 1/2 inch (12.7 mm).
 - b. Properly cure before installing tile.
 2. Clean substrate surface thoroughly.
 - a. Dampen if very dry, but do not saturate.
 3. Install tile with 100 percent contact with mortar bed.
 - a. Obtaining 100 percent contact may require troweling mortar layer on back of each tile before placing on mortar bed.
 4. Install base by flush method (square or thin-lip method is not acceptable):
 - a. Allow for expansion joint directly above any expansion or control joints in slab.
 5. Insert temporary filler in expansion joints.
- F. Application of Mortar:
1. Do not spread more mortar than can be covered within ten (10) to fifteen (15) minutes:
 - a. If 'skinning' occurs, remove mortar and spread fresh material.
 - b. Spread mortar with notches running in one (1) direction, perpendicular to pressing, pushing and pulling of tile during placement.
 2. Install tile before mortar has started initial cure:
 - a. For thin set mortar application, use notch trowel that will achieve the recommended coverage of mortar after tiles have been installed.
 3. Place tile in fresh mortar, press, push and pull tile slightly to achieve as near 100 percent coverage and contact of tile with setting material and substrate as possible:
 - a. Average contact area shall be not less than eighty (80) percent except on exterior or shower installations where contact area shall be ninety-five (95) percent when not less than three (3) tiles or tile assemblies are removed for inspection. The eighty (80) percent or ninety-five (95) percent coverage shall be sufficiently distributed to give full support of the tile.
 - b. Support corners and edges with mortar leaving no hollow corners or edges.
 4. Install so there is 1/8 inch (3 mm) of mortar between tile and substrate after proper bedding:
 - a. Periodically remove sheets or individual tiles to assure proper bond coverage consistent with industry specifications.
 - b. If coverage is found to be insufficient, use a larger size notch trowel.
- G. Application of Grout:
1. Firmly set tile before applying grout:

- a. This requires forty-eight (48) hours minimum.
 2. Before grouting:
 - a. Remove all paper and glue from face of mounted tile.
 - b. Remove spacers or ropes before applying grouting:
 3. Mixing Grout:
 - a. Use clean buckets and mixing tools:
 - 1) Use sufficient pressure and flow grout in progressively to avoid air pockets and voids.
 - b. Machine mixing of grout is preferred to assure uniform blend. To prevent trapping air bubbles into prepared grout, use slow speed mixer.
 - c. Slake for fifteen (15) minutes.
 - d. Water or latex additives used for mixing with dry grout shall be measured accurately.
 4. Before grouting entire area, do a test area to assure there will be no permanent staining or discoloration of tile and to verify that excess grout can be easily removed from tile surface:
 - a. If necessary, pre-coat exposed surfaces of tile with a grout release recommended by Grout Manufacturer to facilitate removal of excess grout.
 5. Installing Grout:
 - a. Use caution, when grouting glazed ceramic tiles to prevent scratching or damaging surface of tile.
 - b. Dampen dry joints prior to grouting with sand-portland cement grout, standard sanded cement grout, standard unsanded cement grout, polymer modified sanded tile grout, and polymer modified unsanded tile grout. Do not leave puddles of water in joints before grouting.
 - c. Keep an adequate joint depth open for grouting. Force maximum amount of grout into joints.
 - d. Apply grout to produce full, smooth grout joints of uniform width, and free of voids and gaps
 - 1) Fill joints of cushion edge tile to depth of cushion.
 - 2) Fill joints of square edge tile flush with surface.
 - 3) Fill joint between wall tile and bull-nosed paver tile base with floor grout.
 - e. Install floor tile with grout thickness of 3/16 inch (4.76 mm) maximum.
 - f. Remove excess grout from surface of tile before it loses its plasticity or begins to set.
 - g. Finished grout shall be uniform in color, smooth, and without voids, pin holes, or low spots.
- H. Curing:
1. Keep installation at 65 to 85 deg F (18 to 30 deg C) during first eight (8) hours of cure. Shade area completely from sun during this period.
- I. Application of Joint Sealants:
1. Apply joint sealants after grout has cured:
 - a. This requires forty-eight (48) hours minimum.
 2. Before applying sealant:
 - a. Remove spacers or ropes before applying joint sealants.
 - b. Apply backer rod and joint sealants at expansion joints.

3.05 FIELD QUALITY CONTROL

- A. Non-Conforming Work:
1. Correct any work found cracked, chipped, broken, unbounded and otherwise defective or not complying with contract document requirements at no additional cost to the Owner.

3.06 CLEANING

- A. Clean tile and grout surfaces.
- B. If one has been used, remove grout release and clean tile surfaces so they are free of grout residue and foreign matter:

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1. If a grout haze or residue remains, use a suitable grout haze remover or cleaner.
2. Flush surface with clean water before and after cleaning.

3.07 PROTECTION

- A. Do not permit traffic over finished floor surface for 4 days after installation.
- B. Close to traffic areas where tile is being set and other tile work being done:
 1. Keep closed until tile is firmly set.
 2. Before, during, and after grouting, keep area clean, dry, and free from foreign materials and airflow that will interfere with setting and curing of grout.
- C. Newly tiled floors shall not be walked on nor worked on without using kneeling boards or equivalent protection of tiled surface.
- D. After cleaning, provide protective covering and maintain conditions protecting tile work from damage and deterioration:
 1. Where tiled surfaces will be subject to equipment or wheel traffic or heavy construction traffic, cover protective covering with 1/4 inch (6 mm) hardboard, plywood, or similar material.

END OF SECTION

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**SECTION 09 5100
ACOUSTICAL CEILINGS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Suspended metal grid ceiling system.
- B. Acoustical units.

1.02 REFERENCE STANDARDS

- A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures Most Recent Edition Cited by Referring Code or Reference Standard.
- B. ASHRAE Std 62.1-2013 - Ventilation for Acceptable Indoor Air Quality 2013.
- C. ASTM A568/A568M - Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements For 2019a.
- D. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire 2019.
- E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.
- F. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method 2017.
- G. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings 2017.
- H. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels 2013.
- I. ASTM D610 - Standard Practice for Evaluating Degree of Rusting on Painted Steel Surfaces 2008 (Reapproved 2019).
- J. ASTM D1779 - Standard Specification for Adhesive for Acoustical Materials 1998.
- K. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber 2016.
- L. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2020.
- M. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials 2020.
- N. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions 2020.
- O. ASTM E795 - Standard Practices for Mounting Test Specimens During Sound Absorption Tests 2016.
- P. ASTM E1111/E1111M - Standard Test Method for Measuring the Interzone Attenuation of Open Office Components 2014.
- Q. ASTM E1264 - Standard Classification for Acoustical Ceiling Products 2019.
- R. ASTM E1414/E1414M - Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum 2016.
- S. ASTM E1477 - Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers 1998a (Reapproved 2017).
- T. NFPA 101 - Life Safety Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- U. NFPA 265 - Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Textile or Expanded Vinyl Wall Coverings on Full Height Panels and Walls 2019.

- V. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conferences:
1. Participate in pre-installation conference specified in Section 09 2900 to review finish requirements for gypsum wallboard ceilings.
 2. Schedule acoustical tile ceiling pre-installation conference after installation of gypsum wallboard but before beginning installation of tile.
 3. In addition to items specified in Section 01 3100, review following:
 - a. Verify that tile comes from same dye lot and has same dye lot code.
 - b. Review requirements of acceptable and non-acceptable tile.
- B. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.
- C. Do not install acoustical units until after interior wet work is dry.
- D. Coordination:
1. Coordinate layout of suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, and fire-suppression systems.
 2. All work above ceiling should be completed prior to installing suspended system. There should be no materials resting against or wrapped around suspension system, hanger wires or ties.

1.04 SUBMITTALS

- A. Product Data: Provide data on suspension system components and acoustical units.
- B. Samples: Submit two samples 6 by 6 inch in size illustrating material and finish of acoustical units.
- C. One (1) sample of each variant of specified tile series.
- D. Minimum 8 inch (200 mm) long samples of exposed wall molding and suspension system, including main runner/tee and cross runner/tee with couplings.
- E. Manufacturer's certifications that products comply with specified requirements including laboratory reports showing compliance with specified tests and standards. For acoustical performance, each carton of material must carry approved independent laboratory classification of NRC, CAC, and AC.
- F. Certificates:
1. Installer(s):
 - a. Provide each Installer's 'Certificate of Completion - Duratile' from Manufacture showing Name and completion date with bid to be included in closing documents for project.
 - 1) Certificate is valid for two (2) years from date printed on Certificate before recertification is required.
 2. Suspension Assemblies:
 - a. Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards.
 - b. Installer's certificates of training.
- G. If requested by Owner, provide copies of Quality Assurance requirements for 'Class A' flame spread rating and 'Room-Corner Test'.
- H. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- I. Closeout Submittals:

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1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Warranty Documentation:
 - 1) Final, executed copy of Warranty.
 - b. Record Documentation:
 - 1) Manufacturers Documentation:
 - (a) Manufacturer's literature.
 - (b) Color and pattern selection.
 2. Installer(s) 'Certificate of Completion - Duratile' submitted at time of bid.
- J. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. Extra Acoustical Units: Provide Owner with two (2) cartons of each pattern and color used on Project for future use.
 - a. Packaged with protective covering for storage and identified with appropriate labels.
 - 2.

1.05 QUALITY ASSURANCE

- A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. Regulatory Agency Sustainability Approvals:
 1. All system components conform to ASTM standards.
 2. Fire-Resistance Rating: UL approved metal suspension system.
- C. Acoustical Panel Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Acceptance Requirements:
 1. Materials shall be delivered in original, unopened packages with labels intact.
- B. Storage And Handling Requirements:
 1. Store materials where protected from moisture, direct sunlight, surface contamination, and damage.
 2. Store in cool, dry location, out of direct sunlight and weather, and at temperatures between 32 deg F (0 deg C) and 86 deg F (30 deg C).
 3. Store adhesive on site at installation temperature, between 65 and 90 deg F (18 and 32 deg C), for one week before installation.
 4. Handle acoustical ceiling panels carefully to avoid chipping edges or damage. Use no soiled, scratched, or broken material in the Work.

1.07 FIELD CONDITIONS

- A. Ambient Conditions:
 1. Building shall be enclosed, mechanical system operating with proper filters in place, and temperature and humidity conditions stabilized within limits under which Project will operate before, during, and after installation until Substantial Completion.
 2. Installation shall be at temperatures between 50 deg F (10 deg C) and 86 deg F (30 deg C) or as per Manufacturer recommendations.
- B. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

1.08 WARRANTY

- A. Acoustical Ceiling Panels:
 1. Manufacturers warranty to be free from defects in material and factory workmanship.
 2. Manufacturer's warranty against sagging and warping.
 3. Manufacturer's warranty against mold/mildew and bacterial growth.
- B. Suspension Assemblies:

1. Manufacturer warranty including repair or replacement of rusting as defined by ASTM D610 and defects in material or factory workmanship.

PART 2 PRODUCTS

2.01 REGULATORY AGENCY SUSTAINABILITY APPROVALS

- A. Fire-Test-Response Characteristics: As determined by testing identical ceiling tile applied with identical adhesives to substrates according to test method indicated below by qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 1. Surface-Burning Characteristics:
 - a. Ceiling tile shall have Class A flame spread rating in accordance with ASTM E84 or UL 723 Type 1.
 - 1) Class A (Flame spread index 0-25; Smoke-developed index 0-450).
 - 2) Flash point: None.
- B. Passage of 'Room-Corner Test' as recognized by AHJ, is required for system. Adhesive cited in test literature is required for installation of ceiling tile on Project.
 1. Room Corner Tests:
 - a. ASTM E84, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
 - b. IBC 803.2.1, 'Room Corner Test for Interior Wall or Ceiling Finish Materials'.
 - c. NFPA 265: 'Room Corner Test for Interior Wall or Ceiling Finish Materials'.
 - d. UL 723, 'Standard for Safety Test for Surface Burning Characteristics of Building Materials'.
- C. All system components conform to ASTM standards.
- D. Fire-Resistance Rating: UL approved metal suspension system.
- E. Meet seismic bracing requirements of ASCE 7, ASTM C635/C635M and ASTM C636/C636M or equivalent governing standard for project site.
- F. Seismic Standard: Acoustical ceilings shall be designed and installed to withstand the effects of earthquake motions according to the following:
 1. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E580/E580M.
 2. CISCA's Recommendations for Acoustical Ceilings: Comply with CISCA's 'Recommendations for Direct-Hung Acoustical Tile and Lay-in Panel Ceilings-Seismic Zones 0-2' (Apply to Seismic Categories A & B).
 3. CISCA's Guidelines for Systems Requiring Seismic Restraint: Comply with CISCA's 'Guidelines for Seismic Restraint of Direct-Hung Suspended Ceiling Assemblies-Seismic Zones 3 & 4' (Apply to Seismic Categories C, D, E & F).

2.02 MANUFACTURERS

- A. Acoustic Ceiling Panels: Manufacturers Contact List:
 1. Armstrong World Industries, Lancaster, PA www.ceiling.com.
 - a. Contact Information:
 - 1) For pricing and ordering of tile, contact Sherry Brunt / Phyllis Miller at (800) 442-4212, FAX 800-233-5598, or bpo_strategic_accounts@armstrong.com.
 - 2) For Strategic Account information, contact Randy Lay at (303) 775-1409 ralay@armstrong.com.
 2. USG Interiors Inc, Chicago, IL www.usg.com.

2.03 ACOUSTICAL PANEL UNITS

- A. Acoustic Ceiling Panels:
 1. Description:
 - a. Color: White (surface factory-applied).
 - b. Composition: Wet-formed mineral fiber.
 2. Design Criteria:

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- a. Acoustics:
 - 1) Noise Reduction Coefficient (NRC): ASTM C423; 0.70 minimum.
 - 2) Ceiling Attenuation Class (CAC): ASTM E1414/E1414M; 35 minimum.
- b. Antimicrobial Protection: Resistance against growth of mold/mildew.
- c. Classification:
 - 1) Meet requirements of ASTM E1264, Type III (mineral base with painted finish), Form 1 (nodular) or Form 4 (cast or molded), Pattern E1 (lightly textured).
- d. Fire Performance: As specified in Quality Assurance in Part 1 of this specification.
- e. Light Reflectance (LR): ASTM E1477; 0.83 minimum.
- f. Sag Resistance: Resistance to sagging in high humidity conditions.
- g. VOC: Low.
- 3. Design Criteria:
 - a. Grid Face: 15/16 inch (24 mm).
 - b. Size: 24 inch x 24 inch x 1" (610 mm x 610 mm x 25.4 mm).
- 4. Acceptable Product:
 - a. Calla by Armstrong:
 - 1) Grid System: Prelude XL Exposed Tee.
 - 2) Edge Profile: Square Lay-in.
 - b. Equal to Armstrong Calla by USG as approved by Architect prior to installation:
 - 1) Grid System: DX/DXL Exposed Tee.
 - 2) Edge Profile: Square.
 - c. Equal as approved by Architect before bidding. See Section 01 6200.

2.04 ACCESSORIES:

- A. Edge Molding:
 - 1. Steel 'U' molding with baked enamel finish.
 - 2. Acceptable Products:
 - a. 7843 Series by Armstrong.
 - b. Equal as approved by Architect before installation. See Section 01 6200.

2.05 SUSPENSION SYSTEM(S)

- A. Manufacturers:
 - 1. Acceptable Manufacturers:
 - a. Grid Face: 15/16 inch:
 - 1) Armstrong World Industries Co, Lancaster, PA www.armstrong.com.
 - 2) USG Interiors Inc, Chicago, IL www.usg.com.
 - 3) Equal as approved by Architect before bidding. See Section 01 6000.
- B. Materials:
 - 1. Grid:
 - a. Systems shall meet requirements of ASTM C635/C635M, Intermediate Duty suspension system required for Seismic Design Categories A, B, or C.
 - b. Systems shall meet requirements of ASTM C635/C635M, Heavy Duty suspension system required for Seismic Design Categories D, E, or F.
 - c. Exposed surfaces shall be finished with factory-applied white baked enamel.
 - d. Meet requirements of ASTM D610 for red rust.
 - e. Main runners and cross tees:
 - 1) All main beams and cross tees shall be commercial quality hot-dipped galvanized (galvanized steel, aluminum, or stainless steel) as per ASTM A653/A653M. Main beams and cross tees are double-web steel construction with type exposed flange design.
 - 2) Wide-face design - main runners and cross tees shall have one inch (25 mm) exposed face.
 - 2. Performance Standards:
 - a. DX Systems by USG Interiors required for Seismic Design Categories A, B, or C.

- b. DXL Systems by USG Interiors required for Seismic Design Categories D, E, or F.
- 3. Wire Hangers, Braces, and Ties:
 - a. Zinc-Coated, carbon-steel wire meeting requirements of ASTM A641/A641M, Class 1 zinc coating, soft temper.
 - b. Size:
 - 1) Standard size: 12 gauge (0.105 inch) (2.70 mm) galvanized, soft annealed steel wire.
 - 2) Select wire diameter so its stress is less than yield when loaded at three (3) times hanger design load (ASTM C635/C635M), Table 1, 'Direct Hung') will be less than yield stress of wire, but provide not less than 12 gauge (0.105 inch) (2.70 mm).
 - c. Protect with rust inhibitive paint.
- 4. Wall Molding: Channel section of cold-rolled electro-galvanized steel.
- 5. Edge Moldings and Trim: Metal or extruded aluminum of types and profiles indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations, including light fixtures, that fit type of edge detail and suspension system indicated. Provide moldings with exposed flange of same width as exposed runner.
- 6. Hold-down Clips: As required by UL to prevent lifting of panels under unusual draft conditions.
- 7. Seismic Joint Clip:
 - a. Required for Seismic Design Categories D, E, or F.
 - b. Quality Standard Product:
 - 1) SJCG by Armstrong World Industries, Lancaster, PA www.armstrong.com.
 - 2) Equal as approved by Architect before bidding. See Section 01 6000.
- 8. Seismic Suspension System:
 - a. Required for Seismic Design Categories A, B, C, D, E, or F:
 - b. Design Criteria:
 - 1) Installation of ceiling system must be as prescribed by ICC-ES Evaluation Reports ESR-1222 or ESR-1308 and applicable code.
 - 2) Meet requirements of ASTM A568/A568M for hot-dipped galvanized, cold-rolled steel.
 - 3) Attach cross runners to wall with seismic clips.
 - c. Wall Molding Size: 7/8 inch (22 mm) for all seismic design categories (code approved).
 - d. Acceptable Products. See Section 01 6000.
 - 1) ACM7 Clip by USG Inc, Chicago, IL www.usg.com.
 - 2) BERC-2 Clip by Armstrong World Industries, Lancaster, PA www.ceilings.com.
- 9. Compression Posts/Struts:
 - a. Required for Seismic Design Categories D, E, or F.
 - b. Meet seismic requirements for Project.

C.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that layout of hangers will not interfere with other work.
- C. Inspect for defects in backing and support that are not acceptable.
 - 1. Examine areas around HVAC diffusers and light fixtures for tile installation problems.
 - 2. Examine ceiling for levelness. CISCA 'Code of Practice' requires ceiling to be free of irregularities and be level to within 1/4 inch (6 mm) in 12 foot (305 mm).
 - 3. Examine substrate for any problems that will compromise adhesion of ceiling tile.
- D. Inspect for defects in support that are not acceptable.

1. All wet work (concrete, painting, and etc.) must be completed and dry.
 2. Temperature conditions within Manufacturer's written recommendation.
 3. Verify weather tightness of area to receive suspension system prior to installation.
- E. Notify Architect of unsuitable conditions in writing.
1. Do not install acoustical ceiling panels until defects in support or environmental conditions are corrected.
 2. Do not apply ceiling tile until defects in backing and support are corrected.

3.02 PREPARATION

- A. Materials shall be dry and clean at time of application.
- B. Follow Manufacturer recommendations for surface preparation:
1. Substrate must be clean, free of grease and dirt, sound, smooth, even and level before applying tile to surface.
 2. Painted Surfaces: Avoid applying tile to newly painted ceiling.
 3. Materials shall be dry and clean at time of application.
- C. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at borders, and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.

3.03 INSTALLATION - SUSPENSION SYSTEM

- A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.
- B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360. Individual component deflection not to exceed 1/360 of span.
- 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. Lay out suspension system symmetrically about center lines of room unless shown otherwise by Contract Drawings. Lay out system so use of tiles less than 1/2 size is minimized.
- F. Suspend main runner/tee from overhead construction with hanger wires spaced 4 feet (1.20 m) on center along length of main runner/tee. Install hanger wires plumb and straight. Hanger wires shall not be installed in convenience holes.
- G. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
1. Use longest practical lengths.
- H. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.
- I. Provide hanger clips during steel deck erection. Provide additional hangers and inserts as required.
- J. Suspend main runner/tee from overhead construction with hanger wires spaced 4 feet (1.20 m) on center along length of main runner/tee. Install hanger wires plumb and straight. Hanger wires shall not be installed in convenience holes.
- K. Suspension System, Non-Seismic: 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.
- L. 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.
- M. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

- N. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.
- O. Do not eccentrically load system or induce rotation of runners.
- P. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
 - 1. Install in bed of acoustical sealant.
 - 2. Use longest practical lengths.
 - 3. Overlap and rivet corners or install corner caps.
- Q. Form expansion joints as detailed. Form to accommodate plus or minus 1 inch movement. Maintain visual closure.
- R. Install light fixture boxes constructed of gypsum board above light fixtures in accordance with fire rated assembly requirements and light fixture ventilation requirements.
- S. Do not attach suspension system to adjustable folding partition headers.
- T. Screws, eyebolts or lag bolts used to support metal acoustical suspended assemblies must have minimum embedment of 5/8 inch (15.9 mm) when installed into structural members.
- U. Nails installed vertically into bottom of structural members, which are subject to pullout, shall not be used to support metal acoustical suspended assemblies:
- V. Nails may be used when installed horizontally into sides of structural members.
- W. Embedment must be at least 5/8 inch (15.9 mm).

3.04 INSTALLATION - ACOUSTICAL PANEL UNITS

- A. Install acoustical units in accordance with manufacturer's instructions.
- B. Install acoustical panels in coordination with suspended system, with edges resting on flanges of main runner and cross tees. Cut and fit panels neatly against abutting surfaces. Support edges by wall moldings.
- C. Special Techniques:
 - 1. If recommended by Manufacturer, use tile one at a time from at least four (4) open boxes to avoid creating any pattern due to slight variations from box to box. Use tile from same color run in individual rooms to assure color match.
 - 2. Leave tile in true plane with straight, even joints.
- D. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.
- E. Lay directional patterned units with pattern parallel to longest room axis.
- F. Fit border trim neatly against abutting surfaces.
- G. Install units after above-ceiling work is complete.
- H. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.
- I. Cutting Acoustical Units:
 - 1. Cut to fit irregular grid and perimeter edge trim.
 - 2. Make field cut edges of same profile as factory edges.
 - 3. Double cut and field paint exposed reveal edges.
- J. Where round obstructions occur, provide preformed closures to match perimeter molding.
- K. Lay acoustical insulation for a distance of 48 inches either side of acoustical partitions as indicated.

3.05 TOLERANCES

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.
- B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

3.06 FIELD QUALITY CONTROL

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1. Installer:
 - a. Substrate preparation and installation of ceiling tile not following CISCA Code of Practice will be unacceptable and considered defective and subject to replacement at no cost to Owner.
- B. Non-Conforming Work:
 1. Suspension Assemblies:
 - a. Field Inspections:
 - 1) Inspect:
 - (a) Suspended ceiling system.
 - (b) Hangers, anchors and fasteners.
 - 2) Correct any work found defective or not complying with contract document requirements at no additional cost to Owner.
- C. Non-Conforming Work:
 1. Acoustical Panels: Remove and replace defective materials at no additional cost to Owner including, but not limited to following:
 - a. Remove and replace damaged or broken acoustical ceiling panels.
 - b. Remove and replace discolored acoustical ceiling panels to match adjacent.
 - c. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

3.07 ADJUSTING

- A. 'Touch-up' minor abraded surfaces.

3.08 CLEANING

- A. Clean exposed surfaces of acoustical ceiling panels, including trim, edge moldings, and suspension members.
 1. Comply with Manufacturer's written instructions for cleaning and touch up of minor finish damage.
- B. Waste Management:
 1. Remove from site all debris connected with work of this Section.

END OF SECTION

**SECTION 09 6500
RESILIENT BASE**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Section Includes But Is Not Limited To:
 - 1. Coordination, sequencing, and scheduling installation of Owner-Furnished and Owner-Installed rubber base as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 01 1000 - Summary: Rubber base excluded from Contract and furnished and installed by Owner. This Section establishes quality of materials and installation for information of Contractor, Architect, and Owner's Representatives.
- A. Resilient base.

1.02 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2021a.
- B. ASTM F1861 - Standard Specification for Resilient Wall Base 2016.
- C. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions and maintenance instructions.
- B. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.
- C. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Record Documentation:
 - 1) Manufacturers documentation:
 - (a) Manufacturer's literature.
 - (b) Color and style selection.

1.04 QUALITY ASSURANCE

- A. Definitions:
 - 1. Flame Spread: Propagation of flame over a surface.
 - 2. Flame Spread Index: The numerical value assigned to a material tested in accordance with ASTM E84 or UL 723.
 - 3. Resilient Wall Base Classification:
 - a. Type:
 - 1) TP: Rubber, thermoplastic.
 - b. Group:
 - 1) Group 1: Solid (homogeneous).
 - 2) Group 2: Layered (multiple layers).
 - c. Styles:
 - 1) Style B: Cove.
 - 4. Smoke-Developed Index: The numerical value assigned to a material tested in accordance with ASTM E84 or UL 723.
 - 5. Regulatory Agency Sustainability Approvals:
 - a. Fire-Test-Response Characteristics:
 - 1) Surface-Burning Characteristics:

- (a) Base shall have Class B flame spread rating in accordance with ASTM E84 or UL 723.

1.05 FIELD CONDITIONS

- A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.
- B. Ambient Conditions:
1. Building Conditions:
 - a. Conditions inside building shall be brought to levels to be normal at occupancy of building.
 - b. Conditions include normal levels of humidity, lighting, heating, and air conditioning.

PART 2 PRODUCTS

2.01 RESILIENT BASE

- A. Resilient Base - Type TP: ASTM F1861, Type TP, rubber, thermoplastic; top set Style B, Cove.
1. Manufacturers:
 - a. Burke Flooring; RubberMyte Wall Base: www.burkeflooring.com/#sle.
 - b. Johnsonite, a Tarkett Company; Rubber Wall Base: www.johnsonite.com/#sle.
 - c. Roppe Corp; Rubber Wall Base: www.roppe.com/#sle.
 - d. Base 2000 Wall Base by Flexco.
 - e. Rubber Wall Base by VPI.
 2. Base shall have Class B flame spread rating in accordance with ASTM E84 or UL 723.
 3. Free from objectionable odors, blisters, cracks, and other defects affecting appearance or serviceability of rubber, and not containing fabric.
 4. Approved Colors:
 - a. Color pigments used shall be highly fade-resistant, insoluble in water, and resistant to light, alkali, and cleaning agents.
 - b. Colors as selected by Architect from Manufacturer's standard colors.
 5. Height: 4 inch.
 6. Thickness: 0.125 inch.
 7. Finish: Satin.
 8. Length: Roll.
 9. Accessories: Premolded external corners and internal corners, butt joint interior corners, corners must meet same height and thickness requirements as wall base.

2.02 ACCESSORIES

- A. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by manufacturer.
- B. Moldings, Transition and Edge Strips: Same material as flooring.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.
- B. Notify Architect of unsuitable conditions in writing.
- C. Do not start work until defects are corrected.
- D. Commencement of Work by installer is considered acceptance of substrate.

3.02 PREPARATION

- A. Clean substrate.

3.03 INSTALLATION - GENERAL

- A. Starting installation constitutes acceptance of conditions.

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- B. Install in accordance with manufacturer's written instructions.
- C. Adhesive-Applied Installation:
 1. Spread only enough adhesive to permit installation of materials before initial set.

3.04 INSTALLATION - RESILIENT BASE

- A. Install in manner to produce smooth, even finished surfaces tightly jointed and accurately aligned.
- B. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.
- C. Miter internal corners. At external corners, use premolded units. At exposed ends, use premolded units.
- D. Install base on solid backing. Bond tightly to wall and floor surfaces.
- E. Scribe and fit to door frames and other interruptions.
- F. Fit specified items tightly. Use fillers where necessary. Fit neatly against projections, piping, electrical service outlets, etc.
- G. Secure specified items with specified adhesive. Cement substantially to vertical surfaces including rubber base to cabinet work base.
- H. Line up top and bottom lines of base throughout.
- I. Do not stretch base during installation.
- J. Roll until firm bond has been established. Leave level, free from buckles, cracks, and projecting edges.
- K. In wall runs longer than 12 inches (300 mm), install no lengths of base shorter than 12 inches (300 mm) long.

3.05 FIELD QUALITY CONTROL

- A. Field Tests:
 1. Resilient base:
 - a. See Section 09 0561 'Common Work Results for Flooring Preparation'.
 2. Non-Conforming Work:
 - a. Replace damaged materials at no additional cost to Owner.
 - b. Damaged materials are defined as having cuts, gouges, scrapes or tears, and not fully adhered.

3.06 CLEANING

- A. General:
 1. Adjacent Work:
 - a. Clean all exposed surfaces of adjoining areas of adhesive spatter before it sets.
- B. Resilient Base And Accessories:
 1. Clean all exposed surfaces of base of adhesive spatter before it sets in accordance with Manufacturer's cleaning instructions.
 2. Damp-mop surfaces to remove marks and soil.

3.07 PROTECTION

- A. Resilient Base And Accessories:
 1. Cover material until Substantial Completion.
 2. Keep traffic away until adhesive has set.

END OF SECTION

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**SECTION 09 6816
SHEET CARPETING - BACK CUSHION, DIRECT GLUE**

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes But Is Not Limited To:
1. Coordination, sequencing, and scheduling installation of Owner-Furnished carpet, carpet base, carpet accessories, leveling compounds as described in Contract Documents and including following:
 - a. Maintain Building Ambient Conditions including normal levels of humidity, lighting, heating, and air conditioning for acceptability for beginning floor preparation and carpet installation.
 - b. Protection of carpet after installation of carpeting as required.
- B. Related Requirements:
1. Section 01 1000 - Summary: Carpet and carpet base excluded from Contract and furnished and installed by Owner. This Section establishes quality of materials and installation for information of Contractor, Architect, and Owner's Representatives.
 2. Section 03 3000 - Cast-in-Place Concrete: for provision of acceptable concrete substrate.
 3. Section 09 0561 - Common Work Results for Flooring Preparation for:
 - a. Floor substrate preparation.
 - b. Pre-installation conference for Sections under 09 6000 heading 'Flooring.
 4. Section 09 6500 - Resilient Base: for resilient base.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
1. Coordinate completion of carpet installation with other trades.
- B. Pre-Installation Conference:
1. Participate in MANDATORY pre-installation conference as specified in Section 09 0561.
 2. Schedule pre-installation conference before installation of flooring system.
 3. Conference may be held at project site or another convenient site. Participants may also attend by video or audio conference if approved by Project Manager.
 4. Schedule conference after substrate preparation and ONE (1) week before installation of flooring system.
 5. In addition to agenda items specified Section 01 3000 and Section 09 0561, review following:
 - a. Review Owner's Representative schedule for furnishing and installation carpet.
 - b. Review Flooring Manufacturer's installation conditions verification procedure and requirements.
 - c. Review Building Ambient Conditions including normal levels of humidity, lighting, heating, and air conditioning for acceptability for beginning floor preparation and carpet installation.
 - d. Review cleaning and disposal requirements.
 - e. Review protection requirements of carpet after installation of carpeting.
- C. Scheduling:
1. Notify Flooring Installer when Building Ambient Conditions requirements are met before installation of flooring system.
 2. Notify Owner's Representative to coordinate installation of carpet.

1.03 SUBMITTALS

- A. Closeout Submittals:
1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Warranty Documentation:
 - 1) Copy of Warranty.

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- b. Record Documentation:
 - 1) Owner will provide Project Carpet Request Documentation forms in both hard copy and digital format:
 - (a) Carpet Request Information Sheet.
 - (b) Carpet Vendor Quotation.
 - (c) Carpet Preinstallation Meeting Agenda.
 - (d) Carpet Installation Notice to Proceed or Cancel.
 - (e) Carpet Inspection and Completion.
 - (f) Carpet Overage Report and Completion.
 - (g) Carpet Quotation Change Request.

B. Maintenance Material Submittals:

- 1. Extra Stock Materials:
 - a. Leave piece of carpet consisting of 12 sq yds (10 sq m), and 25 lineal feet (7.62 meters) minimum of carpet cove base.
 - b. Roll up and tie securely

1.04 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:

- 1. All products provided will meet requirements of all federal, state, and local codes having jurisdiction.
- 2. Label meeting Federal Labeling Requirements, as stated in Textile Products Identification Act under Federal Trade Commission, shall be attached to certification samples and products delivered.

1.05 DELIVERY, STORAGE, AND HANDLING

A. General:

- 1. Comply with instructions and recommendations of Manufacturer for special delivery, storage, and handling requirements.

B. Delivery And Acceptance Requirements:

- 1. Deliver materials and accessories necessary for completion of carpet installation to site before beginning installation of carpet.
- 2. Do not deliver materials before date scheduled for installation.
- 3. Transport carpet in manner that prevents damage and distortion. Bending or folding individual carpet rolls or cuts from rolls is not recommended. When bending or folding is unavoidable for delivery purposes, carpet is required to be unrolled and allowed to lie flat immediately upon arrival at installation site.

C. Storage And Handling Requirements:

- 1. Store carpet and related materials in a climate-controlled, dry space.
- 2. Protect carpet from soil, dust, moisture and other contaminants and store on a flat surface.
- 3. Stacking heavy objects on top of carpet rolls or stacking more than three rolls is prohibited.

1.06 FIELD CONDITIONS

A. Ambient Conditions:

- 1. Building Conditions:
 - a. Conditions inside building shall be brought to levels to be normal at occupancy of building. Conditions include normal levels of humidity, lighting, heating, and air conditioning. (HVAC must be in operation thru out carpet installation):
 - 1) Carpet installation is not to begin until HVAC system is operational and following conditions are maintained for at least forty-eight (48) hours before, during and seventy-two (72) hours after completion:
 - (a) Carpet is to be installed when indoor temperature is between 65° - 95° F (18° - 35° C) with maximum relative humidity of 65%.

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- (b) Substrate surface temperature should not be less than 65° F (18° C) at time of installation.
- (c) Do not allow temperature of indoor carpeted areas to fall below 50° F (10° C), regardless of age of installation.
- 2) Maintain fresh air ventilation after installation for seventy-two (72) hours minimum or until lingering odors are gone.
- 2. Concrete Slab:
 - a. General:
 - 1) Do not install carpet over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive.

1.07 WARRANTY

- A. Manufacturer Warranty:
 - 1. Provide Carpet Manufacturer's standard Warranty which includes following:
 - a. Warranty shall cover defects in installation, workmanship, and installation materials.
 - b. Warranty includes specific workmanship warranties for delamination, edge raveling, fuzzing, pilling, and other textural changes which can be controlled through proper manufacturing (no fraying, zippering, delamination, edge raveling, fuzzing, pilling in carpet is acceptable for any reason).
 - c. Warranty terms will include inspection of defective area within fifteen (15) days of receipt of written notice from Owner and completion of corrective work within forty-five (45) days, unless other arrangements are made in writing with Owner on case-by-case basis.
 - d. Carpet defect or installation defect:
 - 1) Carpet Manufacturer may use any reasonable means to cure first three (3) breaches of warranty affecting an area of carpeting bounded by natural breaks such as doorways, ('affected carpet area'). Such cure must preserve as uniform a blended appearance, acceptable to Carpet Manufacturer and Owner, as exists throughout Installation Site at time of breach.
 - 2) If carpet defect or installation defect continues to appear after three (3) separate notices for correction from Owner, replace carpet where defects have occurred.
 - e. If Carpet Manufacturer follows installation requirements of Section 09 0561 - Common Work Results for Flooring Preparation, Carpet Manufacturer accepts liability of carpet installation for said given time as outlined in Special Warranty regardless of any climate or condition changes affecting RH levels of floor substrate.
 - 2. Special Warranty:
 - a. Sheet Carpeting:
 - 1) General:
 - (a) Appearance Retention to be provided with Special Warranty requirements if not already included in Standard Warranty.

PART 2 PRODUCTS

2.01 OWNER-FURNISHED PRODUCTS

- A. Approved Manufacturers. See Section 01 6000 for definitions of Categories:
 - 1. Materials supplied for carpet installation shall be complete package from specified Carpet Manufacturer:
 - a. Mannington Commercial Carpets, Calhoun, GA:
 - 1) Contact Information: Help Line Voice Mail (800) 241-2262, ext 8045 or Mannington Installation Services, email lds@mannington.com or (855) 466-2664.
 - b. Mohawk Group, Calhoun, GA:
 - 1) Contact Information: Help Line (800) 523-5555 or (801) 397-5626.
 - c. Tarkett: Dalton, GA www.commercial.tarkett.com.
 - 1) Contact Information: Tracy Riddle - cell (801) 580-5147 fax (866) 861-7522 Tracy.Riddle@Tarkett.com.

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2.02 ACCESSORIES

- A. Carpet Accessories: Snap-in vinyl reducer strips and vinyl track.
- B. Floor Leveling Compound, Floor Patching Compound, And Latex Underlayment: As recommended and approved by Carpet Manufacturer.

PART 3 EXECUTION

3.01 APPROVED INSTALLER

- A. Approved Installers. See Section 01 6000:
 - 1. Mannington Product: Mannington Installation Services, St. Augustine, FL.
 - a. Contact Jaimie Flores, (904) 445-8140, email lds@mannington.com.
 - 2. Mohawk Product: Certified Sales, Bountiful, UT.
 - a. Contact Todd Davis, Office: (801) 397-5626, Toll Free Office(800) 523-5555, Mobile: (801) 592-6758, email todd@certsaleserv.com.
 - 3. Tarkett Product: Flooring Services Inc., Sandy, UT www.flooringservices.com.
 - a. Contact Jason Rowley, office (801) 487-3600 x108, cell (801) 631-8382, email jason@flooringservices.com.

3.02 EXAMINATION

- A. Verification of Conditions:
 - 1. Verify required ambient conditions inside building for required normal levels of humidity, lighting, heating, and air conditioning have been maintained for at least forty-eight (48) hours before and during carpet installation and seventy-two (72) after installation of carpet.
- B. Evaluation And Assessment:
 - 1. Carpet Areas:
 - a. Variation In Grade:
 - 1) Plus or minus 1/8 inch (3 mm) in any 10 foot (3 meter) of floor slab and distance between high point and low point of slab of 1/2 inch (13 mm).
 - b. Testing Procedure:
 - 1) Place ends of straightedge on 3/8 inch (10 mm) high shims.
 - 2) Floor is satisfactory if 1/4 inch (6 mm) diameter steel rod rolled under straightedge will not touch anywhere along 10 foot (3 meter) length and 1/2 inch (13 mm) diameter steel rod will not fit under straightedge anywhere along 10 foot (3 meter) length.
 - c. Notify Owner's Representative in writing if floor surface is not acceptable to install carpet:
 - 1) Do not lay carpet over unsuitable surface. Commencing installation constitutes acceptance of floor and approval of existing conditions.

3.03 PREPARATION

- A. Carpet Areas:
 - 1. Flooring Preparation:
 - a. Owner-Furnished Product Supplier's Responsibility:
 - 1) Prepare floor substrate in accordance with 'CRI Carpet Installation Standard' best practices to receive carpet installation and to provide installation that meets warranty requirements.
 - 2) Verify concrete surface cured, clean, dry, and free of foreign substances that will compromise carpet and/or installation.
 - 3) Verify concrete slab Alkalinity and Concrete Moisture Vapor Emission Rate (MVER) Testing for each Project is within Carpet Manufacturer's acceptable levels to meet warranty requirements.
 - b. Concrete floor slab patching:
 - 1) Cracks, chips and joints must be properly patched or repaired.

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- c. Concrete surface cured, clean, dry, and free of foreign substances that will compromise carpet and/or other flooring installations:
 - 1) Removal of curing compounds.
 - 2) Remove paint, sealer, grease, oil, silicone sealants, and other materials incompatible with flooring adhesives.
 - 3) Removal of overspray from painted walls (essential so glue will stick).
- d. Vacuum and damp mop floor areas to receive flooring before flooring installation.
- 2. Relaxing / Conditioning Carpet:
 - a. Highly recommended that carpet be unrolled and allowed to relax in installation area for time period that conforms to requirements of manufacturer of product being installed:
 - b. Protect carpet adequately from soil, dust, moisture and other contaminants.
 - c. Sundry items, such as adhesives, should also be conditioned.
- 3. Carpet Accessories:
 - a. Owner-Furnished Product's Responsibility:
 - 1) Sundry items, such as adhesives, shall be conditioned to building ambient conditions before use.

3.04 ADJUSTING

- A. Inspect and make necessary adjustments within one (1) month after mechanical heat or other heat has been supplied continuously in finished areas.

3.05 CLEANING

- A. General:
 - 1. Carpeting:
 - a. Carpet Installer's Responsibility:
 - 1) Remove any soiling and/or staining from carpet.
 - 2) Remove excessive adhesive with manufacturer recommended adhesive removers.
- B. Damage to building:
 - 1. Carpeting:
 - a. Carpet Installer's Responsibility:
 - 1) Carpet Installer responsible for cleaning and repair of all damaged surfaces to their original condition from carpet installation.
- C. Waste Management:
 - 1. Contractor's Responsibility:
 - a. Provide adequate waste receptacles (dumpsters) and dispose of Owner Furnished materials from building and property as specified in Section 01 7419.
 - 2. Carpet Installer's Responsibility:
 - a. All work areas are to be kept clean, clear and free of debris at all times.
 - b. Disposal of rubbish, wrapping paper, scraps, and trimmings in provided dumpster(s).

3.06 PROTECTION

- A. Protection of Carpeting:
 - 1. Contractor's Responsibility:
 - a. No traffic of any kind on newly installed carpet for minimum of twenty-four (24) hours after installation is completed.
 - b. No wheeled traffic of any kind placement of furniture or equipment on carpet for minimum of forty-eight (48) hours after completion of carpet installation.
 - c. Protect carpet adequately from soil, dust, moisture and other contaminants after carpet installation.
 - d. Protect carpet from abuse, vandalism, or damage occurring after installation is complete.

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END OF SECTION

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**SECTION 09 9113
EXTERIOR PAINTING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints.

1.02 DEFINITIONS

- A. Comply with ASTM D16 for interpretation of terms used in this section.

1.03 REFERENCE STANDARDS

- A. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications 2016.
- B. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials 2020.
- C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual Current Edition.
- D. SSPC-SP 1 - Solvent Cleaning 2015, with Editorial Revision (2016).

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conferences:
 - 1. Schedule painting pre-installation conference after delivery of paint or coatings and before or at same time as application of field samples.
 - a. Coordinate pre-installation conferences of all related painting and coating Sections under 09 9000 heading 'Paints and Coatings'.
 - b. Schedule conference before preparation of control samples as specified in Sections under 09 9000 heading 'Paints and Coatings'.
 - c. Conference to be held at same time as Section 09 2116 to review gypsum board finish preparation.
 - 2. In addition to agenda items specified in Section 01 3000, review following:
 - a. Review Quality Assurance for Approval requirements.
 - b. Review Quality Assurance Field Sample requirements.
 - c. Review Submittal requirements for compliance for MPI Approved Products.
 - d. Review Design Criteria requirements.
 - e. Review Cleaning requirements.
 - f. Review painting schedule.
 - g. Review safety issues.
 - 3. Review additional agenda items from Sections under 09 9000 heading 'Paints and Coatings'.

1.05 SUBMITTALS

- A. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 - 2. MPI product number (e.g. MPI #47).
 - 3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
 - 4. Manufacturer's installation instructions.
 - 5. Confirmation of colors selected and that each area to be painted or coated has color selected for it.

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- B. Samples: Submit two paper "draw down" samples, 4 x 6 inches in size, illustrating range of colors available for each finishing product specified.
 - 1. Where sheen is specified, submit samples in only that sheen.
 - 2. Where sheen is not specified, submit each color in each sheen available.
- C. Closeout Submittals:
 - 1. Include following in Operations and Maintenance Manual specified in Section 01 7800:
 - a. Record Documentation:
 - 1) Manufacturer's documentation:
 - (a) Manufacturer's cut sheet for each component of each system.
 - (b) Schedule showing rooms and surfaces where each system was used.

1.06 QUALITY ASSURANCE

- A. Applicator Qualifications: Company specializing in performing the type of work specified with minimum five years experience and minimum five (5) satisfactorily completed projects of comparable quality, similar size, and complexity in past three (3) years before bidding.
 - 1. Maintain qualified crew of painters throughout duration of the Work.
 - 2. Upon request, submit documentation.

1.07 MOCK-UP

- A. Before application of any paint system, meet on Project site with Architect, Owner's representative, and Manufacturer's representative. Architect may select one (1) surface for application of each paint system specified. This process will include establishing acceptable substrate conditions required for Project before application of paints and coatings.
- B. Apply paint systems to surfaces indicated by Architect following procedures outlined in Contract Documents and Product Data submission specified above.
- C. After approval of samples, proceed with application of paint system throughout Project. Approved samples will serve as standard of acceptability.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 55 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.
- D. Deliver amount of materials necessary to meet Project requirements in single shipment.
- E. Notify Architect two working days before delivery of coatings.
- F. Store materials in single place.
- G. Keep storage area clean and rectify any damage to area at completion of work of this Section.
- H. Maintain storage area at 55 deg F (13 deg C) minimum.

1.09 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- D. Minimum Application Temperatures for Latex Paints: 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of 540 Lux 50 ft candles measured mid-height at substrate surface.

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1. Inspection of painting work shall take place under same lighting conditions as application.
2. If painting and coating work is applied under temporary lighting, deficiencies discovered upon installation of permanent lighting will be considered latent damage as defined in MPI Manual, PDCA P1-92.

PART 2 PRODUCTS

2.01 PERFORMANCE AND DESIGN CRITERIA

- A. Regulatory Agency Sustainability Approval:
 1. Conform to work place safety regulations and requirements of those authorities having jurisdiction for storage, mixing, application and disposal of all paint and related hazardous materials.
 2. Paint and painting materials shall be free of lead and mercury, and have VOC levels acceptable to local jurisdiction.
 3. Master Painters Institute (MPI) Standards:
 - a. Products: Comply with MPI standards indicated and listed in 'MPI Approved Products List'.
 - b. Preparation and Workmanship: Comply with requirements in 'MPI Architectural Painting Specification Manual' for products and coatings indicated.
- B. Performance:
 1. Design Criteria:
 - a. Provide materials for use within each coating system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - b. All materials, preparation and workmanship shall conform to requirements of 'Architectural Painting Specification Manual' by Master Painters Institute (MPI).
 - c. All paint manufacturers and products used shall be as listed under Approved Product List section of MPI Painting Manual.
 - d. Provide Premium Grade systems (2 top coats) as defined in MPI Architectural Painting Specification Manual, except as otherwise indicated.
 - e. Where specified paint system does not have Premium Grade, provide Budget Grade.
 - f. Provide products of same manufacturer for each coat in coating system.
 - g. Color Levels:
 - 1) Color Level II:
 - (a) Number and placement of interior and exterior paint colors and gloss levels shall be as defined by Color Level II from MPI Manual, PDCA P3-93 as modified in following paragraph.
 - (b) No more than one paint color or gloss level will be selected for same substrate within designated interior rooms or exterior areas.
 - 2) Color Level III:
 - (a) Number and placement of interior and exterior paint colors and gloss levels shall be Color Level III from MPI Manual, PDCA P3-93 as modified in following paragraph.
 - (b) Several paint colors or gloss levels will be selected for same substrate within designated interior rooms or exterior areas.
- C. Materials:
 1. Materials used for any painting system shall be from single manufacturer unless approved otherwise in writing by painting system manufacturers and by Architect. Include manufacturer approvals in Product Data submittal.
 2. Linseed oil, shellac, turpentine, and other painting materials shall be pure, be compatible with other coating materials, bear identifying labels on containers, and be of highest quality of an approved manufacturer listed in MPI manuals. Tinting color shall be best grade of type recommended by Manufacturer of paint or stain used on Project.

2.02 MANUFACTURERS

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- A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.

2.03 PAINT SYSTEMS - EXTERIOR

- A. Manufacturers: Products listed in edition of MPI Approved Product List current at time of bidding and later are approved, providing they meet VOC requirements in force where Project is located.
1. New Surfaces: Use MPI(a) EXT 5.1M Waterborne Light Industrial Coating system.
 2. Previously Finished Surfaces: Use MPI(r) REX 5.1K Waterborne Light Industrial Coating.
- B. Exterior Ferrous Metal:
1. Materials:
 - a. All paints and coatings.
 - 1) Primer Coat: MPI Product 107, 'Primer, Rust-Inhibitive, Water Based'.
 - 2) Finish Coats: MPI Product 163, 'Light Industrial Coating, Exterior, Water Based, Semi-Gloss (MPI Gloss Level 5)'.
 - b. Traffic signage:
 - 1) Primer Coat: MPI Product 107, 'Primer, Rust-Inhibitive, Water Based'.
 - 2) Finish Coats: MPI Product 163, 'Light Industrial Coating, Exterior, Water Based, Semi-Gloss (MPI Gloss Level 5)'.
 2. Design Criteria:
 - a. Systems specified are in addition to prime coats provided under other Sections of Project Manual.
 - b. Finish Requirements: Use MPI Premium Grade finish requirements for work of this Section.
 - c. Gloss / Sheen Level Required: Gloss Level 5.
- C. Exterior Galvanized Metal:
1. Materials:
 - a. Polyurethane:
 - 1) Vinyl Wash Primer Coat: MPI Product 80: 'Primer, Vinyl Wash'.
 - 2) Finish Coats:
 - (a) Epoxy MPI Product 101: 'Primer, Epoxy, Anti-Corrosive, for Metal'.
 - (b) Polyurethane MPI Product 72: 'Polyurethane, Two-Component, Pigmented, Gloss (MPI Gloss Level 6-7)'.
 - b. Latex:
 - 1) Waterborne Primer Coat: MPI Product 134: 'Primer, Galvanized, Water Based'.
 - 2) Finish Coats: MPI Product 11: 'Latex, Exterior Semi-Gloss (MPI Gloss Level 5)'.
 2. Exposed Miscellaneous Structural Steel:
 - a. New Surfaces: Use MPI(a) EXT 5.3D Pigmented Polyurethane Finish system.
 - b. Previously Finished Work: Use MPI(r) REX 5.3D Pigmented Polyurethane Finish system.
 3. All Other:
 - a. New Surfaces: Use MPI(a) EXT 5.3H Latex Finish system.
 - b. Previously Finished Surfaces: Use MPI(r) REX 5.3H Latex Finish system.
 4. Performance:
 - a. Finish Requirements:
 - 1) New Surfaces: MPI Premium Grade finish requirements.
 - 2) Deteriorated Existing Surfaces: MPI Premium Grade finish requirements.
 - 3) Sound Existing Surfaces: MPI Custom Grade finish requirements.
 - 4) Gloss / Sheen Level Required: Gloss Level 1.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Protection Of In-Place Conditions:

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1. Protect other finish work and adjacent materials during painting. Do not splatter, drip, or paint surfaces not intended to be painted. These items will not be spelled out in detail but pay special attention to the following:
 - a. Do not paint finish copper, bronze, chromium plate, nickel, stainless steel, anodized aluminum, or monel metal except as explicitly specified.
- B. Do not begin application of paints and finishes until substrates have been properly prepared.
- C. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- D. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- F. Test shop-applied primer for compatibility with subsequent cover materials.
- G. Verification of Conditions:
 1. Directing applicator to begin painting and coating work will indicate that substrates to receive painting and coating materials have been previously inspected as part of work of other Sections and are complete and ready for application of painting and coating systems as specified in those Sections.
- H. Pre-Installation Testing:
 1. Before beginning work of this Section, examine, and test surfaces to be painted or coated for adhesion of painting and coating systems.
 2. Report in writing to Architect of conditions that will adversely affect adhesion of painting and coating work.
 3. Do not apply painting and coating systems until party responsible for adverse condition has corrected adverse condition.
- I. Evaluation And Assessment:
 1. Report defects in substrates that become apparent after application of primer or first finish coat to Architect in writing and do not proceed with further work on defective substrate until such defects are corrected by party responsible for defect.
- J. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
 1. Exterior Plaster and Stucco: 12 percent.
 2. Fiber Cement Siding: 12 percent.
 3. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
 4. Exterior Wood: 15 percent, measured in accordance with ASTM D4442.
 5. Concrete Floors and Traffic Surfaces: 8 percent.

3.02 PREPARATION

- A. Protection of In-Place Conditions:
 1. Protect other finish work and adjacent materials during painting. Do not splatter, drip, or paint surfaces not intended to be painted. These items will not be spelled out in detail but pay special attention to the following:
 - a. Do not paint finish copper, bronze, chromium plate, nickel, stainless steel, anodized aluminum, or monel metal except as explicitly specified.
- B. Surface Preparation:
 1. Prepare surfaces in accordance with MPI requirements and requirements of Manufacturer for each painting system specified, unless instructed differently in Contract Documents. Bring conflicts to attention of Architect in writing.
 2. Fill minor holes and cracks in wood surfaces to receive paint or stain.
 3. Surfaces to be painted shall be clean and free of loose dirt. Clean and dust surfaces before painting or finishing.

4. Do no exterior painting while surface is damp, unless recommended by Manufacturer, nor during rainy or frosty weather. Interior surfaces shall be dry before painting. Moisture content of materials to be painted shall be within tolerances acceptable to Paint Manufacturer.
 5. Sand woodwork smooth in direction of grain leaving no sanding marks. Clean surfaces before proceeding with stain or first coat application.
- C. Clean surfaces thoroughly and correct defects prior to application.
 - D. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
 - E. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.
 - F. Seal surfaces that might cause bleed through or staining of topcoat.

3.03 APPLICATION

- A. Interface with Other Work:
 1. Coordinate with other trades for materials and systems that require painting before installation.
 2. Schedule painting and coating work to begin when work upon which painting and coating work is dependent has been completed. Schedule installation of pre-finished and non-painted items, which are to be installed on painted surfaces, after application of final finishes.
- B. Paint or finish complete all surfaces to be painted or coated as described in Contract Documents, including but not limited to following items.
- C. Apply sealant in gaps 3/16 inch (5 mm) and smaller between two substrates that are both to be painted or coated. Sealants in other gaps furnished and installed under Section 07 9200.
- D. On wood to receive a transparent finish, putty nail holes in wood after application of stain using natural colored type to match wood stain color. Bring putty flush with adjoining surfaces.
- E. In multiple coat paint work, tint each succeeding coat with slightly lighter color, but approximating shade of final coat, so it is possible to check application of specified number of coats. Tint final coat to required color.
- F. Spread materials smoothly and evenly. Apply coats to not less than wet and dry film thicknesses and at spreading rates for specified products as recommended by Manufacturer.
- G. Touch up suction spots after application of first finish coat.
- H. Paint shall be thoroughly dry and surfaces clean before applying succeeding coats.
- I. Use fine sandpaper between coats as necessary to produce even, smooth surfaces.
- J. Make edges of paint adjoining other materials or colors clean, sharp, and without overlapping.
- K. Finished work shall be a 'Properly Painted Surface' as defined in this Section.
- L. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- M. Exterior Wood to Receive Opaque Finish: If final painting must be delayed more than 2 weeks after installation of woodwork, apply primer within 2 weeks and final coating within 4 weeks.
- N. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- O. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.
- P. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- Q. Apply each coat to uniform appearance.

- R. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply additional coats until complete hide is achieved.
- S. Exterior Ferrous Metal:
 - 1. New Surfaces: Clean metal to be painted of rust, mill scale, grease, oil, and welding spatters, burrs, flux, slag, and fume. If all traces of rust cannot be removed, apply rust blocker recommended by Paint Manufacturer before applying primer coat.
- T. Exterior Galvanized Metal:
 - 1. New Surfaces:
 - a. Clean 'passivated' or 'stabilized' galvanized steel as specified in SSPC-SP 1.
 - b. After removal of 'passivated' or 'stabilized' coating or for surfaces without coating, clean surfaces to be painted with mineral spirits or product recommended by Paint Manufacturer. Change to clean rags or wiping cloths regularly to reduce possibility of re-contamination of surface.
 - c. Apply prime coat.
 - d. Apply finish coats.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection.
- B. Owner will provide field inspection.
- C. Non-Conforming Work:
 - 1. Correct deficiencies in workmanship as required to leave surfaces in conformance with 'Properly Painted Surface,' as defined in this Section.
 - 2. Correction of 'Latent Damage' and 'Damage Caused By Others,' as defined in this Section, is not included in work of this Section.

3.05 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.
- B. As work proceeds and upon completion of work of any painting Section, remove paint spots from floors, walls, glass, or other surfaces and leave work clean, orderly, and in acceptable condition.
- C. Waste Management:
 - 1. Remove rags and waste used in painting operations from building each night. Take every precaution to avoid danger of fire.
 - 2. Paint, stain and wood preservative finishes and related materials (thinners, solvents, caulking, empty paint cans, cleaning rags, etc.) shall be disposed of subject to regulations of applicable authorities having jurisdiction.
 - 3. Remove debris caused by work of paint Sections from premises and properly dispose.
 - 4. Retain cleaning water and filter out and properly dispose of sediments.

3.06 PROTECTION

- A. Protect finishes until completion of project.
- B. Touch-up damaged finishes after Substantial Completion.

3.07 SCHEDULE OF PAINT COLORS

- A. Exterior:
 - 1. Exterior Metal (See Section 09 9112):
 - a. Color Quality Standard. See Section 01 6000.
 - 1) Selected by Architect to match dark bronze finish on exterior metals.

END OF SECTION

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**SECTION 09 9123
INTERIOR PAINTING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints.
- C. Materials for backpriming woodwork.
- D. Do Not Paint or Finish the Following Items:
 - 1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
 - 5. Stainless steel, anodized aluminum, bronze, terne coated stainless steel, and lead items.
 - 6. Marble, granite, slate, and other natural stones.
 - 7. Floors, unless specifically indicated.
 - 8. Ceramic and other tiles.
 - 9. Brick, architectural concrete, cast stone, integrally colored plaster and stucco.
 - 10. Glass.
 - 11. Concrete masonry units in utility, mechanical, and electrical spaces.
 - 12. Acoustical materials, unless specifically indicated.
 - 13. Concealed pipes, ducts, and conduits.

1.02 DEFINITIONS

- A. Comply with ASTM D16 for interpretation of terms used in this section.

1.03 REFERENCE STANDARDS

- A. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications 2016.
- B. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association Current Edition.
- C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conferences:
 - 1. Schedule painting pre-installation conference after delivery of paint or coatings and before or at same time as application of field samples.
 - a. Coordinate pre-installation conferences of all related painting and coating Sections under 09 9000 heading 'Paints and Coatings'.
 - b. Schedule conference before preparation of control samples as specified in Sections under 09 9000 heading 'Paints and Coatings'.
 - c. Conference to be held at same time as Section 09 2116 to review gypsum board finish preparation.
 - 2. In addition to agenda items specified in Section 01 3000, review following:
 - a. Review Quality Assurance for Approval requirements.
 - b. Review Quality Assurance Field Sample requirements.
 - c. Review Submittal requirements for compliance for MPI Approved Products.
 - d. Review Design Criteria requirements.
 - e. Review Cleaning requirements.
 - f. Review painting schedule.

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- g. Review safety issues.
- 3. Review additional agenda items from Sections under 09 9000 heading 'Paints and Coatings'.

1.05 SUBMITTALS

- A. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 - 2. MPI product number (e.g. MPI #47).
 - 3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
 - 4. Manufacturer's installation instructions.
- B. Samples: Submit two paper "draw down" samples, 4 x 6 inches in size, illustrating range of colors available for each finishing product specified.
 - 1. Where sheen is specified, submit samples in only that sheen.
 - 2. Where sheen is not specified, submit each color in each sheen available.
- C. Closeout Submittals:
 - 1. Include following in Operations and Maintenance Manual specified in Section 01 7800:
 - a. Record Documentation:
 - 1) Manufacturer's documentation:
 - (a) Manufacturer's cut sheet for each component of each system.
 - (b) Schedule showing rooms and surfaces where each system was used.

1.06 QUALITY ASSURANCE

- A. Applicator Qualifications: Company specializing in performing the type of work specified with minimum five years experience and approved by manufacturer.
 - 1. Minimum five (5) satisfactorily completed projects of comparable quality, similar size, and complexity in past three (3) years before bidding.
 - 2. Maintain qualified crew of painters throughout duration of the Work.
 - 3. Upon request, submit documentation.

1.07 MOCK-UP

- A. Before application of any paint system, meet on Project site with Architect, Owner's representative, and Manufacturer's representative. Architect may select one (1) surface for application of each paint system specified. This process will include establishing acceptable substrate conditions required for Project before application of paints and coatings.
- B. Apply paint systems to surfaces indicated by Architect following procedures outlined in Contract Documents and Product Data submission specified above.
- C. After approval of samples, proceed with application of paint system throughout Project. Approved samples will serve as standard of acceptability.

1.08 DELIVERY, STORAGE, AND HANDLING

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

PART 2 PRODUCTS

2.01 PERFORMANCE AND DESIGN CRITERIA

- A. Regulatory Agency Sustainability Approval:

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1. Conform to work place safety regulations and requirements of those authorities having jurisdiction for storage, mixing, application and disposal of all paint and related hazardous materials.
2. Paint and painting materials shall be free of lead and mercury, and have VOC levels acceptable to local jurisdiction.
3. Master Painters Institute (MPI) Standards:
 - a. Products: Comply with MPI standards indicated and listed in 'MPI Approved Products List'.
 - b. Preparation and Workmanship: Comply with requirements in 'MPI Architectural Painting Specification Manual' for products and coatings indicated.

2.02 PAINTS AND FINISHES - GENERAL

- A. Paints and Finishes: Ready mixed, unless intended to be a field-catalyzed paint.
 1. Where MPI paint numbers are specified, provide products listed in Master Painters Institute Approved Product List, current edition available at www.paintinfo.com, for specified MPI categories, except as otherwise indicated.
 2. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 3. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
 4. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
 5. Supply each paint material in quantity required to complete entire project's work from a single production run.
 6. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

2.03 PAINT SYSTEMS - INTERIOR

- A. Concrete Floor Sealers - Interior
 1. Materials:
 - a. Water-based acrylic sealer.
 - b. Low VOC.
 - c. Vapor permeable.
 2. Performance:
 3. MPI Product INT 3.2F, 'Concrete floor sealer, water based finish' system.
- B. Interior Gypsum Board and Plaster:
 1. Materials:
 - a. Primers:
 - 1) MPI Product 50, 'Primer Sealer, Latex, Interior'.
 - b. Finish Coats:
 - 1) Rest Rooms And Custodial Rooms:
 - (a) Buildings with only Gypsum Board surfaces in rooms:
 - (1) MPI Product 115, 'Epoxy-Modified Latex, Interior, Gloss (MPI Gloss Level 6)'.
 - 2) Remaining Painted Surfaces:
 - (a) Walls/Partitions/Vertical Surfaces - MPI Product 141, 'Latex, Interior, High Performance Architectural, Semi-Gloss (MPI Gloss Level 5)'.
 - (b) Ceilings - MPI Product 143 'Latex, Interior, High Performance Architectural, Flat (MPI Gloss Level 1 or 2)'.
 2. Performance:
 - a. Design Criteria:
 - 1) New Surfaces: MPI Premium Grade finish requirements.

- 2) Gloss / Sheen Required:
 - (a) Rest Rooms And Custodial Rooms: Gloss Level 6.
 - (b) Remaining Painted Surfaces: Gloss Level 5.
 - b. Rest Rooms And Custodial Rooms:
 - 1) New Surfaces: Use MPI(a) INT 9.2F Waterborne Epoxy Finish system.
 - c. All Other:
 - 1) New Surfaces: Use MPI(a) INT 9.2B Latex Finish system.
- C. Interior Metal:
- 1. Materials:
 - a. All paints and coatings shall comply with VOC content limits as indicated in section 01 8113.
 - b. Primers:
 - 1) Ferrous Metal: MPI Product 107, 'Primer, Rust-Inhibitive, Water Based'.
 - 2) Galvanized Metal: MPI Product 134: 'Primer, Galvanized, Water Based'.
 - 3) Aluminum: MPI Product 95: 'Primer, Quick Dry, for Aluminum'.
 - c. Finish Coats: MPI Product 153: 'Light Industrial Coating, Interior, Water Based, Semi-Gloss (MPI Gloss Level 5)'.
 - 2. Performance:
 - a. Design Requirements:
 - 1) New Surfaces: MPI Premium Grade finish requirements.
 - 2) Deteriorated Existing Surfaces: MPI Premium Grade finish requirements.
 - 3) Sound Existing Surfaces: MPI Custom Grade finish requirements.
 - 4) Gloss / Sheen Level Required: Gloss Level 5.
 - b. Ferrous Metal:
 - 1) New Surfaces: Use MPI(a) INT 5.1B Waterborne Light Industrial Finish system.
 - 2) Previously Finished Surfaces: Use MPI(r) RIN 5.1B Waterborne Light Industrial Finish system.
 - c. Galvanized Metal:
 - 1) New Surfaces: Use MPI(a) INT 5.3J Latex Finish system b. Previously Finished Surfaces: Use MPI(r) RIN 5.3AH Latex Finish system.
 - d. Aluminum:
 - 1) New Surfaces: Use MPI(a) INT 5.4E Waterborne Light Industrial Finish system.
 - 2) Previously Finished Surfaces: Use MPI(r) REX 5.4E Light Industrial Finish system.
- D. Locations indicated as Epoxy:
- 1. Materials
 - a. Wall and Ceiling Surfacing System:
 - 1) Interior Primer:
 - (a) Approved Product. See Section 01 6000:
 - (b) B28W601 PrepRite High Build Interior Latex Primer/Surfacer by Sherwin-Williams.
 - 2) Epoxy:
 - (a) Color: As selected by architect.
 - (b) Approved Product. See Section 01 6000:
 - (c) B71W111 Pro Industrial HI-BLD Water-based Catalyzed Epoxy by Sherwin-Williams.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin application of paints and finishes until substrates have been properly prepared.
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

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- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.
- D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Protection of In-Place Conditions:
 - 1. Protect other finish work and adjacent materials during painting. Do not splatter, drip, or paint surfaces not intended to be painted. These items will not be spelled out in detail but pay special attention to the following:
 - a. Do not paint finish copper, bronze, chromium plate, nickel, stainless steel, anodized aluminum, or monel metal except as explicitly specified.
 - b. Keep cones of ceiling speakers completely free of paint. In all cases where painting of metal speaker grilles is required, paint without grilles mounted to speakers and without grilles on ceiling.
- B. Surface Preparation:
 - 1. Prepare surfaces in accordance with MPI requirements and requirements of Manufacturer for each painting system specified, unless instructed differently in Contract Documents. Bring conflicts to attention of Architect in writing.
 - 2. Fill minor holes and cracks in wood surfaces to receive paint or stain.
 - 3. Surfaces to be painted shall be clean and free of loose dirt. Clean and dust surfaces before painting or finishing.
 - 4. Do no exterior painting while surface is damp, unless recommended by Manufacturer, nor during rainy or frosty weather. Interior surfaces shall be dry before painting. Moisture content of materials to be painted shall be within tolerances acceptable to Paint Manufacturer.
 - 5. Sand woodwork smooth in direction of grain leaving no sanding marks. Clean surfaces before proceeding with stain or first coat application.
- C. Clean surfaces thoroughly and correct defects prior to application.
- D. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- E. Remove or repair existing paints or finishes that exhibit surface defects.
- F. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- G. Seal surfaces that might cause bleed through or staining of topcoat.
- H. Interior Poured Concrete:
 - 1. New Surfaces:
 - a. Prep according to manufacturer's instructions.
 - b. Apply prime coat.
 - c. Apply finish coats.
- I. Interior Gypsum Board and Plaster:
 - 1. Interface With Other Work: Properly clean and paint light cove interiors before installation of light fixtures.
 - 2. New Surfaces:
 - a. Primer: Apply primer to be covered with other paint coats with roller only, or with spray gun and back-rolled.
 - 3. Existing Painted Surfaces:
 - a. Remove deteriorated existing paint down to sound substrate by scraping or sanding. Feather edges of existing paint by sanding to be smooth with adjacent surfaces.
 - b. Clean surface with mild soap and water, or with tri-sodium phosphate (TSP). Wash surfaces that have been defaced with marking pens, crayons, lipstick, etc, with solvent recommended by Paint Manufacturer. Spot prime such surfaces.

- c. Spackle and tape cracks. Sand to smooth finish and spot prime.
 - d. Sand or chemically etch existing painted surface as required to prepare surface to accept new paint.
 - e. Re-clean surface.
 - f. Apply primer coat.
 - g. Apply finish coats.
- J. Interior Metal:
- 1. New Surfaces: Remove rust spots by sanding and immediately spot prime. If all traces of rust cannot be removed, apply rust blocker recommended by Paint Manufacturer before applying full primer coat.
 - 2. Existing Painted Surfaces:
 - a. Remove deteriorated existing paint down to sound substrate by scraping and sanding. Feather edges of existing paint by sanding to be smooth with adjacent surfaces. Spot prime bare metal surfaces immediately.
 - b. Remove rust spots by sanding and immediately spot prime. If all traces of rust cannot be removed, apply rust blocker recommended by Paint Manufacturer before applying full primer coat.
 - c. Clean existing sound painted surfaces as well as scraped and sanded existing painted surfaces as recommended by Paint Manufacturer.
 - d. Apply prime coat over entire surface to be painted.
 - e. Lightly sand entire surface.
 - f. Clean surface as recommended by Paint Manufacturer.
 - g. Apply finish coats.

3.03 APPLICATION

- A. Interface with Other Work:
 - 1. Coordinate with other trades for materials and systems that require painting before installation.
 - 2. Schedule painting and coating work to begin when work upon which painting and coating work is dependent has been completed. Schedule installation of pre-finished and non-painted items, which are to be installed on painted surfaces, after application of final finishes.
- B. Paint or finish complete all surfaces to be painted or coated as described in Contract Documents, including but not limited to following items.
- C. Apply sealant in gaps 3/16 inch (5 mm) and smaller between two substrates that are both to be painted or coated. Sealants in other gaps furnished and installed under Section 07 9200.
- D. On wood to receive a transparent finish, putty nail holes in wood after application of stain using natural colored type to match wood stain color. Bring putty flush with adjoining surfaces.
- E. In multiple coat paint work, tint each succeeding coat with slightly lighter color, but approximating shade of final coat, so it is possible to check application of specified number of coats. Tint final coat to required color.
- F. Spread materials smoothly and evenly. Apply coats to not less than wet and dry film thicknesses and at spreading rates for specified products as recommended by Manufacturer.
- G. Touch up suction spots after application of first finish coat.
- H. Paint shall be thoroughly dry and surfaces clean before applying succeeding coats.
- I. Use fine sandpaper between coats as necessary to produce even, smooth surfaces.
- J. Make edges of paint adjoining other materials or colors clean, sharp, and without overlapping.
- K. Finished work shall be a 'Properly Painted Surface' as defined in this Section.
 - 1. Finish casework and wood trims that are specified to be installed under Section 06 2000 and that are not called out to be factory-or shop-finished. Back prime wood elements to be installed against concrete or masonry or that may be subjected to moisture.

2. Paint mechanical, electrical, and audio/visual items that require field painting as indicated in Contract Documents. These include but are not limited to:
 - a. Gas pipe from gas meter into building.
 - b. Mechanical flues and pipes penetrating roof.
 - c. Electrical panel and disconnect enclosures.
 - d. Metal protective structures for refrigerant lines.
 3. Metal reveals at ceiling access doors.
 4. Paint inside of chases in occupied spaces flat black for 18 inches (450 mm) or beyond sightline, whichever is greater.
 5. Paint surfaces in organ chamber behind grille cloth with flat black paint.
- L. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- M. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- N. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.
- O. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- P. Apply each coat to uniform appearance in thicknesses specified by manufacturer.
- Q. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.
- R. Sand wood and metal surfaces lightly between coats to achieve required finish.
- S. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- T. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection.
- B. Owner will provide field inspection.
- C. Non-Conforming Work:
 1. Correct deficiencies in workmanship as required to leave surfaces in conformance with 'Properly Painted Surface,' as defined in this Section.
 2. Correction of 'Latent Damage' and 'Damage Caused By Others,' as defined in this Section, is not included in work of this Section.

3.05 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.
- B. As work proceeds and upon completion of work of any painting Section, remove paint spots from floors, walls, glass, or other surfaces and leave work clean, orderly, and in acceptable condition.
- C. Waste Management:
 1. Remove rags and waste used in painting operations from building each night. Take every precaution to avoid danger of fire.
 2. Paint, stain and wood preservative finishes and related materials (thinners, solvents, caulking, empty paint cans, cleaning rags, etc.) shall be disposed of subject to regulations of applicable authorities having jurisdiction.
 3. Remove debris caused by work of paint Sections from premises and properly dispose.
 4. Retain cleaning water and filter out and properly dispose of sediments.

3.06 PROTECTION

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- A. Protect finishes until completion of project.
- B. Touch-up damaged finishes after Substantial Completion.

3.07 SCHEDULE OF PAINT COLORS

- A. Interior:
 - 1. Interior Gypsum Board, Plaster (See Section 09 9123):
 - a. Field wall color:
 - 1) SW7009 Pearly White by Sherwin Williams.
 - b. Accent wall color #1:
 - 1) SW 9148 Smoky Azurite by Sherwin Williams.
 - c. Accent wall color #2:
 - 1) SW 7702 Spiced Cider by Sherwin Williams.
 - 2. Interior Metal (See Section 09 9123):
 - a. SW7009 Pearly White by Sherwin Williams.

END OF SECTION

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SECTION 10 1400 SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Interior directional and informational signs.
- B. Building identification signs.
- C. Traffic signs.

1.02 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.
- B. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.

1.03 SUBMITTALS

- A. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.
- B. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
 - 1. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
 - 2. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
 - 3. Submit for approval by Owner through Architect prior to fabrication.
- C. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

1.04 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Sign shall meet ANSI A117.1 accessibility code and ADA standards for accessible design and local and state authorities having jurisdiction (AHJ) requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Package signs as required to prevent damage before installation.
- B. Package room and door signs in sequential order of installation, labeled by floor or building.
- C. Store tape adhesive at normal room temperature.

1.06 FIELD CONDITIONS

- A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.
- B. Maintain this minimum temperature during and after installation of signs.

PART 2 PRODUCTS

2.01 SIGNAGE APPLICATIONS

- A. Traffic Signage:
 - 1. Permanently Mounted:
 - a. Post Foundation Concrete: One cu ft cement, 2 cu ft (0.0566 cu m) sand, 4 cu ft (0.1132 cu m) gravel, and 5 gallons (18.93 liters) minimum to 6 gallons (22.71 liters) maximum of water.
 - b. Post Setting Grout at Sleeves:
 - 1) Acceptable Products:
 - (a) Normal Construction Grout A by Bonsal American, Charlotte, NC
www.bonsal.com.

- (b) Advantage 1107 Grout by Dayton Superior Specialty Chemicals, Kansas City, KS www.daytonsuperiorchemical.com.
 - (c) NS Grout by Euclid Chemical Co, Cleveland, OH www.euclidchemical.com
 - 4) 5 Star Special Grout 110 by Five Star Products Inc, Fairfield, CT www.fivestarproducts.com.
 - (d) Duragrout by L&M Construction Chemicals Inc, Omaha, NE www.lmcc.com
 - 6) Sonneborn / BASF Building Systems, Shakopee, MN www.chemrex.com.
 - (e) Tamms Grout 621 by TAMMS Industries, Mentor, OH www.tamms.com.
 - (f) U S Spec MP Grout by U S Mix Products Co www.usspec.com.
 - (g) CG-86 Grout by W R Meadows, Hampshire, IL www.wrmeadows.com.
 - (h) Equal as approved by Architect before use. See Section 01 6000.
- c. Accessible Parking Signs:
- 1) Design Criteria:
 - (a) Meet regulatory agency requirements for accessibility.
 - (b) Sign graphics and lettering shall be minimum required by agency having jurisdiction:
 - (1) International symbol of accessibility should be posted on all accessible parking spaces.
 - (2) Letters must contain visual characters and high dark to light contrast between characters and background as per ADA requirements:
 - (3) Provide reflective background.
 - (4) Van-accessible parking spaces to have additional 'text' or 'sign' below the accessibility symbol to mark the van-accessible area specifically:
 - (c) Size: 12 inches (305 mm) x 18 inches (457 mm) aluminum sign.
 - (d) Sign shall have rounded corners.
 - 2) Acceptable Products:
 - (a) Parking signs by My Parking Sign, Brooklyn, NY www.MyParkingSign.com.
 - (b) Equal as approved by Architect before use. See Section 01 6000.
- d. Posts:
- 1) Provide stainless steel posts as shown on Contract Drawings.
2. Installation:
- a. Permanently Mounted:
 - 1) Locate as shown on Site Plan.
 - (a) Follow ADA guidelines and local and state authorities having jurisdiction (AHJ) for placement of sign requirements:
 - (1) Van accessible sign should be placed so that it is not obscured by anything including a standing van, vehicle or other obtrusive objects.
 - (2) Signs should be placed at such a height (at least 60 inches (1 500 mm) above surface of parking stall) that they do not get obscured by any parked vehicles or other obstructions. Signs must be viewable from drivers' seat of vehicle and located right in view of parking spaces.
 - 2) Install signs square and plumb.
 - 3) Post Foundations:
 - (a) Follow requirements of Section 03 3000: 'Miscellaneous Exterior Cast-In-Place Concrete' for post foundation:
 - (1) Mix concrete components thoroughly, place in post foundation holes sized as shown on Contract Drawings.
 - 4) Handicap Accessible Parking Signage:
 - (a) Attach sign to stainless steel bars as shown on Contract Drawings with stainless steel self tapping screws.
 - (b) Isolate dissimilar materials (stainless steel bar and aluminum sign).

- B. Owner Furnished Miscellaneous Interior Signage.
1. Approved Distributors. See Section 01 6000:
 - a. Standard Interior Signs:
 - 1) Visual Identity Office:
 - (a) Contact Information:
 - (b) 50 E. North Temple St. Rm. 2350, Salt Lake City, UT 84150-3232.
 - (c) Phone: 1-801-240-1302.
 - (d) Fax: 1-801-240-5997.
 - (e) vidoffice@churchofjesuschrist.org.
 - 2) Room Signs: Molded clear acrylic sub-surface graphics sign with set-screw to attach to included mounting bracket.
 - 3) Provide tactile / braille features in signage.
 - 4) Cabinet Door Signs: Flat clear acrylic sub-surface graphics sign with mounting adhesive in position.
 - 5) Color:
 - (a) Background: Blue.
 - (b) Lettering: White.
 - a. Install interior signs square and plumb:
 - a. Room Signs:
 - 1) Install bracket using two screws. Use proper anchor for substrate.
 - 2) Attach sign to bracket using set-screw.
 - 3) Mount signs as described in Contract Drawings and as directed by the Owner.
 - b. Cabinet Signs:
 - 1) Remove adhesive protective layer.
 - 2) Position sign correctly and apply to door.
 - 3) Roll sign to secure to door, taking care not to damage sign.
 - 4) Mount signs as described in Contract Drawings.
- C. Owner Furnished Exterior Signage.
1. Standard Exterior Signs:
 - a. Building-mounted Seminary sign.
 - b. Building-mounted address sign.
 - c. Post-mounted site Seminary sign.
 2. Color:
 - a. Dark bronze metal with white or gold lettering.
 3. Install exterior signs square and plumb as directed by the Owner and as described in the Contract Documents.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install neatly, with horizontal edges level.
- C. Locate signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.
- D. Protect from damage until Date of Substantial Completion; repair or replace damaged items.

END OF SECTION

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**SECTION 10 2239
FOLDING PANEL PARTITIONS**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Automatic vertically retractable acoustic walls as shown on the Contract Drawings.
- B. All necessary hardware, seals, lifting machinery, and electrical controls.
- C. Top-supported operable panel partitions, vertical opening, electrical operation.

1.02 RELATED REQUIREMENTS

- A. Section 05 1200 - Structural Steel Framing: Steel structure supporting the Automatic Retractable Acoustical Wall.
- B. Section 09 2116 - Gypsum Board Assemblies: Storage pockets along the axis of the Automatic Retractable Acoustical Wall.
- C. Section 06 1000 - Rough Carpentry: Wood blocking and track support shimming.
- D. Section 07 2100 - Thermal Insulation: Insulation above, below, and in the fixed walls at both ends of the Automatic Retractable Acoustical Wall.
- E. Division 26 - Electrical: Site wiring and connections for main power, including disconnect switches at each motor location.
- F. Division 27 - Communications: Site wiring and connections for control, integration with AV controls for adjacent rooms, and installation of touch screen control devices as specified in this Section.

1.03 REFERENCE STANDARDS

- A. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method 2022.
- B. ASTM E336 - Standard Test Method for Measurement of Airborne Sound Attenuation Between Rooms in Buildings 2020.
- C. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements 2009 (Reapproved 2016).
- D. ASTM E413 - Classification for Rating Sound Insulation 2022.
- E. ASTM E557 - Standard Guide for Architectural Design and Installation Practices for Sound Isolation Between Spaces Separated by Operable Partitions 2012 (Reapproved 2020).
- F. ASTM E596 - Standard Test Method for Laboratory Measurement of Noise Reduction of Sound-Isolating Enclosures 2022.
- G. ISO 354 - Acoustics Measurement of sound absorption in a reverberation room 2nd Edition, May 15, 2003.
- H. ISO 10140-5 - Acoustics — Laboratory measurement of sound insulation of building elements — Part 5: Requirements for test facilities and equipment 2nd Edition, April 2021.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate efforts of various trades affected by the Work of this Section.
 - a. Ensure accurate installation of required headers, jambs and pocket framing.
 - 2. Coordinate completion of all associated trim.
 - 3. Coordinate completion of operable wall installation with sound system testing so acoustic testing of operable walls may be performed at same time.
- B. Sequencing:
 - 1. Install operable walls after following has been completed:
 - a. Headers and adjacent walls and ceilings are finished and painted.

- b. All jambs and trim installed and finished.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data:
- C. Provide data on Operable Wall operation, hardware and accessories, colors and finishes available.
- D. Manufacturer's Installation Instructions: Indicate special procedures.
- E. Shop Drawings:
 - 1. Show complete layout of operable wall system based on field verified dimensions. The drawings shall include dimensional relationship to adjoining work. Include details indicating materials, finishes, tolerances, and methods of attachment to building steel and electrical requirements.
- F. Test And Evaluation Reports:
 - 1. Submit certified test reports evidencing compliance to acoustical STC (Rw) requirements as specified and in accordance to the references specified in this Section.
- G. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Operations and Maintenance Data:
 - 1) Manufacturer's maintenance instructions:
 - (a) Panel finish facings and finishes for exposed trim and accessories. Include precautions for cleaning materials and methods that could be detrimental to finishes and performance.
 - (b) Seals, hardware, track, carriers, and other operating components.
 - b. Warranty Documentation:
 - 1) Include copy of final, executed warranty / Certificate stating that installed materials comply with specification.
 - c. Record Documentation:
 - 1) Manufacturers Documentation:
 - (a) Manufacturer's literature.
 - (b) Color selections.
- H. Maintenance Data:
 - 1. Describe cleaning materials detrimental to finish surfaces and hardware finish. Include recommended cleaning methods, cleaning materials, and stain removal methods.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified in writing by the operable partition manufacturer, as qualified to install the manufacturer's partition systems for work similar in material, design, and extent to that indicated for this Project.
- B. Preparation of the opening shall conform to the criteria set forth per ASTM E557 Standard Practice for Architectural Application and Installation of Operable Partitions.
- C. Acoustical Performance: Test operable partitions in an independent acoustical laboratory in accordance with ASTM E90 test procedure and classified in accordance with ASTM E413 to attain no less than the STC rating specified.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver in Manufacturer's original, unopened package(s).
- B. Store products in manufacturer's unopened packaging until installation.
- C. Provide secure location protected from the weather and other trades.

1.08 WARRANTY

- A. **Basic Warranty:** The operable wall shall be warranted free from defects in material and workmanship for a period of two (2) years or five thousand (5,000) cycles, whichever occurs first, from the date of shipment. **Extended Parts Warranty (optional):** An extended warranty on parts (excluding touch screen operator stations) is available in addition to the basic warranty. It includes coverage on all parts for a period of ten (10) years or five thousand (5,000) cycles, whichever occurs first from date of shipment. Refer to Owner's manual for full warranty details.
- B. **Acoustical Performance:** The operable wall shall retain its acoustical properties for 10 years from the date of shipment providing proper maintenance has been performed on the operable wall.
- C. **Parts and labor** required to maintain the operable wall and part subject to normal wear and tear are not covered under the warranty and are the owner's responsibility. (Refer to Maintenance Program).

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. **Operable Panel Partitions - Vertical Opening:**
 - 1. Skyfold Inc. Baie d'Urfe (Montréal) Québec, Canada Web-site: www.skyfold.com
 - a. Contact Joel Brinkle at 480-263-3561 or joel.brinkle@modernfold.com

2.02 OPERABLE PANEL PARTITIONS - VERTICAL OPENING

- A. **Approved Product.** See Section 01 6000:
 - 1. Skyfold Zenith® 48:
 - a. System STC 48 (Rw 47), Panel Construction STC 57 (Rw 56)
- B. **Sound Transmission Requirements:**
 - 1. Automatic vertically retractable acoustic wall tested for laboratory sound transmission loss performance according to ASTM E90, determined by ASTM E413 and rated for an STC as follows:
 - a. Sound transmission class (STC):
 - 1) Construction: 57 STC
 - 2) Fully automatic operable wall: 48 STC minimum.
- C. **Description:**
 - 1. **Definition**
 - a. Automatic Vertically Retractable Acoustical Wall (Operable Wall) shall refer specifically to acoustical partitions that, when in the down position (closed) are hard, rigid, flat, plumb walls, made of a grid of rectangular acoustical panels, and when are lifted (opened), fold upward (vertically) without the use of any manual labor, in a manner similar to an accordion, into a framed pocket in the ceiling. In the down (closed) position, the operable wall shall be comprised of two vertical planes of acoustical panels, separated by an acoustical air space.
 - 2. **Controls:**
 - a. Operation controls by two touch screen operator stations.
 - b. Both touch screens must be operated at the same time for operable wall to open or close.
 - 3. **Operation:**
 - a. The operable wall shall open and close in a manner similar to an accordion, in that all wall panels fold and unfold sequentially in an accordion fashion.
 - b. From a fully open position, the operable wall shall be able to go through its entire cycle of closing and/or opening without any manual intervention.
 - c. When the operable wall is being lowered (closed) it shall come automatically to rest once it has reached the fully down (closed) position.
 - d. When the operable wall is being lifted (opened) it shall come automatically to rest once it has reached the fully up (open) position.

- e. The operable wall shall automatically and acoustically seal against the floor without the need for any manual intervention. The floor seals shall leave a joint between the floor and the bottom acoustical panels of not more than approximately 2".
 - f. The operable wall shall automatically and acoustically seal against the two end walls without the need for any manual intervention. The end seals shall act in such a way as not to come into contact with the end walls while the operable wall is in motion. The end seals shall leave a joint between the acoustical panels and the end walls of no more than approximately 1" (25 mm). Seals that rub or brush against the end walls are not acceptable. Once the operable wall reaches the full down position, the end seals shall activate automatically.
 - 1) The control stations do not need to be activated during the deployment of the end seals.
 - g. The operable wall shall automatically and acoustically seal against the ceiling without any manual intervention. The top seals shall leave a joint between the top acoustical panels and the ceiling of the pocket of not more than approximately 2".
 - h. The operable wall shall open and close at an average speed of approximately 5 to 10 vertical feet per minute.
 - i. When the operable wall is being lowered (closed), it shall stop if the leading (bottom) edge comes into firm contact with any object between it and the floor. The operable wall will then automatically reverse its direction and ascend for approximately 3 seconds to clear the object. The regular operation of the operable wall can resume once the obstruction has been removed.
4. Standard Drive System:
- a. Motor drive assembly is mounted directly above the center line of the operable wall.
 - b. Support steel required where shown on the Contract Drawings.
- D. Materials:
- 1. Panels:
 - a. Steel-faced panels coated with scratch resistant, permanently bonded white markerboard finish.
 - b. Modular construction.
 - c. Constructed of non-combustible or fire-treated materials.
 - d. Panel finish:
 - 1) Maximum weight of material: 0.111 lbs/ft²
 - 2) Maximum thickness of material: 1/8"
 - 3) Color and Pattern Finish: White Markerboard
 - e. Panels shall be visibly flat and rigid in the down (closed) position.
 - f. There shall be no exposed hinges, brackets, screws, and no part of the mechanical system shall be visible when the operable wall is in the down (closed) position.
 - g. All of the panel edges shall be right angled, with a minimum radius not more than 1/16".
 - h. All of the panels shall be rectangular, nominally of the same size.
 - i. Joints between panel, vertical and horizontal, shall be no more than approximately 1/2".
 - j. The operable wall shall stack in the up (open) position into a space no greater than 65" wide. The operable wall shall have a stacking height ratio in the range of 1:5 to 1:10, depending on the height of the wall.
 - k. Each panel shall be individually removable using only a screwdriver. No special tools or equipment shall be required. The removal of a single panel shall not affect, dislocate or cause the removal of any adjacent panels or other panels.
 - 2. Folding Mechanism
 - a. The hanging, folding and extension mechanism shall be made from structural grade aluminum extrusions and structural shapes.

- b. All wear surfaces, such as bushings, spacers, pins, discs, bearings, and sleeves shall be designed to function quietly and with minimum wear over the design life cycle of the operable wall.
 - c. Wherever possible, ball bearings shall be used instead of bushings and wear surfaces.
 - d. Chain or belt drive systems shall not be used.
 - e. The hangers, which fasten the lifting mechanism to the support steel, shall be fabricated from steel and shall be welded or bolted to the support steel supplied by others.
3. Motor Drive and System:
- a. Sized to operate the operable wall effectively over the design life cycle of the wall, at the minimum design speed specified.
 - b. Designed to use the latest in industry standards in thermal protection, overload protection, quick acting fuses, etc., in order to ensure the safety and reliability of the system.
 - c. Cable:
 - 1) Include a wire rope cable for every set of folding mechanism.
 - 2) 6 x 31 construction aircraft-grade galvanized steel cable.
 - 3) Diameter sized to support the entire weight of the operable wall, with the appropriate safety factor.
 - 4) Wraps on yoyo drums with 2 safety wraps and multiple layers of cable.
 - d. Line shaft:
 - 1) Supports and rotates the cable drums.
 - 2) Sized to deliver the required torque with minimum deflection.
 - e. Flange bearings shall be used for the drive system, located immediately on both sides of the drum assembly.
4. Safety Equipment:
- a. Electromagnetic brake:
 - 1) Activates immediately at loss of power to the system.
 - 2) Minimum retarding torque rating equal to 200% of the motor drive's full load torque.
 - 3) Include manual override for the drive and a brake release lever.
 - b. Dynamic brake:
 - 1) Activates at catastrophic failure in the motor drive's power train.
 - 2) Halts operation of the operable wall, or controls the speed at 150% of the normal down speed.
 - c. Limit switches:
 - 1) Set the up and down travel limits of the operable wall.
 - d. Over-torque detector:
 - 1) Mechanical sensor using the drive motor's torque arm.
 - 2) Activates at a jam in the system.
 - 3) Operates as an over-travel limit in the up direction at failure of the upper limit switch.
 - e. Pressure sensing strip:
 - 1) Continuous along the bottom edge of the operable wall.
 - 2) Cuts power to the motor drive and activates the electromagnetic brake.
 - 3) Activates if the sensing edge comes in firm contact with an object prior to obtaining the full down (closed) position.
 - 4) Triggers reverse direction operation to lift the wall for 3 seconds to allow obstruction objects to be cleared.
 - 5) Power shall remain cut to the motor drive until the pressure sensing switch has been released.

E. Performance:

1. Design Criteria:
 - a. General:
 - 1) Total operable wall assembly shall be repairable at installed location without removal to repair shop or factory.
 - 2) The operable wall shall not weigh more than the following (excluding the motor drive and architectural finish): ~6.0 lbs per ft²
 - b. Life Cycle:
 - 1) At least 10,000 complete closed to opened to closed cycles.
2. Panels:
 - a. Acoustical panels shall be architecturally flat with no bowing, oil canning, warping, waviness or any other surface deformation and discontinuity.

2.03 ACCESSORIES

- A. Electrical Control Box: NEMA 1.
- B. Touch Screen Operator Stations:
 1. Two 4.3" resistive LCD touch screens, wired in series with multilingual capabilities and 4-digit adjustable user pin.
 2. AV dry contacts, linked to the building AV system to control the speakers between the Chapel and Cultural Center as noted in the Contract Drawings and Specifications.
 3. Low-voltage Wiring: 18 gauge wiring from the operator stations to the control box (Furnished and installed by the Contractor).

2.04 FABRICATION

- A. Factory assemble all components, assemblies and systems into the largest possible assemblies in order to minimize the amount of assembly on site.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that required utilities are available, of the correct characteristics, in proper location, and ready for use.
- C. Verify track supports are laterally braced and will permit track to be level within the manufacturer tolerances of required position and parallel to the floor surface over entire length of the opening.
- D. Verify floor flatness of 1/8 inch in 10 feet, non-cumulative.
- E. Verify wall plumbness of 1/8 inch in 10 feet, non-cumulative.
- F. Verify conditions are in accordance with approved shop drawings.
- G. Notify Architect in writing of unsatisfactory conditions or non-compliance:
 1. Do not install in unsatisfactory openings.
- H. Commencement of Work by installer is considered acceptance of substrate.

3.02 INSTALLATION

- A. Install partition in accordance with manufacturer's instructions and ASTM E557.
- B. Install electric operator, wiring, and controls. Locate control station(s) as indicated.
- C. Fit and align partition assembly and pocket doors level and plumb.
- D. Lubricate moving components.
- E. Install acoustic sealant to achieve required acoustic performance.
- F. Coordinate electrical connections.
- G. Special Techniques:
 1. Installation shall comply with requirements of ASTM E557.

3.03 FIELD QUALITY CONTROL

- A. Field Tests:
 - 1. Installer shall test completed assembly using own sound source and instruments:
 - a. Make corrections required to meet specified NIC rating.
 - b. When completed, notify Architect and Door Manufacturer in writing that partition is ready for testing by Architect's Sound / Acoustic Consultant.
 - 2. Architect's Sound / Acoustic Consultant will test finished, installed folding panel partition assemblies to determine NIC ratings specified above:
 - a. Notify Door Manufacturer minimum forty-eight (48) hours in writing prior to test time, verifying specific date in writing.
 - 3. Testing will occur at time of sound system balancing.
- B. Non-Conforming Work: Non-conforming work as covered in the General Conditions applies, but is not limited to the following:
 - 1. Sound / Acoustic testing:
 - a. If partitions do not meet specified NIC requirements or if partitions are not ready for testing, make necessary corrections and pay for additional fees and expenses required for subsequent testing.
 - 2. Correct any work found defective or not complying with contract document requirements at no additional cost to the Owner.

3.04 ADJUSTING

- A. Adjust partition assembly to provide smooth operation from stacked to full open position. Do not over-compress acoustic seals.
- B. Visually inspect partition in full extended position for light leaks to identify a potential acoustical leak.
- C. Adjust partition assembly to achieve lightproof seal.

3.05 CLEANING

- A. Clean finish surfaces and partition accessories.
- B. General:
 - 1. Clean any soiling of partitions as recommended by Manufacturer or any surrounding areas caused by installation of partitions.
- C. Building Damage:
 - 1. Installer responsible for cleaning and repair of all damaged surfaces to their original condition from partition installation.
- D. Waste Management:
 - 1. All work areas are to be kept clean, clear and free of debris at all times.
 - 2. Disposal of rubbish, debris, and packaging materials to Dumpster.

3.06 CLOSEOUT ACTIVITIES

- A. Demonstrate operation of partition and identify potential operational problems.
- B. Demonstration:
 - 1. After installation and when folding panel partition is fully operational, provide minimum two (2) hour instruction and demonstration period concerning operation and maintenance of folding panel partitions.
 - 2. Those to be included in instruction period are Architect, Owner's Representative, Stake Representative, and Facilities Manager.
- C. Instruction of Owner:
 - 1. After installation, meet with Owner's Representative's personnel.
 - a. Review maintenance procedures and materials using specified maintenance and repair Manual.

3.07 PROTECTION

- A. Upon completion of partition installation, protect partitions from damage and replace or repair subsequent damage at no cost to Owner.

END OF SECTION

SECTION 10 2600
WALL PROTECTION

PART 1 GENERAL**1.01 SUMMARY**

- A. Includes But Not Limited To:
1. Furnish and install corner guards and rub rails as described in Contract Documents.

1.02 REFERENCES

- A. Definitions:
1. Flame Spread: The propagation of flame over a surface.
 2. Flame Spread Index: The numerical value assigned to a material tested in accordance with ASTM E84.
 3. Smoke-Developed Index: The numerical value assigned to a material tested in accordance with ASTM E84.
- B. Reference Standards:
1. ASTM International:
 - a. ASTM D256-10(2018), 'Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics'.
 - b. ASTM D543-14, 'Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents'.
 - c. ASTM E84-18b, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
 2. Underwriters Laboratories / American National Standards Institute:
 - a. UL/ANSI 723, 'Standard for Safety Test for Surface Burning Characteristics of Building Materials' 11th Edition).

1.03 SUBMITTALS

- A. Action Submittals:
1. Product Data: Color selections.
 2. Shop Drawings:
 - a. Show locations, extent and installation details.
 - b. Show method of attachment.
 3. Sample:
 - a. Provide 12 inches (305 mm) sample show color, texture, pattern, and guard.
- B. Informational Submittals:
1. Test And Evaluation Reports:
 - a. Copies of Quality Assurance requirements for 'Class A' flame spread rating.
 2. Qualification Statement:
 - a. Installer:
 - 1) Provide Qualification documentation if requested by Architect or Owner.
- C. Closeout Submittals:
1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Operations and Maintenance Data:
 - 1) Maintenance, and cleaning instructions.
 - b. Record Documentation:
 - 1) Manufacturers documentation:
 - (a) Manufacturer's literature.
 - (b) Color selection.

1.04 QUALITY ASSURANCE

- A. Regulatory Requirements:
1. System shall be recognized for intended use by applicable building codes.

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2. Fire Test Response Characteristics:
 - a. UL classified conforming to NFPA Class A fire rating with surface burning characteristics as tested materials in accordance with UL 723 (ASTM E84).
 - 1) Flame Spread: 10.
 - 2) Smoke Developed: 350 to 450.
 - b. 20 ft/lbs/ per square inch as tested in accordance with ASTM D256, Notched Izod Test.
- B. Qualifications:
 1. Installers:
 - a. Installer shall have performed at least three (3) installations of similar size, scope, and complexity in each of the past two (2) years.
 - b. Provide documentation if requested.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
 1. Deliver materials in sealed containers with Manufacturer's labels intact.
- B. Storage And Handling Requirements:
 1. Store materials in protected area in original, undamaged packaging in a cool, dry place out of direct sunlight and exposure to elements. Minimum room temperature of 40 deg F (4.4 deg C) and a maximum of 100 deg F (37.8 deg C) should be maintained.
 2. Material must be stored flat.

1.06 FIELD CONDITIONS

- A. Ambient Conditions:
 1. Material must be acclimated in an environment of 65 deg F to 75 deg F (18 deg C to 24 deg C) for at least twenty-four (24) hours prior to beginning installation.
 2. Installation areas must be enclosed and weatherproofed before installation commences.

PART 2 PRODUCTS

2.01 MANUFACTURED UNITS

- A. Category Four Approved Manufacturers. See Section 01 6200 for definition of Categories.
 1. Acrovyn, Div Construction Specialties Group, Muncie, PA www.c-sgroup.com.
 2. American Floor Products Co, Rockville, MD www.afco-usa.com.
 3. IPC Door and Wall Protection Systems, Muskego, WI www.inprocorp.com.
 4. Koroseal Wall Protection Systems, Fairlawn, OH www.korogard.com.
 5. Pawling Corp, Pawling, NY www.pawling.com.
- B. Materials:
 1. Vinyl Corner Guards:
 - a. Design Criteria:
 - 1) Corner guard system: continuous .070" mill finish aluminum retainer with 2" x 2" continuous snap-on .080 vinyl cover.
 - 2) Chemical and stain resistance: Provide wall protection system components with chemical and stain resistance in accordance with ASTM D543.
 - 3) Impact strength: Provide rigid vinyl profile materials that have an impact strength of 30.2 ft-lbs/inch of thickness as tested in accordance with the procedures specified in ASTM D-256-90B.
 - b. Install in lengths required to achieve a one piece, jointless installation.
 - c. Approved products:
 - 1) Quality standard: Inpro 160 High Impact Corner Guard.
 - 2) Equal as approved by architect.
 2. Rub Rails / Wall Guards:
 - a. Design Criteria:

- 1) Surface mounted, 0.040 inch minimum thick by 12 inches tall by 10 feet long minimum, nominal high-impact vinyl / acrylic or polyvinyl chloride (PVC) extrusions designed to absorb and resist abrasions under impact.
 - 2) Chemical and stain resistance: Provide wall protection system components with chemical and stain resistance in accordance with ASTM D543.
 - b. Approved products:
 - 1) Any product by the approved manufacturers that meets all of the Design Criteria and Color Standards noted.
- C. Color Standards:
1. At walls with field paint color:
 - a. InPro 0103 White Sand.
 - b. Equal as approved by Architect prior to installation.
 2. At walls with accent paint color #1:
 - a. InPro 0189 Skylight.
 3. At walls with accent paint color #2:
 - a. InPro 0235 Penny.
- D. Fabrication:
1. Fabricate wall protection systems to comply with requirements indicated for design, dimensions, details, finish, and member sizes.

2.02 ACCESSORIES

- A. Adhesive: As supplied or recommended by wall protection Manufacturer.
- B. Mounting hardware appropriate for the substrates indicated on the drawings.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification Of Conditions:
 1. Examine substrate and conditions under which Work is to be performed and identify conditions detrimental to proper or timely completion.
 2. Notify Architect of unsuitable conditions in writing.
 3. Do not proceed until unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Surface Preparation:
 1. Prior to installation, clean substrate to remove dirt, debris and loose particles. Perform additional preparation procedures as required by manufacturer's instructions.
- B. Protection:
 1. Take all necessary steps to prevent damage to material during installation as required in manufacturer's installation instructions.

3.03 INSTALLATION

- A. Acceptable Installers:
 1. Meet Quality Assurance Installer Qualifications as specified in Part 1 of this specification.
- B. Install the Work of this section in strict accordance with manufacturer's recommendations, using only approved mounting hardware, and locating all components firmly into position, level and plumb.
- C. Maintain ambient conditions for at least forty eight (48) hours.
- D. Install wall protection (corner guards and rub rails / wall guards) at locations indicated in the Contract Documents.
- E. Install corner guards from top of base to ceiling in one piece with no joints, except where interrupted by the rub rails / wall guards where occurs.

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- F. Apply adhesive carefully to insure continuous contact between wall and guard. Take care to avoid soiling or leaving visible adhesive on wall or base.

3.04 CLEANING

- A. General:
 - 1. Immediately upon completion of installation, clean guards and accessories in accordance with manufacturer's recommended cleaning method.
 - 2. Remove surplus materials, rubbish and debris resulting from installation as work progresses and upon completion of work.

3.05 PROTECTION

- A. Protect installed materials to prevent damage by other trades. Use materials that may be easily removed without leaving residue or permanent stains.

END OF SECTION

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**SECTION 10 2800
TOILET AND BATH ACCESSORIES**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Commercial toilet accessories.
- B. Custodial room accessories.

1.02 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.
- D. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2015.
- E. ASTM C1036 - Standard Specification for Flat Glass 2016.
- F. ASTM F446 - Standard Consumer Safety Specification for Grab Bars and Accessories Installed in the Bathing Area 2019.
- G. ISO 25537 - Glass in building — Silvered, flat-glass mirror 2008.

1.03 SUBMITTALS

- A. Product Data: Submit data on accessories describing operating characteristics, size, finish, details of function, rough-in dimensions and attachment methods.
- B. Shop Drawings:
 - 1. Schedule showing items used, location where installed, and proper attaching devices for substrate.
- C. Manufacturer's Installation Instructions: Indicate operation, care, cleaning instructions, special procedures and conditions requiring special attention.
- D. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - 2. Warranty Documentation:
 - a. Final, executed copy of Warranty for each product.
 - 3. Record Documentation:
 - a. Manufacturers documentation:
 - 1) Manufacturer's literature or cut sheets.

1.04 QUALITY ASSURANCE

- A. Source Limitations:
 - 1. For products listed together in same Part 2 articles, obtain products from single source from single manufacturer.

1.05 WARRANTY

- A. Commercial Toilet Accessories:
 - 1. Manufacturer's standard warranty.
- B. Special Mirror Warranty:
 - 1. Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage or frame corrosion defects within specified warranty period:
 - a. Warranty Period: fifteen (15) years from date of Substantial Completion.

PART 2 PRODUCTS**2.01 OWNER-FURNISHED PRODUCTS**

14922 / 2022 New Construction Master	10 2800 - 1	Toilet and Bath Accessories
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- A. Approved Products:
1. Automatic Touchless Towel Dispensers:
 - a. Size: 14.8 inches (376 mm) wide x 9.75 inches (248 mm) deep x 16.75 inches (425 mm) high.
 2. Soap dispensers.
 3. Toilet tissue dispensers.

2.02 MANUFACTURED UNITS

- A. Manufacturers:
1. Manufacturer Contact List:
 - a. AJW Architectural Products, A&J Washroom Accessories, Inc., New Windsor, NY www.ajwashroom.com.
 - b. American Specialties Inc (ASI), Yonkers, NY www.americanspecialties.com.
 - c. Bobrick Washroom Equipment Inc, North Hollywood, CA www.bobrick.com or Bobrick Washroom Equipment of Canada Ltd, Scarborough, ON (416) 298-1611.
 - d. Bradley Corp, Menomonee Falls, WI www.bradleycorp.com.
 - e. General Accessory Manufacturing Co (GAMCO), Durant, OK www.gamcousa.com.
 - f. Seachrome Corporation, Long Beach, CA.
- B. Materials:
1. Design Criteria:
 - a. Stainless Steel: ASTM A666 Type 304 (18-8); satin finish exposed surfaces unless otherwise indicated.
 - b. Galvanized-Steel Mounting Devices: ASTM A153/A153M, hot-dip galvanized after fabrication.
 - c. Fasteners:
 - 1) Exposed: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant.
 - 2) Concealed: Galvanized Steel.
 2. Rest Rooms:
 - a. Mirrors:
 - 1) Channel-Frame Mirror:
 - (a) Frame: Type 304 or Type 430, 20 gauge stainless steel channel frame.
 - (b) Roll-formed one piece construction.
 - (c) Exposed surfaces have #4 satin finish.
 - (d) Edges and corners are burr free.
 - (e) Glass: 1/4 inch (6.4 mm) silver coated and hermetically sealed. Guaranteed for 15 years against silver spoilage. Mirrors meet ASTM C1036 requirements.
 - (f) Concealed surface mounted wall hanger.
 - 2) Approved Products. See Section 01 6000:
 - (a) AJW Architectural Products: Model U711.
 - (b) American Specialties (ASI): Model 0620.
 - (c) Bobrick: Model B-165.
 - (d) Bradley: Model 781.
 - (e) General Accessory (GAMCO): Model C Series.
 - b. Sanitary Napkin Disposal Container:
 - 1) Design Criteria:
 - (a) Surface mounted type 304, 22 gauge stainless steel with #4 satin finish. Seamless construction with radius and hemmed edges.
 - (b) Stainless steel piano hinge.
 - 2) Approved Products. See Section 01 6000:
 - (a) AJW Architectural Products: Model U590.
 - (b) American Specialties (ASI): Model 0852.

- (c) Bobrick: Model B-270.
- (d) Bradley: Model 4781-15.
- (e) General Accessory (GAMCO): Model ND-1.
- c. Single Robe Hook:
 - 1) Surface mounted type 304, 22 gauge stainless steel with #4 satin finish.
 - 2) Concealed mounting bracket.
 - 3) Stainless steel locking setscrew on bottom.
 - 4) Approved Products. See Section 01 6000:
 - (a) AJW Architectural Products: Model UX110SF.
 - (b) American Specialties (ASI): Model 7340-S.
 - (c) Bobrick: Model B6717.
 - (d) Bradley: Model 9114.
 - (e) General Accessory (GAMCO): Model 76717.
- d. Grab Bars:
 - 1) Configuration shown on Contract Drawings. Include center support for longer lengths when required:
 - 2) Design Criteria:
 - (a) Comply with ADA guidelines and ADAAG accessible design for structural strength and local and state codes.
 - (b) Concealed mount.
 - (c) 18 ga (1.27 mm), type 304 stainless steel tubing.
 - (d) 1-1/2 inch (38 mm) diameter.
 - (e) Provide center support when required.
 - (f) Snap-on flange covers.
 - (g) Peened (non-slip) finish.
 - (h) Sustain loads in excess of 900 lbs (408 kg).
 - 3) Approved Products. See Section 01 6000:
 - (a) AJW Architectural Products: Model UG3 Series.
 - (b) American Specialties (ASI): Model 3800 Series.
 - (c) Bobrick: Model B-6806 Series.
 - (d) Bradley: Model 812 Series.
 - (e) General Accessory (GAMCO): Model 150 Series.
- 3. Custodial Room:
 - a. Utility Shelf:
 - 1) Provide mop / broom hangers, shelf, and rod for hanging rags.
 - 2) Size as shown on Contract Drawings.
 - 3) Approved Products. See Section 01 6000:
 - (a) AJW Architectural Products: Model UJ41.
 - (b) American Specialties (ASI): Model 1300 Series.
 - (c) Bobrick: Model B-224 Series.
 - (d) Bradley: Model 9933 Series.
 - (e) General Accessory (GAMCO): Model US Series.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify exact location of accessories for installation.
- C. For electrically-operated accessories, verify that electrical power connections are ready and in the correct locations.
- D. Verify that field measurements are as indicated on drawings.
- E. See Section 06 1000 for installation of blocking, reinforcing plates, and concealed anchors in walls and ceilings.

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3.02 PREPARATION

- A. Deliver inserts and rough-in frames to site for timely installation.
- B. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

- A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.
- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. Comply with ADA Accessibility Guidelines and installation heights as shown on Contract Drawings.
- D. Assemble fixtures and associated fittings and trim in accordance with manufacturer's instructions.
- E. Install using mounting devices proper for base structure.
- F. Install equipment level, plumb, and firmly in place in accordance with manufacturer's rough-in drawings.
- G. Where possible, mount like items in adjoining compartments back-to-back on same partition.
- H. Grab Bars:
 - 1. Install as per Manufacturers written installation instructions.
 - 2. Install grab bars to withstand downward force of not less than 250 lbf (1112 N) per ASTM F446.
- I. Install items in accordance with Manufacturer's submitted, written instructions for screws or lag bolts into solid substrate capable of supporting 200 lbs (90 kg). Install using mounting devices proper for base structure.

3.04 REPAIR

- A. Repair or replace defective work, including damaged equipment and components.
- B. Repair or replace malfunctioning equipment, or equipment with parts that bind or are misaligned.

3.05 CLEANING

- A. Clean unit surfaces and leave in ready-to-use condition.

3.06 ADJUSTING

- A. Test each piece of equipment provided with moving parts to assure proper operation, freedom of movement, and alignment. Install new batteries in battery-powered items.

3.07 CLOSEOUT ACTIVITIES

- A. Turn over keys, tools, maintenance instructions, and maintenance stock to Owner.

3.08 PROTECTION

- A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

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**SECTION 10 4400
FIRE PROTECTION SPECIALTIES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fire extinguishers.
- B. Fire extinguisher cabinets.
- C. Accessories.

1.02 REFERENCE STANDARDS

- A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems 2013a (Reapproved 2017).
- B. NFPA 10 - Standard for Portable Fire Extinguishers 2017, with Errata (2018).

1.03 SUBMITTALS

- A. Product Data: Provide extinguisher operational features.
- B. Shop Drawings: Indicate locations of cabinets, cabinet physical dimensions, and rough-in measurements for recessed cabinets.
- C. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.
- D. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.
- E. Closeout Submittals:
 - 1. Include following in Operations and Maintenance Manual specified in Section 01 7800:
 - a. Warranty Documentation:
 - 1) Include copy of final, executed warranty.
 - b. Record Documentation:
 - 1) Testing and Inspection Reports:
 - (a) Testing Agency Inspecting Reports of Drilled-In Mechanical Anchors / Adhesive Anchors / Screw Anchors.

1.04 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Fire extinguishers shall be inspected and have annual inspection tag attached before Substantial Completion.

1.05 FIELD CONDITIONS

- A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

1.06 WARRANTY

- A. Manufacturer Warranty:
 - 1. Manufacturer's standard, written warranty on fire extinguisher.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Fire Extinguishers:
 - 1. Approved Manufacturers. See Section 01 6000:
 - a. Amerex Corp, Trussville, AL www.amerex-fire.com.
 - b. Ansul Incorporated, Marinette, WI www.ansul.com.
 - c. Buckeye Fire Equipment, Kings Mountain, NC www.buckeyef.com.
 - d. Extinguishers private-labeled by manufacturers approved above are approved, with appropriate documentation.
- B. Cabinets and Brackets:

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1. Acceptable Manufacturers:
 - a. J L Industries, Bloomington, MN www.jlindustries.com.
 - b. Larsen's Manufacturing Co, Minneapolis, MN www.larsensmfg.com.
 - c. Modern Metal Products / Technico, Owatonna, MN www.modern-metal.com.
 - d. National Fire Equipment Ltd, Scarborough, ON www.nationalfire.com.
 - e. Potter-Roemer, Cerritos, CA www.potterroemer.com.
 - f. Samson Products Inc, City of Commerce, CA www.samsonproducts.com.
 - g. Seton Inc, Richmond Hill, ON (905) 764-1122.
 - h. Equal as approved by Architect before bidding. See Section 01 6000.
- C. Acceptable Distributors:
 1. W.W. Grainger, Inc., Lake Forest, IL www.grainger.com.
 2. Equal as approved by Architect before bidding. See Section 01 6000.

2.02 FIRE EXTINGUISHERS

- A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
- B. Design Criteria:
 1. Ten pound dry chemical ABC stored pressurized type equipped with pressure gauge and which does not need recharging except after use.
 2. Instructions for repairs, maintenance, and recharging shall be attached.
 3. Unit shall be tested and approved by UL and have minimum 4A:60-B:C UL rating. UL rating shall appear on extinguisher labels and be attached to and a part of fire extinguisher units.

2.03 FIRE EXTINGUISHER CABINETS

- A. Fire Rating: Listed and labeled in accordance with ASTM E814 requirements for fire resistance rating of walls where being installed.
- B. Design Criteria:
 1. Two-piece, semi-recessed or flush type depending on wall thickness, and have white baked enameled steel tubs with white baked enamel return trim and doors, clear acrylic full glazing, and handles. No locks.
 2. Supply each cabinet with one specified fire extinguisher.
- C. Acceptable Manufacturers:
 1. Basis of Design Product: Ambassador 1017 G10 by J L Industries.
 2. Equal as approved by Architect before bidding from Acceptable Manufacturer's equivalent product. See Section 01 6000.

2.04 ACCESSORIES

- A. Extinguisher Brackets:
 1. Design Criteria:
 - a. Heavy duty with minimum of double strap/bracket.
 2. Approved Bracket. See Section 01 6000:
 - a. Basis of Design Product: No. 846 by Larsen's.
 - b. Equal as approved by Architect before bidding from Approved Manufacturer's equivalent product.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

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- B. Securely Install cabinets and hangers plumb and level with wall surfaces.
- C. Trim for cabinets shall be neat in appearance.
- D. Place extinguishers in cabinets.

3.03 ADJUSTING

- A. Fire extinguishers shall be inspected and have annual inspection tag attached before Substantial Completion.

END OF SECTION

14922 / 2022 New Construction Master	10 4400 - 3	Fire Protection Specialties
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**SECTION 11 3013
RESIDENTIAL APPLIANCES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Kitchen appliances.

1.02 SUBMITTALS

- A. Product Data: Manufacturer's data indicating dimensions, capacity, and operating features of each piece of residential equipment specified.
1. Provide Anti-Tip Bracket installation instructions for free-standing range.
 2. Catalog sheets before ordering items of equipment.
- B. Shop Drawings:
1. Complete utility drawings showing exact locations of electrical outlets and connections.
- C. Copies of Warranties: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- D. Closeout Submittals:
1. Include following in Operations and Maintenance Manual specified in Section 01 7800:
 - a. Record Documentation:
 - 1) Manufacturers documentation:
 - (a) Manufacturer's literature packaged for each appliance.

1.03 DELIVERY, STORAGE, AND HANDLING REQUIREMENTS

- A. Delivery and Acceptance Requirements:
1. General Contractor responsibility:
 - a. Supervise unloading and handling for Owner Furnished Products.
- B. Storage and Handling Requirements:
1. General Contractor responsibility:
 - a. Provide secure location protected from weather and other trades.

PART 2 PRODUCTS

2.01 OWNER-FURNISHED PRODUCTS

- A. Manufactured Units:
1. Refrigerator / Freezer:
 - a. 15.5 cu ft (0.44 cu meters) with top freezer compartment and reversible doors.
 - b. Dimensions: 64 inches (1 600 mm) high by 28 inches (700 mm) wide by 28-7/8 inches (722 mm) deep.
 2. Microwave Oven:
 - a. 800 watts.
 - b. Dimensions: 12 inches (300 mm) high by 24 inches (200 mm) wide by 13 inches (325 mm) deep.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify utility rough-ins are provided and correctly located.

3.02 ADJUSTING

- A. Adjust equipment to provide efficient operation.

3.03 SOURCE QUALITY CONTROL

- A. Field Inspections:
1. Nameplates:

- a. Each piece of equipment shall bear nameplate of suitable size, securely fastened to equipment.
- b. Each piece of electrically operated or heated equipment shall bear nameplate showing complete electrical requirements and capacities.

3.04 CLEANING

- A. Remove packing materials from equipment and properly discard.
- B. Wash and clean equipment.

END OF SECTION

14922 / 2022 New Construction Master	11 3013 - 2	Residential Appliances
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**SECTION 12 2123
ROLL-DOWN BLINDS**

PART 1 GENERAL

1.01 SUMMARY

- A. Includes But Not Limited To:
1. Furnish and install interior roller shade as described in Contract Documents.

1.02 REFERENCES

- A. Definitions:
1. Anti-Microbial: Capable of destroying or inhibiting the growth of disease-causing microorganisms.
 2. Inherently Flame Resistant: Material that meets requirements set forth in NFPA 701. Inherently flame-resistant fabric is woven from fibers that are non-combustible for life of material.
 3. Shade Cloth: Fabric designed to provide specified amount of shade.
- B. Reference Standards:
1. ASTM International:
 - a. ASTM G21 15: 'Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi'.
 2. National Fire Protection Association:
 - a. NFPA 701, 'Standard Methods of Fire Tests for Flame Propagation of Textiles and Films, (2019 or most recent edition adopted by AHJ).

1.03 SUBMITTALS

- A. Action Submittals:
1. Product Data:
 - a. Styles, material descriptions, dimensions of components, profiles, features, and finishes.
 2. Shop Drawings:
 - a. Plans, elevations, sections, product details, installation details, operational clearances, and relationship to adjacent work.
 3. Samples:
 - a. One (1) set of shade cloth options and roller finish samples representing Manufacturer's full range of available colors.
 - b. Mark face of material to indicate interior faces.
- B. Informational Submittals:
1. Manufacturer Instructions:
 - a. Storage and handling requirements and recommendations.
 - b. Preparation instructions and recommendations.
 - c. Mounting details and installation methods.
 2. Qualification Statement:
 - a. Installers:
 - 1) Provide Qualification documentation if requested by Architect or Owner.
- C. Closeout Submittals:
1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Operations and Maintenance Data:
 - 1) Operating and maintenance instructions.
 - b. Warranty Documentation:
 - 1) Final, executed copy of Warranty.
 - c. Record Documentation:
 - 1) Manufacturers documentation:
 - (a) Fabric Supplier's literature or cut sheets on fabric.

- (b) Shade Manufacturer's literature or cut sheets.
- (c) Color and style selection.

1.04 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Material Characteristics:
 - a. Material used shall be inherently flame retardant with a flame spread rating meeting code requirements when tested in accordance with NFPA 701.
 - 2. Anti-Microbial Characteristics:
 - a. 'No Growth' in accordance with ASTM G21 results for fungi ATCC9642, ATCC 9644, and ATCC9645.
- B. Qualifications:
 - 1. Installers: Requirements of Section 01 4301 applies, but not limited to following:
 - a. Installer trained and certified by Manufacturer in installing specified products.
 - b. Minimum three (3) satisfactorily completed installations of comparable quality, scope, similar size, and complexity in past two (2) years before bidding.
 - c. Upon request, submit documentation.

1.05 WARRANTY

- A. Manufacturer Warranty:
 - 1. Manufacturer's standard warranty.

PART 2 PRODUCTS

2.01 MANUFACTURED UNITS

- A. Manufacturer:
 - 1. Acceptable Manufacturers:
 - a. Roller:
 - 1) Rollease Acmeda.
 - b. Fabric:
 - 1) Verosol.
 - c. Equal as approved by Architect before bid. See Section 01 6200.
- B. Materials:
 - 1. Acceptable Products:
 - a. S45 Roller Shade.
 - 2. Fabric:
 - a. Single-fabric shade cloth:
 - 1) Design Criteria:
 - (a) Metalized PVC-coated fiberglass.
 - (1) 85% solar reflectance.
 - (b) Openness: 4 percent.
 - (c) SHGC: 12% - 14%.
 - (d) 11.8 oz per sq yd.
 - (e) Meet Quality Assurance requirements in Part 1 of this specification for material characteristics.
 - b. Color shall be selected by the Architect from the manufacturer's standard colors.
 - 3. Drive Chain:
 - a. Design Criteria:
 - 1) Chain:
 - (a) #10 qualified stainless-steel chain.
 - (b) Chain rated to 90 lb (40.8 kg) minimum breaking strength.
 - (c) Nickel plate chain shall not be accepted because of rusting.
 - (d) Chainhold tensioning device required.
- C. Fabrication:

1. Shade Bands:
 - a. Description:
 - 1) Construction of shade band includes fabric, hem weight, hem-pocket, shade roller tube, and attachment of shade band to roller tube.
 - b. Hem Pockets and Hem Weights:
 - 1) Design Criteria:
 - (a) Fabric hem pocket with RF-welded seams (including welded ends) and concealed hem weights.
 - (b) Hem weights shall be of appropriate size and weight for shade band.
 - (c) Hem weight shall be continuous inside sealed hem pocket.
 - (d) Hem pocket construction and hem weights shall be similar, for shades within one (1) room.
 - c. Shade Band And Shade Roller Attachment:
 - 1) Design Criteria:
 - (a) Shade Roller Tube:
 - (1) Use extruded aluminum shade roller tube of diameter and wall thickness required to support shade fabric without excessive deflection.
 - (2) Roller tubes less than 1.5 inch (38 mm) in diameter for manual shades are not acceptable.
 - (b) Provide for positive mechanical engagement with drive / brake mechanism.
 - (c) Provide for positive attachment of shade band to roller tube.
 - (d) Mounting spline shall not require use of adhesives, adhesive tapes, staples, and/or rivets.
2. Shades:
 - a. Design Criteria:
 - 1) Shadecloth:
 - (a) Fabricate shadecloth to hang flat without buckling or distortion.
 - (b) Fabricate with heat-sealed trimmed edges to hang straight without curling or raveling.
 - (c) Fabricate unguided shadecloth to roll true and straight without shifting sideways more than 1/8 inch (3 mm) in either direction per 8 feet (2.45 m) of shade height due to warp distortion or weave design.
 - (d) Fabricate hem with bottom hem weights.
 - 2) Provide battens in standard shades as required to assure proper tracking and uniform rolling of shadebands.
 - (a) Assure that width-to-height (W:H) ratios shall not exceed Manufacturer's standards or, in absence of such standards, shall be responsible for establishing appropriate standards to assure proper tracking and rolling of the shadecloth within specified standards.
 - (b) Battens shall be roll-formed stainless steel or tempered steel, as required.
 - 3) Provide battens for railroad shades when width-to-height (W:H) ratios meet or exceed Manufacturer's standards.
 - (a) In absence of Manufacturer's standards, be responsible for proper use and placement of battens to assure proper tracking and roll of shadebands.
 - 4) Battens shall be roll formed of stainless steel or tempered steel and concave to match roller tube contour.
 - 5) Batten Pockets:
 - (a) Batten pockets shall be self-colored fabric front and back RF welded into shadecloth.
 - (b) Provide self-color opaque liner front and back to eliminate any see through of batten pocket that shall not exceed 1-1/2 inches (38.1 mm) high.

PART 3 EXECUTION

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3.01 INSTALLATION

- A. Install roller shade in accordance with manufacturer's instructions including recommended support brackets and fasteners on inside of window jamb.
- B. Install roller shade with adequate clearance to permit smooth operation of blinds:
 - 1. Demonstrate blinds to be in smooth, uniform working order.
- C. Install level and plumb. Verify that when blinds are fully extended, the blinds are plumb and parallel to the vertical window mullions.

3.02 ADJUSTING

- A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout operational range.

3.03 CLEANING

- A. Clean roller shade surfaces after installation.

3.04 CLOSE-OUT ACTIVITIES

- A. Training:
 - 1. Installer shall train Owner's maintenance personnel to adjust, operate, and maintain roller shade systems.

END OF SECTION

14922 / 2022 New Construction Master	12 2123 - 4	Roll-down Blinds
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**SECTION 21 1313
WET-PIPE SPRINKLER SYSTEMS**

PART 1 GENERAL

1.01 SUMMARY

- A. Includes But Not Limited To:
 - 1. Furnish and install complete fire sprinkler system as specified in Contract Documents.
 - 2. Furnish and install Firestop Penetration Systems for plumbing systems penetrations as described in Contract Documents.

1.02 RELATED REQUIREMENTS

- A. Section 01 7000: 'Closeout Submittals'.
- B. Section 28 4600: 'Fire Detection and Alarm System' for fire detection and alarm annunciation panels including connection of tamper switches and pressure flow detectors to alarm system and furnishing and installing of low temperature switch.
- C. Section 28 4600 Fire Detection and Alarm
- D. Section 33 1416 Site Water Utility Distribution Piping : .

1.03 REFERENCE STANDARDS

- A. ASME B1.20.1-2013 'Pipe Threads, General Purpose (Inch)'.
- B. ASME B1.20.1M-2006 (R2011), 'Pipe Threads, General Purpose (Metric)'.
- C. ASME B16.1-2015, 'Grey Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250'.
- D. ASME B16.3-2011, 'Malleable Iron Threaded Fittings: Classes 150 and 300'.
- E. ASME B16.4-2011, 'Gray Iron Threaded Fittings, Classes 125 and 250'.
- F. ASME B16.5-2013, 'Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard'.
- G. AWWA C606-15, 'Grooved and Shouldered Joints'.
- H. AWA B2.1/B2.1M-2014, 'Specification for Welding Procedure and Performance Qualification', (5th Edition).
- I. ASTM A53/A53M-12, 'Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless'.
- J. ASTM A135/A135M-09 (2014), 'Standard Specification for Electric-Resistance-Welded Steel Pipe'.
- K. ASTM A234/A234M-17, 'Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service'.
- L. ASTM A395/A395M-99 (2014), 'Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures'.
- M. ASTM A536-84 (2014), 'Standard Specification for Ductile Iron Castings'.
- N. ASTM A795/A795M-13, 'Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use'.
- O. NFPA 13, 'Standard for the Installation of Sprinkler Systems' (2016 Edition or latest AHJ approved edition).
- P. NFPA 24, 'Standard for the Installation of Private Fire Service Mains and their Appurtenances' (2016 Edition).
- Q. NFPA 25, 'Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems' (2014 Edition).
- R. NFPA 101, 'Life Safety Code' (2015 Edition).
- S. UL Directory B, 'Fire Protection Equipment, Directory B' (2011).

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.
- B. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Action Submittals:
 - 1. Shop Drawings:
 - a. Size sprinkler system using NFPA 13 hydraulic calculation design method based on water supply evaluation performed at building site:
 - 1) On submittals, refer to sprinkler heads by sprinkler identification or model number published in appropriate agency listing or approval. Trade names and other abbreviated designations are not acceptable.
 - (a) Grooved joint couplings and fittings shall be shown on drawings and product submittals and be specifically identified with applicable Victaulic styles or series numbers.
 - b. Submittal Procedure:
 - 1) After award of Contract and before purchase of equipment, submit seven sets of shop drawings with specifications and hydraulic calculations, if pipe schedule method is not used, to Fire Sprinkler Consultant and two sets to local jurisdiction having authority for fire prevention for review.
 - 2) After integrating Fire Sprinkler Consultant's and local jurisdiction's comments into drawings, licensed certified fire protection engineer of record submitting fire sprinkler system design construction documents shall stamp, sign, and date each sheet of shop drawings and first page of specifications and calculations.
 - 3) Submit stamped documents to area office and local jurisdiction having authority for fire prevention for final approval.
 - 4) After final approval, submit four copies of approved stamped documents to Fire Sprinkler Consultant.
 - 5) Failure of system to meet requirements of authority having jurisdiction shall be corrected at no additional cost to Owner.
- C. Informational Submittals:
 - 1. Certificates:
 - a. Provide one (1) copy of completed NFPA 13 'Contractor's Material and Test Certification for Aboveground Piping' as specified in 'Field Quality Control' in Part 3 of this specification:
 - 2. Qualification Statement:
 - a. Licensed fire protection engineer or fire protection system designer:
 - 1) Licensed for area of Project.
 - 2) Certified by NICET to level three minimum.
 - 3) Provide Qualification documentation if requested by Fire Sprinkler Consultant or Owner's Representative.
 - b. Installer:
 - 1) Provide Qualification documentation if requested by Fire Sprinkler Consultant or Owner's Representative.
- D. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Operations and Maintenance Data:
 - 1) Maintenance and instructions.
 - (a) List of system components used indicating name and model of each item.

- (b) Manufacturer's maintenance instructions for each component installed in Project.
 - (c) Instructions shall include installation instructions, parts numbers and lists, operation instructions of equipment, and maintenance and lubrication instructions.
 - b. Warranty Documentation:
 - 1) Include copies of required warranties.
 - c. Record Documentation:
 - 1) Include copies of approved shop drawings.
 - 2) Provide master index showing items included.
 - 3) Provide name, address, and phone number of Architect, Fire Sprinkler Consultant, General Contractor, and Fire Protection subcontractor.
 - 4) Provide operating instructions to include:
 - (a) General description of fire protection system.
 - (b) Step by step procedure to follow for shutting down system or putting system into operation.
 - 5) Provide signed copy of NFPA 13 'Contractor's Material and Test Certification for Aboveground Piping'.
- 2. Instruction of Owner (as specified in Part 3 of this specification):
 - a. Provide Owner with latest version of NFPA 25.
- E. Maintenance Materials Submittals:
 - 1. Extra Stock Materials:
 - a. Six (6) spare sprinkler heads selected in representative proportion to quantity used in Project and in accordance with NFPA 13. Do not include Pendent and sidewall dry barrel sprinkler heads.
 - b. Provide spare heads in cabinet with sprinkler head wrench for each type of head used. After approval of cabinet and contents, mount cabinet in convenient location in Riser Room.
- F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies:
 - 1. Unless noted otherwise, system shall conform to:
 - a. NFPA 13 for Light & Ordinary Hazard Occupancies.
 - b. NFPA 24 for Service Mains and Their Appurtenances, Private.
 - c. NFPA 25, for 'Inspection, Testing, and Maintenance.
 - d. NFPA 101, for Life Safety Code.
 - e. Requirements of local water department and local authority having jurisdiction for fire protection.
 - f. Underwriters Laboratories Publication, 'Fire Protection Equipment Directory' (Current Edition at time of Pre-Bid Meeting).
 - g. Comply with backflow prevention requirements and, if required, include device in hydraulic calculations.
 - h. Applicable rules, regulations, laws, and ordinances.
- B. Qualifications:
 - 1. Licensed fire protection engineer or fire protection system designer certified by NICET to level three minimum and engaged in design of fire protection systems. Engineer / designer shall:
 - a. Licensed for area of Project.
 - b. Minimum five (5) years experience in fire protection system installations.
 - c. Minimum five (5) satisfactorily completed installations in past three (3) years of projects similar in size, scope, and complexity required for this project before bidding.

- d. Be responsible for overseeing preparation of shop drawings, hydraulic calculations where applicable, and system installation.
 - e. Make complete inspection of installation.
 - f. Provide corrected record drawings to Owner with letter of acceptance.
 - g. Certify that installation is in accordance with Contract Documents.
 - h. Upon request, submit documentation.
2. Installer:
- a. Licensed for area of Project.
 - b. Minimum five (5) years experience in fire protection system installations.
 - c. Minimum five (5) satisfactorily completed installations in past three (3) years of projects similar in size, scope, and complexity required for this project before bidding.
 - d. Upon request, submit documentation.
- C. Designer Qualifications: Perform design under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
- D. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Acceptance Requirements:
- 1. Do not deliver system components until proper protection can be provided.
 - 2. Accept valves on-site in shipping containers with labeling in place.
 - 3. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- B. Storage and Handling Requirements:
- 1. Protect all components from damage and corrosion.
 - 2. Store items subject to moisture damage in dry, heated spaces.
 - 3. Leave protective coverings and packaging in place until time of installation.

1.08 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Manufacturer Warranty:
- 1. Pipe Boot:
 - a. Provide thirty-five (35) year limited Product Warranty.

PART 2 PRODUCTS

2.01 SYSTEM

- A. Manufacturers:
- 1. Manufacturers Contact List:
 - a. AGF Manufacturing, Inc , Malvern, PA 19355 www.agfmanufacturing.com
 - b. Croker Corp, Elmsford, NY www.croker.com.
 - c. Gruvlock by Anvil International, Portsmouth, NH www.anvilintl.com.
 - d. H O Trerice Company, Oak Park, MI www.hotco.com.
 - e. Kennedy Valve, Elmira, NY www.kennedyvalve.com.
 - f. Milwaukee Valve Co, New Berlin, WI www.milwaukeevalve.com.
 - g. Mueller Company, Decatur, IL www.muellerflo.com.
 - h. Nibco Inc, Elkhart, IN www.nibco.com.
 - i. Noble Company, Grand Haven MI www.noblecompany.com.
 - j. Notifier by Honeywell, Northford, CT www.notifier.com.
 - k. Potter Electric Signal Co, St Louis, MO www.pottersignal.com.
 - l. Potter-Roemer, Cerritos, CA www.potterroemer.com.
 - m. Prinzing, Milwaukee, WI www.prinzing.com.
 - n. Reliable Automatic Sprinkler Co, Mount Vernon, NY www.reliablesprinkler.com.

- o. System Sensor, St Charles, IL www.systemsensor.com.
 - p. TYCO Fire & Building Products, Lansdale, PA www.tyco-fire.com.
 - q. Viega LLC 585 Interlocken Blvd Broomfield, CO 80021
<https://www.viega.us/en/homepage.html>
 - r. Victaulic Company of America, Easton, PA or Victaulic Company of Canada, Rexdale, ON www.victaulic.com.
 - s. Viking Corp, Hastings, MI www.vikingcorp.com.
 - t. Equal as approved by Architect before bidding. See Section 01 6200.
- B. Description:
1. Automatic wet-pipe fire sprinkler system starting at flange in Fire Riser Room and extending throughout heated portions of building.
 2. Dry sprinkler heads connected to wet system over and into Vestibules.
- C. Performance:
1. Design Criteria:
 - a. Area of Application and Corresponding Design Density:
 - 1) Serving Area and Mechanical, Electrical, and Janitorial Areas:
 - (a) Ordinary Hazard Group 1.
 - (b) Design density = 0.15 gpm per sq ft over 1,500 sq ft (140 sq m).
 - 2) Storage Areas:
 - (a) Ordinary Hazard Group 2.
 - (b) Design density = 0.20 gpm per sq ft over 1,500 sq ft (140 sq m).
 - 3) All Other Areas:
 - (a) Light Hazard.
 - (b) Design density = 0.10 gpm per sq ft over 1,500 sq ft (140 sq m).
 - 4) Increase remote areas by 30 percent where ceiling / roof is sloped more than 2 inches (50 mm) per ft.
 - 5) Remote areas may be reduced within parameters indicated in NFPA 13 for use of quick response sprinklers throughout.
 - b. Maximum Coverage per Sprinkler Head:
 - 1) Ordinary Hazard Areas: 130 sq ft (12.1 sq meters).
 - 2) Attic Areas: 120 sq ft (11.2 sq meters).
 - 3) Light Hazard Areas: 225 sq ft (20.1 sq meters).
 - c. Design Area shall be hydraulically most remote area in accordance with NFPA 13.
 - 1) Provide a 10% safety allowance under adjusted water flow supply curve.
 - d. Maximum velocity of water flow within piping: 20 feet (6.1 m) per sec.
- D. Components:
1. General: Use only domestically manufactured cast iron pipe fittings, valves, sprinkler heads, and other components.
 - a. Pipe of foreign manufacture that meets ASTM Standards is acceptable.
 - b. Ductile iron fittings of foreign manufacture are acceptable.
 2. Pipe:
 - a. **Schedule 40** Welded Steel:
 - 1) Exterior, Above Ground: Schedule 40 hot-dip galvanized welded steel meeting requirements of ASTM A53/A53M, ASTM A135/A135M or ASTM A795/A795M.
 - 2) Interior, Above Ground: Schedule 40 black welded steel meeting requirements of ASTM A53/A53M, ASTM A135/A135M or ASTM A795/A795M.
 - 3) Connections:
 - (a) 2 inches (50 mm) And Smaller: Screwed, flanged, or roll grooved coupling system.
 - (b) 2-1/2 inches (64 mm) And Larger: Flanged or roll grooved coupling system.
 3. Fittings:
 - a. Usage:

- 1) 2 inches (50 mm) And Smaller: Welded, screwed, flanged, press, or roll grooved coupling system. For use with schedule 40 carbon steel pipe.
- 2) 2-1/2 inches (64 mm) And Larger: Welded, flanged, or roll grooved coupling system.
- b. Types And Quality:
 - 1) Screwed:
 - (a) Cast iron meeting requirements of ANSI B 16.4 or ductile iron meeting requirements of ANSI B 16.3 and ASTM A536, Grade 65-45-12.
 - (b) Threaded fittings and pipe shall have threads cut to ANSI B1.20.1.
 - (c) Do not extend pipe into fittings to reduce waterway.
 - (d) Ream pipe after cutting to remove burrs and fins.
 - 2) Flanged: Steel meeting requirements of ANSI B16.5.
 - 3) Welded:
 - (a) Carbon steel meeting requirements of ASTM A234/A234M.
 - (b) Weld pipe using methods complying with AWS B2.1, level AR-3. Welding procedures and performance of welders shall comply with ASW B2.1, level AR3.
 - 4) Press
 - (a) Approved Product
 - (1) Viega MergPress for Black Iron 1/2 inch to 2 inch and/or current offerings.
 - 5) Roll Grooved Pipe Coupling System:
 - (a) Ductile iron meeting requirements of ASTM A395/A395M and ASTM A536, and UL / CASA listed and FM approved.
 - (b) Grooved products used on Project shall be from same manufacturer. Grooving tools shall be as recommended by manufacturer of grooved products.
 - (c) Approved Products. See Section 01 6200:

	Grulvok	Tyco	Victaulic	Viking
Rigid Couplings	7401	772	Style 005	V-Z05
Flexible Couplings (*1)	7000	705	Style 75	V-7705
Flange Adaptors (*2)	7012	71	Style 744	V-7041
Grooved Coupling Gaskets (*3)	'E' EPDM	'E' EPDM	'E' EPDM (*4)	E-EPDM

- (1) Use in locations where vibration attenuation and stress relief are required.
- (2) Class 125 or 150.
- (3) Temperature rated 30 to 150 deg F (minus one to 65 deg C). NSF-61 certified.
- (4) Grade 'A'

c. Use of saddle or hole cut type mechanical tees is NOT APPROVED.

4. Valves:

- a. Air Venting Valves
 - 1) Design Criteria:
 - (a) Shall be located near a high point in the system to allow air to be removed from that portion of the system.
 - (b) Locate where most effective. Multiple locations, if needed are allowed.
 - (c) Manual ball valve, minimum 1/2 inch, with hose connection and cap
- b. Butterfly Valves:
 - 1) UL / CASA / FM approved.

- 2) Indicating type.
- 3) Approved Products.
 - (a) Milwaukee:
 - (1) Model BB-SC502 threaded ends with tamper switch one inch (25 mm) to 2 inches (50 mm).
 - (2) Model BBV SC502 Grooved ends with tamper switch 2 inches (50 mm) to 2-1/2 inches (64 mm).
 - (b) Nibco:
 - (1) WD3510-4 Wafer type with valve tamper switch.
 - (2) GD4765-8N Grooved type with valve tamper switch, 2-1/2 inches (64 mm) to 8 inch (200 mm).
 - (c) Tyco (Grinnell):
 - (1) Model TFP1515 wafer.
 - (2) Model TFP1510 Grooved.
 - (d) Victaulic: Series 705-W Grooved end type with internal supervisory switches.
 - (e) Kennedy:
 - (1) Model 01W wafer.
 - (2) Model 01G grooved.
- c. Gate Valves:
 - 1) UL / CASA / FM approved.
 - 2) Outside Screw and Yoke Type (O.S.&Y).
 - 3) Class 150 psi (1.03 MPa).
 - 4) Approved Products.
 - (a) Nibco:
 - (1) T-1040 with Threaded Ends 1/2 inch (12.7 mm) to 2 inches (50 mm).
 - (2) F-637-31 Flanged Ends.
 - (b) Mueller: R-2360-6 Flanged Ends.
 - (c) Victaulic: Series 771 Grooved Ends.
- d. Ball Valves:
 - 1) UL / CASA / FM approved.
 - 2) Valve tamper switch.
 - 3) Approved Products.
 - (a) Milwaukee: BB-SCS02 with threaded ends.
 - (b) Nibco:
 - (1) KT-505 with threaded ends.
 - (2) KG-505 with grooved ends.
 - (c) Victaulic: Series 728 with grooved or threaded ends.
- e. Swing Check Valves:
 - 1) 2 to 4 inch (50 to 100 mm), grooved ends, ductile iron, 300 psi (2.07 MPa).
 - (a) Regrinding type.
 - (b) Renewable disk.
 - (c) Bronze Class 125 with threaded ends.
 - (d) Approved Products.
 - (1) Nibco: KT-403-W.
 - (2) Tyco (Grinnell): CV-1F grooved ends.
 - (3) Victaulic: 712.
 - (4) Viking: G-1 grooved ends.
 - 2) 3 to 12 inch Horizontal Check:
 - (a) Bolted bonnet.
 - (b) Raised face flanges.
 - (c) Bronze mounted with ductile iron body.
 - (d) 125 lb Class A.

- (e) Approved Products.
 - (1) Nibco: F-938-31.
 - (2) Mueller: A-2120-6.
 - (3) Viking: F-1 grooved and flanged.
 - f. Wafer Type Check Valves:
 - 1) 4 to 8 inch (100 to 200 mm) cast iron body.
 - 2) 175 psi minimum working pressure.
 - 3) Rubber Seat.
 - 4) Approved Products.
 - (a) Nibco: KW-900-W.
 - (b) Mueller: A-2102.
 - (c) Kennedy: Fig. 706.
 - g. Grooved-End Check Valves:
 - 1) 2-1/2 to 12 inch (64 to 300 mm) ductile iron body.
 - 2) 250 psi maximum working pressure.
 - 3) Disc And Seat:
 - (a) 2-1/2 And 3 Inch (64 to 76 mm): Aluminum bronze disc with mounted elastomer seal and PPS (polyphenylene sulfide) coated seat.
 - (b) 4 Inch (100 mm) And Larger: Elastomer encapsulated ductile iron disc with welded in nickel seat.
 - 4) Approved Products.
 - (a) Victaulic Series 717.
 - (b) Kennedy: Fig. 426.
 - h. Retard Chamber
 - 1) Design Criteria:
 - (a) Self-draining.
 - i. Approved Products:
 - 1) Reliable: E-1.
 - 2) Victaulic: Series 752.
 - 3) Viking: C-1.
 - j. Inspector's Test Valve:
 - 1) Design Criteria:
 - (a) Bronze body with threaded or grooved ends.
 - (b) Combination sight glass / orifice.
 - k. Approved Products.
 - 1) Reliable Model TD or TD with optional relief valve kit.
 - 2) Tyco (Grinnell): Model F350.
 - 3) Victaulic: Testmaster Alarm Test Module Style 720.
 - 4) Viking 3011ASG [includes pressure relief] or Viking 3011SG.
 - l. Inspector's Test Valve:
 - 1) Combination sight glass/orifice.
 - (a) Bronze top works.
 - (b) Approved Products.
 - (1) Reliable Model TD or TD with optional Relief valve kit.
 - (2) Tyco (Grinnell): Model F350.
 - (3) Victaulic: Testmaster II Alarm Test Module Style 720.
 - (4) Viking 3011ASG [includes pressure relief] or Viking 3011SG.
- 5. Sprinkler Heads:
 - a. Concealed Pendant:
 - 1) Design Criteria:
 - (a) Adjustable cover.
 - (b) UL / CASA listed and approved.
 - (c) Concealed Cover Finish: White.

- 2) Acceptable Products:
 - (a) Wet Pendant, Flat Profile:
 - (1) Reliable: F4FR.
 - (2) Victaulic: Model 3802.
 - (3) Viking: Model VK462.
 - (4) Tyco (Grinnell): Model RF11.
 - (5) Equal as approved by Fire Sprinkler Consultant before bidding. See Section 01 6200.
 - (b) Dry Pendant, Flat Profile:
 - (1) Tyco (Grinnell): DS-C.
 - (2) Victaulic: V3618.
 - (3) Equal as approved by Fire Sprinkler Consultant before bidding. See Section 01 6200.
- b. Dry Pendant
 - 1) Flat Profile:
 - (a) Tyco (Grinnell): DS-C.
 - (b) Victaulic: V3618.
 - (c) Equal as approved by Fire Sprinkler Consultant before bidding. See Section 01 6200.
- c. Dry Flexible
 - 1) Acceptable Product
 - 2) Victaulic VICFLEX VS1
- 6. Horizontal Sidewall Sprinkler:
 - a. Design Criteria:
 - 1) UL / CASA listed and approved.
 - 2) Recess adjustable.
 - 3) Where guards are required, use chrome plated sprinkler guards that are listed, that are approved by Sprinkler Manufacturer for use with head, and that are supplied by Sprinkler Manufacturer.
 - b. Acceptable Products:
 - 1) Wet System:
 - (a) Reliable: F1FR.
 - (b) Tyco (Grinnell): Model TY-FRB.
 - (c) Victaulic: Model V2710.
 - (d) Viking: VK305.
 - (e) Equal as approved by Fire Sprinkler Consultant before bidding. See Section 01 6200.
- 7. Attic Sprinklers, Upright:
 - a. Design Criteria:
 - 1) UL / CASA listed and approved.
 - 2) Approved for use in roof structures, combustible and non-combustible, with ceiling below.
 - b. Approved Products:
 - 1) Tyco: BB, SD, or HIP.
 - 2) Reliable DD56, DS56, GP56
 - 3) Viking V-BB, V-SD, V-HIP, VK697
- 8. Pendant Sprinklers:
 - a. Design Criteria:
 - 1) UL / CASA listed and approved.
 - 2) Where guards or escutcheons are required, use chrome plated sprinkler guards and escutcheons that are listed, that are approved by Sprinkler Manufacturer for use with head, and that are supplied by Sprinkler Manufacturer.
 - b. Acceptable Products:

- 1) Reliable: F1FR.
 - 2) Tyco: TY-FRB.
 - 3) Victaulic: Model V2704.
 - 4) Viking: VK302.
 - 5) Equal as approved by Fire Sprinkler Consultant before bidding. See Section 01 6200.
9. Upright Sprinklers:
- a. Design Criteria:
 - 1) UL / CASA listed and approved.
 - b. Acceptable Products:
 - 1) Reliable: F1FR.
 - 2) Tyco: TY-FRB.
 - 3) Victaulic: Models V2704.
 - 4) Viking: VK300.
 - 5) Equal as approved by Fire Sprinkler Consultant before bidding. See Section 01 6200.
10. Water Flow Alarm:
- a. Electric Flow Alarm:
 - 1) Design Criteria:
 - (a) UL / CASA listed and approved.
 - 2) Approved Products:
 - (a) Bell Type:
 - (b) Potter Electric: Bell, PBA-AC, 6 inch (150 mm) diameter, 120VAC.
 - (c) System Sensor: Bell, SSV-120, 120VAC.
 - (d) Horne Strobe Type:
 - (e) Potter Electric: Horn Strobe, SASH-120, 120VAC.
 - (f) System Sensor: Horn Strobe, P2RHK-120, 120 VAC.
 - 3) Mechanical Flow Alarm: Water Gong.
 - (a) Design Criteria:
 - (b) UL / CASA listed and approved.
 - (c) Approved Products:
 - (d) Reliable: C.
 - (e) System Sensor: SSV 120 or SSM 24 Series.
 - (f) Tyco: WMA-1.
 - (g) Victaulic: Series 760.
 - (h) Viking: F-2.
11. Concealed Spaces Sprinkler heads
- a. Design Criteria:
 - 1) UL / CASA listed and approved.
 - b. Acceptable Products:
 - 1) Viking VK950
 - 2) Other sprinklers listed in other sections can be used if it meets their listing.
12. Pressure Gauges:
- a. Mechanical Water Pressure Gauges:
 - b. Design Criteria:
 - c. UL / CASA listed and approved.
 - d. 3-1/2 inch (89 mm) diameter dial.
 - e. 0 to 300 psi (0 to 2.07 MPa) in 5 psi (34.5 kPa) increments.
 - f. Approved Products:
 - 1) Reliable: UA.
 - 2) HO Trerice: 500.
 - 3) Viking: 01124A.
13. Waterflow Detectors:

- a. Electrical Water Flow Switch:
 - 1) Design Criteria:
 - (a) UL / CASA listed.
 - (b) Switch activates with flow of 10 gpm (37.85 lpm) or more.
 - (c) Two single pole double throw switches.
 - (d) Automatic reset.
 - 2) Approved Products:
 - (a) Potter-Roemer: Model 6201 thru 6208.
 - (b) System Sensor: WFD20 thru WFD80.
 - (c) Viking: VSR-F.
- 14. Tamper Switch
 - a. Weather and Tamper Resistant Switch.
 - 1) Design Criteria:
 - (a) UL / CASA listed.
 - (b) Mount to monitor valve and not interfere with operation.
 - (c) Shall operate in horizontal and vertical position.
 - 2) Approved Products.
 - (a) Control Valves, Butterfly Valves, Post Indicator Valves:
 - (1) Potter Electric: Model PCVS.
 - (2) Notifier: Model PIBV2.
 - (3) System Sensor: Model PIBV2.
 - (b) O.S. & Y Valves:
 - (1) Potter Electric: Model OSYSU.
 - (2) System sensor: Model OSY2.
- 15. Electric Flow Alarm:
 - a. Design Criteria:
 - 1) UL / CASA listed and approved.
 - b. Approved Products:
 - 1) Include following paragraph for Bell.
 - 2) Potter Electric: Bell, PBA-AC, 6 inch (150 mm) diameter, 120VAC.
 - 3) System Sensor: Bell, SSV-120, 120VAC.
 - 4) Include following paragraph for Horn Strobe.
 - (a) Potter Electric: Horn Strobe, SASH-120, 120VAC.
 - (b) System Sensor: Horn Strobe, P2RHK-120, 120 VAC.
- 16. Mechanical Flow Alarm: Water Gong. - **ONLY USE if AHJ requires**
 - a. Design Criteria:
 - 1) UL / CASA listed and approved.
 - b. Approved Products:
 - 1) Reliable: C.
 - 2) System Sensor: SSV 120 or SSM 24 Series.
 - 3) Tyco: WMA-1.
 - 4) Victaulic: Series 760.
 - 5) Viking: F-2.
- 17. Automatic Drain Device:
 - a. Design Criteria:
 - 1) Straight Design, 3/4 inch (19 mm).
 - b. Approved Products:
 - 1) Nibco: Ball-Drip.
 - 2) Potter-Roemer: Figure 5982.
- 18. Fire Department Connection: Do not use bare brass due to theft issues
 - a. Two-way Inlet with single clapper:
 - 1) Quality Standards: See Section 01 6000:
 - (a) Round 'AUTO SPKR' identification plate, red enamel finish aluminum plate:

- (1) Croker: Fig 6766.
 - (2) Potter-Roemer Fig. 5966.
 - 2) Approved Products.
 - (a) Rough chrome plated:
 - (1) Croker: 6405-RC.
 - (2) Potter-Roemer: Fig. 5710-C.
 - (b) Caps and Chains:
 - (1) Croker: 6747 RC.
 - (2) Potter-Roemer: 4625.
- 19. Indicating Post Valve:
 - a. Design Criteria:
 - 1) As specified in Section 33 1416 Site Water Utility Distribution Piping
 - 2) Prefer exposed parts non-brass, for theft protection.
 - 3) Supervisory switch.
 - b. Approved Products:
 - 1) As required by Authority Having Jurisdiction (AHJ).
- 20. Riser Manifold Assembly:
 - a. Design Criteria:
 - 1) Groove x Groove Manifold Body.
 - 2) Water Flow Alarm Switch, VSC with Vane, UL / CASA listed and approved.
 - 3) 300 psi (2.07 MPa) Water Pressure Gauge.
 - 4) Test and Drain Valve with Manifold Drain Trim and 1/2 inch (12.7 mm) diameter test Orifice.
 - 5) Pressure Relief Valve, 175 psi (1.21 MPa), non-adjustable, pipe discharge to test Drain Valve.
 - 6) Approved Products:
 - (a) Tyco: Model 513.
 - (b) Victaulic: Style 747P.
 - (c) Victaulic: Style 747.

2.02 ACCESSORIES

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Anvil International, Portsmouth, NH www.anvilintl.com.
 - b. Eaton, Highland, IL www.cooperbline.com.
 - c. Unistrut Construction, Itasca, IL www.unistrutconstruction.com.
 - 2. Continuous Inserts:
 - a. Quality Standard: See Section 01 6000.
 - 1) Unistrut Standard Duty P-3249 through P-3270.
- B. Hangers, Rods, And Clamps:
 - 1. Design Criteria:
 - a. Galvanized, unless specified otherwise, and UL/CASA listed and labeled for service intended.
 - b. Hanger supports for sprinkler piping to conformance with NFPA 13.
 - 2. Quality Standard:
 - a. Hangers and accessories shall be Anvil numbers specified or equals by B-Line by Eaton.
 - b. Pipe Ring Hangers: Equal to Anvil Fig 69.
 - c. Riser Clamps: Equal to Anvil Fig. 261.
- C. Posted System Diagram:
 - 1. Provide single floor plan diagram showing wet pipe system elements.
 - 2. Include following information on diagram sheet:
 - a. Step by step shut down procedure.

- b. Step by step system drainage procedure.
 - c. Step by step start-up procedure.
 - d. Step by step procedure for protection of system from freezing.
 - e. Step by step procedure to follow in deactivating system for maintenance.
3. Laminate diagram with plastic and mat or frame suitable for hanging near riser.

PART 3 EXECUTION

3.01 INSTALLERS - (SELECT ONE OF THE FOLLOWING THREE OPTIONS)

- A. Approved Installers. See Section 01 4000:
- 1. Mechanical Subcontractor Contact Information:
 - a. [].
 - b. [].
 - c. [].
- B. Approved Installers. See Section 01 4000:
- 1. Approved Mechanical Subcontractors shall be pre-approved in accordance with Supplementary Conditions and included in Construction Documents by Addendum.
- C. Approved Installers. See Section 01 4000:
- 1. Meet Quality Assurance Installer Qualifications as specified in Part 1 of this specification.

3.02 EXAMINATION

- A. Drawings:
- 1. Fire Protection Drawings show general arrangement of piping. Follow as closely as actual building construction and work of other trades will permit. Install system so it drains.
 - 2. Consider Architectural and Structural Drawings part of this work insofar as these drawings furnish information relating to design and construction of building. These drawings take precedence over Fire Protection Drawings.
 - 3. Because of small scale of Drawings, it is not possible to indicate all offsets, fittings, and accessories that may be required. Investigate structural and finish conditions affecting this work and arrange work accordingly, providing such fittings, valves, and accessories required to meet conditions and to enable system to drain.

3.03 INSTALLATION

- A. Interface With Other Work: Provide inserts for attaching hangers in concrete floor construction at time floors are placed.
- B. Connect system to flange provided under Section 33 1416: Site Water Utility Distribution Piping'. After installation of riser, fill annular space between pipe and slab with flexible mastic.
- C. Install sprinkler systems in accordance with requirements of latest edition of NFPA 13 and as specified below:
- 1. Provide maintenance access to equipment.
 - 2. Conceal sprinkler lines installed in occupied areas. In Mezzanine areas, route pipe to side or underneath Mezzanine walkway. Do not impede egress from Attic.
 - 3. Install to enable drainage of system.
 - a. Install main drain from riser according to NFPA 13.
 - 4. Install piping system, except for dry heads, so it will not be exposed to freezing temperatures.
 - 5. Do not use dropped, damaged, or used sprinkler heads.
 - 6. Install tamper switches and flow detectors where located by Fire Sprinkler Consultant.
 - 7. Except for Siamese connection, install automatic ball drip device in lowest point of piping to fire department connection and drain to floor drain or to exterior of building.
 - 8. Brace and support system to meet seismic zone requirements for building site.
 - 9. Replacing anti-freeze fluid in existing systems only:

- a. Placard: Provide tag/placard on antifreeze system main valve that indicates manufacture type and brand of antifreeze solution, concentration by volume of antifreeze solution used, and volume of antifreeze solution used in system.
- D. Install sprinkler systems in accordance with requirements of latest edition of NFPA 13 and as specified below:
 - 1. Provide maintenance access to equipment.
 - 2. Conceal sprinkler lines installed in occupied areas. In Mezzanine areas, route pipe to side or underneath Mezzanine walkway. Do not impede egress from Mezzanine or Roof.
 - 3. Install to enable drainage of system. Drain trapped piping in accordance with NFPA 13.
 - a. Install main drain from riser.
 - 4. Install piping system, except for dry heads, so it will not be exposed to freezing temperatures.
 - 5. Do not use dropped, damaged, or used sprinkler heads.
 - 6. Install tamper switches and flow detectors where located by Fire Sprinkler Consultant.
 - 7. Install automatic ball drip device in lowest point of piping to fire department connection and drain to floor drain or to exterior of building.
 - 8. Brace and support system to meet seismic zone requirements for building site.
- E. Flush system at full design flow rate for minimum five minutes. Route water to outside of building. Protect landscaping and other exterior elements from damage during flow tests.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Field Tests:
 - 1. Pressure Test:
 - a. Hydrostatically test system to 200 psi (1.38 MPa) minimum for two (2) hours as required by 'Contractor's Material And Testing certificate for Aboveground Piping':
 - 1) NFPA 13 (2010), Figure 24.1.
 - 2) NFPA 13 (2013), Figure 25.1.
 - 3) NFPA 13 (2016), Figure 25.1.
 - 2. Water Flow Test:
 - a. Test to determine static and residual pressures and corresponding flow rate at point of connection to utility water main.
 - b. Adjust water flow test data for seasonal fluctuations and future growth as recommended by Water Utility and AHJ.
 - c. At point of connection to utility water main, combine inside and outside hose stream allowances.
 - d. Flush system
 - 3. Check piping in relation to insulation envelope to be certain piping and auxiliary drains are properly enclosed inside building insulation envelope. Report unsatisfactory conditions to Fire Sprinkler Consultant.
 - 4. Check piping in relation to building's thermal envelope to be certain piping is within insulation envelope and protected from freezing temperatures. Report unsatisfactory conditions to Fire Sprinkler Consultant.
 - 5. Tests shall be witnessed by Fire Sprinkler Consultant and representative of local jurisdiction over fire prevention.

3.05 CLOSEOUT ACTIVITIES

- A. See Section 01 7800 - Closeout Submittals, for closeout submittals.
- B. Instruction of Owner:
 - 1. Instruction Sessions:
 - a. Instruct Owner's personnel in operation and maintenance of system utilizing 'Operation And Maintenance Manual' when so doing. Minimum instruction period shall be four (4) hours.

- b. Instruction sessions shall occur after Substantial Completion inspection when system is properly working and before final payment is made.
 - c. Provide Owner with latest version of NFPA 25.
- C. Training:
- 1. Installer required to provide FM Training from latest version of NFPA 25 with checklist and brief explanation of following inspections:
 - a. Weekly Inspection.
 - b. Monthly Inspection.
 - c. Quarterly Inspection.
 - d. Semi-Annual Inspection.
 - e. Annual Inspection.

END OF SECTION

SECTION 22 0501**COMMON PLUMBING REQUIREMENTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
1. Common requirements and procedures for plumbing systems.
 2. Responsibility for proper operation of electrically powered equipment furnished under this Division.
 3. Furnish and install sealants relating to installation of systems installed under this Division.
 4. Furnish and install Firestop Penetration Systems for plumbing systems penetrations as described in Contract Documents.
- B. Products Furnished But Not Installed Under This Section:
1. Sleeves, inserts, supports, and equipment for plumbing systems installed under other Sections.
- C. Related Requirements:
1. Section 03 3111: 'Cast-In-Place Structural Concrete' for exterior concrete pads and bases for mechanical equipment.
 2. Section 05 0523: 'Metal Fastening' for quality and requirements for welding.
 3. Section 07 8400: 'Firestopping' for quality of penetration firestop systems to be used on Project and submittal requirements.
 4. Section 07 9213: 'Elastomeric Joint Sealant' for quality at building exterior.
 5. Sections Under 09 9000 Heading: 'Paints And Coatings' for painting of plumbing items requiring field painting.
 6. Division 26: 'Electrical' for raceway and conduit, unless specified otherwise, and line voltage wiring.
 7. Division 33: 'Utilities' for piped utilities.
 8. Slots and openings through floors, walls, ceilings, and roofs provided under other Divisions in their respective materials.

1.2 SUBMITTALS

- A. Action Submittals:
1. Product Data:
 - a. Manufacturer's catalog data for each manufactured item.
 - 1) Provide section in submittal for each type of item of equipment. Include Manufacturer's catalog data of each manufactured item and enough information to show compliance with Contract Document requirements. Literature shall show capacities and size of equipment used and be marked indicating each specific item with applicable data underlined.
 - 2) Include name, address, and phone number of each supplier.
- B. Informational Submittals:
1. Qualification Statement:
 - a. Plumbing Subcontractor:
 - 1) Provide Qualification documentation if requested by Architect or Owner.
 - b. Installer:
 - 1) Provide Qualification documentation if requested by Architect or Owner.
- C. Closeout Submittals:

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1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Operations and Maintenance Data (Modify and add to requirements of Section 01 7800):
 - 1) At beginning of PLUMBING section of Operations And Maintenance Manual, provide master index showing items included:
 - a) Provide name, address, and phone number of Architect, Architect's Mechanical Engineer, General Contractor, and Plumbing subcontractor.
 - b) Identify maintenance instructions by using same equipment identification used in Contract Drawings. Maintenance instructions shall include:
 - (1) List of plumbing equipment used indicating name, model, serial number, and nameplate data of each item together with number and name associated with each system item.
 - (2) Manufacturer's maintenance instructions for each piece of plumbing equipment installed in Project. Instructions shall include name of vendor, installation instructions, parts numbers and lists, operation instructions of equipment, and maintenance instructions.
 - c) Provide operating instructions to include:
 - (1) General description of fire protection system.
 - (2) Step by step procedure to follow for shutting down system or putting system into operation.
 - b. Warranty Documentation:
 - 1) Include copies of warranties required in individual Sections of Division 22.

1.3 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 1. Perform work in accordance with applicable provisions of Plumbing Codes applicable to Project. Provide materials and labor necessary to comply with rules, regulations, and ordinances.
 2. In case of differences between building codes, laws, local ordinances, utility company regulations, and Contract Documents, the most stringent shall govern. Notify Architect in writing of such differences before performing work affected by such differences.
 3. Identification:
 - a. Motor and equipment name plates as well as applicable UL / ULC and AGA / CGA labels shall be in place when Project is turned over to Owner.
- B. Qualifications. Requirements of Section 01 4301 applies, but not limited to following:
 1. Plumbing Subcontractor:
 - a. Company specializing in performing work of this section.
 - 1) Minimum five (5) years experience in plumbing installations.
 - 2) Minimum five (5) satisfactorily completed installations in past three (3) years of projects similar in size, scope, and complexity required for this project before bidding.
 - b. Upon request, submit documentation.
 2. Installer:
 - a. Licensed for area of Project.
 - b. Designate one (1) individual as project foremen who shall be on site at all times during installation and experienced with installation procedures required for this project.
 - c. Upon request, submit documentation.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
 1. Accept valves on site in shipping containers with labeling in place.
 2. Provide temporary protective coating on cast iron and steel valves.
 3. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

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B. Storage And Handling Requirements:

- 1. In addition to requirements specified in Division 01, stored material must be readily accessible for inspection by Architect until installed.
- 2. Store items subject to moisture damage in dry, heated spaces.

1.5 WARRANTY

A. Manufacturer Warranty:

- 1. Provide certificates of warranty for each piece of equipment made out in favor of Owner.

B. Special Warranty:

- 1. Guarantee plumbing systems to be free from noise in operation that may develop from failure to construct system in accordance with Contract Documents.
- 2. If plumbing sub-contractor with offices located more than 150 miles (240 km) from Project site is used, provide service / warranty work agreement for warranty period with local plumbing sub-contractor approved by Architect. Include copy of service / warranty agreement in warranty section of Operation And Maintenance Manual.

PART 2 - PRODUCTS

2.1 COMPONENTS

A. Components shall bear Manufacturer's name and trade name. Equipment and materials of same general type shall be of same make throughout work to provide uniform appearance, operation, and maintenance.

B. Pipe And Pipe Fittings:

- 1. Weld-O-Let and Screw-O-Let fittings are acceptable.

C. Sleeves:

- 1. General:
 - a. Two sizes larger than bare pipe or insulation on insulated pipe.
- 2. In Concrete And Masonry:
 - a. Sleeves through outside walls, interior shear walls, and footings shall be schedule 80 black steel pipe with welded plate.
- 3. In Framing And Suspended Floor Slabs:
 - a. Standard weight galvanized iron pipe, Schedule 40 PVC, or 14 ga (2 mm) galvanized sheet metal.

D. Valves:

- 1. Valves of same type shall be of same manufacturer.

PART 3 - EXECUTION

3.1 INSTALLERS

A. Acceptable Installers. See Section 01 4301:

- 1. Meet Quality Assurance Installer Qualifications as specified in Part 1 of this specification.

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3.2 EXAMINATION

- A. Drawings:
 1. Plumbing Drawings show general arrangement of piping, equipment, etc. Follow as closely as actual building construction and work of other trades will permit.
 2. Consider Architectural and Structural Drawings part of this work insofar as these drawings furnish information relating to design and construction of building. These drawings take precedence over Plumbing Drawings.
 3. Because of small scale of Drawings, it is not possible to indicate all offsets, fittings, and accessories that may be required. Investigate structural and finish conditions affecting this work and arrange work accordingly, providing such fittings, valves, and accessories required to meet conditions.

- B. Verification Of Conditions:
 1. Examine premises to understand conditions that may affect performance of work of this Division before submitting proposals for this work. Examine adjoining work on which plumbing work is dependent for efficiency and report work that requires correction.
 2. Ensure that items furnished fit space available. Make necessary field measurements to ascertain space requirements including those for connections and furnish and install equipment of size and shape so final installation suits true intent and meaning of Contract Documents. If approval is received by Addendum or Change Order to use other than originally specified items, be responsible for specified capacities and for ensuring that items furnished will fit space available.
 3. Check that slots and openings provided under other Divisions through floors, walls, ceilings, and roofs are properly located. Perform cutting and patching caused by neglecting to coordinate with Divisions providing slots and openings at no additional cost to Owner.
 4. No subsequent allowance for time or money will be considered for any consequence related to failure to examine site conditions.

3.3 PREPARATION

- A. Changes Due To Equipment Selection:
 1. Where equipment specified or otherwise approved requires different arrangement or connections from that shown in Contract Documents, submit drawings showing proposed installations.
 2. If proposed changes are approved, install equipment to operate properly and in harmony with intent of Contract Documents. Make incidental changes in piping, ductwork, supports, installation, wiring, heaters, panelboards, and as otherwise necessary.
 3. Provide additional motors, valves, controllers, fittings, and other equipment required for proper operation of systems resulting from selection of equipment.
 4. Be responsible for proper location of rough-in and connections provided under other Divisions.

3.4 INSTALLATION

- A. Interface With Other Work:
 1. Furnish exact location of electrical connections and complete information on motor controls to installer of electrical system.
 2. Furnish sleeves, inserts, supports, and equipment that are to be installed by others in sufficient time to be incorporated into construction as work proceeds. Locate these items and confirm that they are properly installed.

- B. Cut carefully to minimize necessity for repairs to previously installed or existing work. Do not cut beams, columns, or trusses.

- C. Locating Equipment:
 1. Arrange pipes and equipment to permit ready access to valves, cocks, unions, traps, and to clear openings of doors and access panels.

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2. Adjust locations of pipes, equipment, and fixtures to accommodate work to interferences anticipated and encountered.
 3. Install plumbing work to permit removal of equipment and parts of equipment requiring periodic replacement or maintenance without damage to or interference with other parts of equipment or structure.
 4. Determine exact route and location of each pipe before fabrication.
 - a. Right-Of-Way:
 - 1) Lines that pitch shall have right-of-way over those that do not pitch. For example, plumbing drains shall normally have right-of-way.
 - 2) Lines whose elevations cannot be changed shall have right-of-way over lines whose elevations can be changed.
 - b. Offsets, Transitions, and Changes in Direction:
 - 1) Make offsets, transitions, and changes in direction in pipes as required to maintain proper head room and pitch of sloping lines whether or not indicated on Drawings.
 - 2) Furnish and install all traps, air vents, sanitary vents, and devices as required to effect these offsets, transitions, and changes in direction.
- D. Penetration Firestops:
1. Install Penetration Firestop System appropriate for penetration at plumbing systems penetrations through walls, ceilings, roofs, and top plates of walls.
- E. Sealants:
1. Seal openings through building exterior caused by penetrations of elements of plumbing systems.
 2. Furnish and install acoustical sealant to seal penetrations through acoustically insulated walls and ceilings.
- F. Furnish and install complete system of piping, valved as indicated or as necessary to completely control entire apparatus:
1. Pipe drawings are diagrammatic and indicate general location and connections. Piping may have to be offset, lowered, or raised as required or directed at site. This does not relieve this Division from responsibility for proper installation of plumbing systems.
 2. Arrange piping to not interfere with removal of other equipment, ducts, or devices, or block access to doors, windows, or access openings:
 - a. Arrange so as to facilitate removal of tube bundles.
 - b. Provide accessible flanges or ground joint unions, as applicable for type of piping specified, at connections to equipment and on bypasses.
 - 1) Make connections of dissimilar metals with di-electric unions.
 - 2) Install valves and unions ahead of traps and strainers. Provide unions on both sides of traps.
 - c. Do not use reducing bushings, bull head tees, close nipples, or running couplings. Street elbows are allowed only on potable water pipe 3/4 inch (19 mm) in diameter and smaller.
 - d. Install piping systems so they may be easily drained
 - e. Install piping to insure noiseless circulation.
 - f. Place valves and specialties to permit easy operation and access. Valves shall be regulated, packed, and glands adjusted at completion of work before final acceptance.
 3. Do not install piping in shear walls.
 4. Cut piping accurately to measurements established at site. Remove burr and cutting slag from pipes.
 5. Work piping into place without springing or forcing. Make piping connections to pumps and other equipment without strain at piping connection. Remove bolts in flanged connections or disconnect piping to demonstrate that piping has been so connected, if requested.
 6. Make changes in direction with proper fittings.
 7. Expansion of Thermoplastic Pipe:
 - a. Provide for expansion in every 30 feet (9 meters) of straight run.
 - b. Provide 12 inch (300 mm) offset below roof line in each vent line penetrating roof.
 8. Expansion of PEX Pipe: Allow for expansion and contraction of PEX pipe as recommended by Pipe Manufacturer.

G. Sleeves:

1. Do not place sleeves around soil, waste, vent, or roof drain lines passing through concrete slabs on grade.
2. Provide sleeves around pipes passing through concrete or masonry floors, walls, partitions, or structural members. Seal sleeves with specified sealants. Follow Pipe Manufacturer's recommendations for PEX pipe penetrations through studs and floor slabs.
3. Sleeves through floors shall extend 1/4 inch (6 mm) above floor finish in mechanical equipment rooms above basement floor. In other rooms, sleeves shall be flush with floor.
4. Sleeves through floors and foundation walls shall be watertight.

H. Escutcheons:

1. Provide spring clamp plates where pipes run through walls, floors, or ceilings and are exposed in finished locations of building. Plates shall be chrome plated heavy brass of plain pattern and shall be set tight on pipe and to building surface.

3.5 REPAIR / RESTORATION

A. Each Section of this Division shall bear expense of cutting, patching, repairing, and replacing of work of other Sections required because of its fault, error, tardiness, or because of damage done by it:

1. Patch and repair walls, floors, ceilings, and roofs with materials of same quality and appearance as adjacent surfaces unless otherwise shown.
2. Surface finishes shall exactly match existing finishes of same materials.

3.6 FIELD QUALITY CONTROL

A. Field Tests:

1. Perform tests on plumbing piping systems. Furnish devices required for testing purposes.

B. Non-Conforming Work:

1. Replace material or workmanship proven defective with sound material at no additional cost to Owner.
2. Repeat tests on new material, if requested.

3.7 CLEANING

A. Remove dirt, grease, and other foreign matter from each length of piping before installation:

1. After each section of piping used for movement of water or steam is installed, flush with clean water, except where specified otherwise.
2. Arrange temporary flushing connections for each section of piping and arrange for flushing total piping system.
3. Provide temporary cross connections and water supply for flushing and drainage and remove after completion of work.

B. Clean exposed piping, equipment, and fixtures. Remove stickers from fixtures and adjust flush valves.

3.8 CLOSEOUT ACTIVITIES

A. Instruction of Owner:

1. Instruct building maintenance personnel and Stake Physical Facilities Representative in operation and maintenance of plumbing systems utilizing Operation And Maintenance Manual when so doing.
2. Conduct instruction period after Substantial Completion inspection when systems are properly working and before final payment is made.

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3.9 PROTECTION

- A. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system. Cap or plug open ends of pipes and equipment to keep dirt and other foreign materials out of system. Do not use plugs of rags, wool, cotton waste, or similar materials.

3.10 SEISMIC RESTRAINT

- A. Restrain all equipment and piping in compliance with the Authority Having Jurisdiction and the Building Code.

END OF SECTION

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SECTION 22 0529**HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 1. Common hanger and support requirements and procedures for plumbing systems.
- B. Products Installed But Not Furnished Under This Section:
 1. Paint identification for gas piping used in HVAC equipment.
- C. Related Requirements:
 1. Section 05 0523: 'Metal Fastening' for quality and requirements for welding.
 2. Section 07 8400: 'Firestopping' for quality of Penetration Firestop Systems to be used on Project and submittal requirements.
 3. Sections Under 09 9000 Heading: Painting of mechanical items requiring field painting.
 4. Slots and openings through floors, walls, ceilings, and roofs provided under other Divisions in their respective materials.
 5. Section 23 0529: 'Hangers And Supports For HVAC Piping And Equipment' for gas piping used with HVAC equipment.
 6. Section 23 0553: 'Identification For HVAC Piping And Equipment' for paint identification of gas piping used with HVAC equipment.

1.2 SUBMITTALS

- A. Action Submittals:
 1. Product Data:
 - a. Manufacturer's catalog data for each manufactured item.

PART 2 - PRODUCTS**2.1 ASSEMBLIES**

- A. Manufacturers:
 1. Manufacturer Contact List:
 - a. Anvil International, Portsmouth, NH www.anvilintl.com.
 - b. Cooper B-Line, Highland, IL www.b-line.com.
 - c. Unistrut, Wayne, MI www.tyco-unistrut.com.
- B. Materials:
 1. Hangers, Rods, And Inserts
 - a. Galvanized and UL approved for service intended.
 - b. Support horizontal piping from hangers or on roller assemblies with channel supports, except where trapeze type hangers are explicitly shown on Drawings. Hangers shall have double nuts.
 - 1) Support insulated pipes 2 inches (in diameter and smaller with adjustable swivel ring hanger with insulation protection shield. Gauge and length of shield shall be in accordance with Anvil design data.
 - a) Acceptable Products:
 - (1) Swivel Ring Hanger: Anvil Fig. 69.

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- (2) Insulation Protection Shield: Anvil Fig. 167.
- (3) Equals by Cooper B-Line.
- 2) Support insulated pipes 2-1/2 inches (in diameter and larger with clevis hanger or roller assembly with an insulation protection shield. Gauge and length of shield shall be according to Anvil design data.
 - a) Acceptable Products:
 - (1) Clevis Hanger: Anvil Fig. 260.
 - (2) Roller Assembly: Anvil Fig. 171.
 - (3) Insulation Protection Shield: Anvil Fig. 167.
 - (4) Equals by Cooper B-Line.
- 3) Support uninsulated copper pipe 2 inches (in diameter and smaller from swivel ring hanger, copper plated and otherwise fully suitable for use with copper tubing. Support non-copper uninsulated pipes from swivel ring hanger.
 - a) Acceptable Products:
 - (1) Swivel Ring Hanger For Copper Pipe: Anvil Fig. CT-69.
 - (2) Swivel Ring Hanger For Other Pipe: Anvil Fig. 69.
 - (3) Equals by Cooper B-Line.
- 4) Support uninsulated copper pipe 2-1/2 inches (in diameter and larger from clevis hanger, copper plated hangers and otherwise fully suitable for use with copper tubing. Support non-copper uninsulated pipes from clevis hanger.
 - a) Acceptable Products:
 - (1) Clevis Hanger For Copper Pipe: Anvil Fig. CT-65.
 - (2) Clevis Hanger For Other Pipe: Anvil Fig. 260.
 - (3) Equals by Cooper B-Line.
- c. Support rods for single pipe shall be in accordance with following table:

Rod Diameter	Pipe Size
3/8 inch	2 inches and smaller
1/2 inch	2-1/2 to 3-1/2 inches
- d. Support rods for multiple pipe supported on steel angle trapeze hangers shall be in accordance with following table:

Rods		Number of Pipes per Hanger for Each Pipe Size						
Number	Diameter	2 Inch	2.5 Inch	3 Inch	4 Inch	5 Inch	6 Inch	8 Inch
2	3/8 Inch	Two	0	0	0	0	0	0
2	1/2 Inch	Three	Three	Two	0	0	0	0

 - 1) Size trapeze angles so bending stress is less than 10,000 psi.
- e. Riser Clamps For Vertical Piping:
 - 1) Acceptable Products:
 - a) Anvil Fig. 261.
 - b) Equals by Cooper B-Line.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Piping:
 - 1. Properly support piping and make adequate provisions for expansion, contraction, slope, and anchorage.
 - a. Except for underground pipe, suspend piping from roof trusses or clamp to vertical walls using support channels and clamps. Do not hang pipe from other pipe, equipment, or ductwork. Laying of piping on any building element is not allowed.
 - b. Supports For Horizontal Piping:
 - 1) Support metal piping at 96 inches mm on center maximum for pipe 1-1/4 inches or larger and 72 inches on center maximum for pipe 1-1/8 inch or less.
 - 2) Support thermoplastic pipe at 48 inches on center maximum.
 - 1) Support PEX pipe at 32 inches minimum on center.
 - 2) Provide support at each elbow. Install additional support as required.

- c. Supports for Vertical Piping:
 - 1) Place riser clamps at each floor or ceiling level.
 - 2) Securely support clamps by structural members, which in turn are supported directly from building structure.
 - 3) Provide clamps as necessary to brace pipe to wall.
- d. Insulate hangers for copper pipe from piping by means of at least two layers of Scotch 33 plastic tape.
- 2. Gas piping Identification:
 - a. Apply paint identification for gas piping used with HVAC equipment as specified in Section 23 0553.

END OF SECTION

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SECTION 22 0553

IDENTIFICATION FOR PLUMBING PIPES AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

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

PART 2 - PRODUCTS

2.1 SYSTEM

- A. Materials:
 1. Labels:
 - a. Equipment Identification:
 - 1) Black formica, with white reveal when engraved.
 - 2) Lettering to be 3/16 inch (5 mm) high minimum.
 2. Pipe Markers:
 - a. Rigid vinyl or polyester, 360 degree wrap-around pipe markers.
 - b. Surface printed with UV ink and then thermoformed. Legend to include pipe contents and directional arrows.
 3. Valve Tags:
 - a. Valve Identification: Black Formica, with white reveal when engraved. Lettering to be 3/16 inch high minimum.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Labels:
 1. Identify following items with specified labels fastened to equipment with screws (unless noted otherwise):
 - a. Water Heaters.
 2. Engrave following data from Equipment Schedules on Drawings onto labels:
 - a. Equipment mark.
 - b. Room(s) served.
 - c. Panel and breaker from which unit is powered.
- B. Pipe Markers:
 1. Wrap pipe marker around pipe with 1/2 inch (12.7 mm) minimum overlap. Use adhesive strip at overlap to adhere ends of marker together.
 2. Locate markers as follows:
 - a. Adjacent to each item of equipment.
 - b. At points of entry and exit where piping goes through wall.
 - c. On each riser and junction.
 - d. Every 25 feet (7.6 m) maximum on long, continuous runs.

C. Valve Tags:

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1. Identify domestic water shut-off valves with specified valve tag fastened to valve body with removable chain.
2. Engrave following data onto valve tags:
 - a. Area served.
 - b. Fixtures Served.
 - c. Note tags for exterior wall hydrants with the following: "During freezing temperatures, close this valve and open hydrant".

3.2 ATTACHMENTS

- A. Schedules:
 1. Pipe Identification Schedule:
 - a. Apply symbols as follows:

Pipe Use	Abbreviation	Direction of Flow
Domestic Cold Water	CW	➡
Domestic Hot Water	HW	➡
Domestic Recirc Water	HW Recirc	➡

END OF SECTION

SECTION 22 0719

PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To:
 - 1. Furnish and install insulation on hot and cold water lines, fittings, valves, and accessories as described in Contract Documents.
 - 2. Furnish and install insulation on roof drainage piping and roof drains and drain bodies.
- B. Related Requirements:
 - 1. Section 22 1116: 'Domestic Water Piping'.

PART 2 - PRODUCTS

2.1 COMPONENTS

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Armacell, Mebane, NC www.armacell.com.
 - b. Childers Products Co, Eastlake, OH www.fosterproducts.com.
 - c. IMCOA, Youngsville, NC www.nomacokflex.com.
 - d. Johns-Manville, Denver, CO www.jm.com.
 - e. Knauf, Shelbyville, IN www.knauffiberglass.com.
 - f. Manson, Brossard, PQ, Canada www.isolationmanson.com.
 - g. Nomaco Inc, Yopungsville, NC www.nomacokflex.com.
 - h. Owens-Corning, Toledo, OH www.owenscorning.com.
 - i. Speedline Corp, Solon, OH www.speedlinepvc.com.
- B. Materials:
 - 1. Above Grade Metal Piping:
 - a. Insulation For Piping:
 - 1) Snap-on glass fiber or melamine foam pipe insulation, or heavy density pipe insulation with factory vapor jacket.
 - 2) Insulation Thickness:

Service Water Temperature	Pipe Sizes		
	Up to 1-1/4 In	1-1/2 to 2 In	Over 2 In
45 - 130 Deg F	1/2 In	1/2 In	One In
 - 3) Performance Standards: Fiberglas ASJ by Owens-Corning.
 - 4) Acceptable Manufacturers:
 - a) Childers Products.
 - b) Knauf.
 - c) Manson.
 - d) Owens-Corning.
 - e) Johns-Manville.
 - f) Equal as approved by Architect before bidding. See Section 01 6200.
 - b. Fitting, Valve, And Accessory Covers:
 - 1) PVC.

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- 2) Performance Standard: Zeston by Johns-Manville.
- 3) Acceptable Manufacturers:
 - a) Knauf.
 - b) Speedline.
 - c) Johns-Manville.
 - d) Equal as approved by Architect before bidding. See Section 01 6200.
- 2. Below Grade Metal Piping:
 - a. Insulation:
 - 1) 1/2 inch thick.
 - 2) Acceptable Products:
 - a) SS Tubolit by Armacell.
 - b) ImcoLock by Imcoa.
 - c) Nomalock or Therma-Cel by Nomaco.
 - b. Joint Sealant:
 - 1) Acceptable Products:
 - a) Armacell 520.
 - b) Nomaco K-Flex R-373.
- 3. Pex Piping, Above And Below Grade:
 - a. Insulation:
 - 1) 1/2 inch thick.
 - 2) Acceptable Products:
 - a) SS Tubolit by Armacell.
 - b) ImcoLock by Imcoa.
 - c) Nomalock or Therma-Cel by Nomaco.
 - b. Joint Sealant:
 - 1) Acceptable Products:
 - a) Armacell 520.
 - b) Nomaco K-Flex R-373.
- 4. PP-R Piping, Above And Below Grade:
 - a. Insulation:
 - 1) 1/2 inch thick.
 - 2) Acceptable Products:
 - a) SS Tubolit by Armacell.
 - b) ImcoLock by Imcoa.
 - c) Nomalock or Therma-Cel by Nomaco.
 - b. Joint Sealant:
 - 1) Acceptable Products:
 - a) Armacell 520.
 - b) Nomaco K-Flex R-373.
- 5. Stormwater and Overflow piping:
 - a. Insulation For Piping:
 - 1) Mineral -Fiber, Preformed Pipe Insulation, Type 1: 1 inch thick.
 - 2) Performance Standards: Fiberglas ASJ by Owens-Corning.
 - 3) Acceptable Manufacturers:
 - a) Childers Products.
 - b) Knauf.
 - c) Manson.
 - d) Owens-Corning.
 - e) Johns-Manville.
 - f) Equal as approved by Architect before bidding. See Section 01 6200.
 - b. Fitting Covers:
 - 1) PVC.
 - 2) Performance Standard: Zeston by Johns-Manville.
 - 3) Acceptable Manufacturers:
 - a) Knauf.
 - b) Speedline.
 - c) Johns-Manville.
 - d) Equal as approved by Architect before bidding. See Section 01 6200.

6. Roof Drain and Overflow Drain Bodies:
 - a. Insulation:
 - 1) Mineral -Fiber, Preformed Pipe Insulation, Type 1: 1 inch thick.
 - 2) Drain Manufacturer's Pre-formed bowl insulation: 1 inch thick.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Above Grade Piping:
 1. Apply insulation to clean, dry piping with joints tightly butted.
 2. Install insulation in manner to facilitate removal for repairs. Place sections or blocks so least possible damage to insulation will result from inspection or repairs of piping or equipment.
 3. Piping:
 - a. Adhere 'factory applied vapor barrier jacket lap' smoothly and securely at longitudinal laps with white vapor barrier adhesive.
 - b. Adhere 3 inch wide self-sealing butt joint strips over end joints.
 4. Fittings, Valves, And Accessories:
 - a. Insulate with same type and thickness of insulation as pipe, with ends of insulation tucked snugly into throat of fitting and edges adjacent to pipe insulation tufted and tucked in.
 - 1) Cover insulation with one piece fitting cover secured by stapling or taping ends to adjacent pipe covering.
 - 2) Alternate Method:
 - a) Insulate fittings, valves, and accessories with one inch of insulating cement and vapor seal with two 1/8 inch wet coats of vapor barrier mastic reinforced with glass fabric extending 2 inches onto adjacent insulation.
 5. Pipe Hangers:
 - a. Do not allow pipes to come in contact with hangers.
 - b. Pipe Shield:
 - 1) Provide schedule 40 PVC by 6 inch (150 mm) long at each clevis and/or unistrut type hanger.
 - 2) Provide 16 ga by 6 inch long galvanized shields at each pipe hanger to protect pipe insulation from crushing by clevis hanger.
 - 3) Provide 22 ga by 6 inch long galvanized shield at each pipe hanger to protect insulation from crushing by Unistrut type hanger.
- B. Below Grade Piping:
 1. Slip underground pipe insulation onto pipe and seal butt joints.
 2. Where slip-on technique is not possible, slit insulation, apply to pipe, and seal seams and joints.

END OF SECTION

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SECTION 22 1116**DOMESTIC WATER PIPING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
1. Perform excavating and backfilling required by work of this Section.
 2. Furnish and install potable water piping complete with necessary valves, connections, and accessories inside building and connect with outside utility lines 5 feet (1 50 m) from building perimeter as described in Contract Documents.
- B. Related Requirements:
1. Section 03 3111: 'Cast-In-Place Structural Concrete'.
 - a. Pre-installation conference held jointly with other concrete related sections.
 2. Section 22 0501: 'Common Piping Requirements'.
 3. Section 22 0719: 'Plumbing Piping Insulation'.
 4. Section 31 2316: 'Excavation' for criteria for performance of excavation.
 5. Section 31 2323: 'Fill' for criteria for performance of backfill.
 6. Section 33 1116: 'Site Water Utility Distribution Piping' for domestic water piping from 5 feet (1 50 m) from building perimeter to main.

1.2 REFERENCES

- A. Reference Standards:
1. American National Standards Institute / American Society of Sanitary Engineers:
 - a. ANSI/ASSE 1003-2009, 'Performance Requirements for Water Pressure Reducing Valves for Domestic Water Distribution Systems'.
 - b. ANSI/ASSE 1017-2009, 'Performance Requirements for Temperature Actuated Mixing Valves for Hot Water Distribution Systems'.
 - c. ANSI/ASSE 1070-2015, 'Performance Requirements for Water Temperature Limiting Devices'.
 2. American Water Works Association:
 - a. AWWA C904-16, 'Cross-Linked Polyethylene (PEX) Pressure Pipe, 1/2 inch (12 mm) Through 3 inch (76 mm) for Water Service'.
 3. ASTM International:
 - a. ASTM B88-16, 'Standard Specification for Seamless Copper Water Tube'.
 - b. ASTM E84-18b, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
 - c. ASTM F876-17, 'Standard Specification for Crosslinked Polyethylene (PEX) Tubing'.
 - d. ASTM F877-18a, 'Standard Specification for Crosslinked Polyethylene (PEX) Hot- and Cold-Water Distribution Systems'.
 - e. ASTM F1807-18a, 'Standard Specification for Metal Insert Fittings Utilizing a Copper Crimp Ring for SDR9 Cross-linked Polyethylene (PEX) Tubing and SDR9 Polyethylene of Raised Temperature (PE-RT) Tubing'.
 - f. ASTM F2023-15, "Standard Test Method for Evaluating the Oxidative Resistance of Crosslinked Polyethylene (PEX) Tubing and Systems to Hot Chlorinated Water'.
 - g. ASTM F2389-17a, 'Standard Specification for Pressure-rated Polypropylene (PP) Piping Systems'.
 4. NSF International Standard:
 - a. NSF P171, 'Protocol for Chlorine Resistance of Plastic Piping Materials' (1999).
 5. NSF International Standard / American National Standards Institute:
 - a. NSF/ANSI 14-2018, 'Plastic Piping System Components and Related Materials'.

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- b. NSF/ANSI 61-2017, 'Drinking Water System Components - Health Effects'.
- c. NSF/ANSI 372-2016, 'Drinking Water System Components - Lead Content'.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Qualifications:
 - 1. Manufacturer Qualifications:
 - a. PP-R pipe and PP-RCT pipe:
 - 1) Certified by NSF International.
 - 2. Installers Qualifications:
 - a. PP-R pipe and PP-RCT pipe:
 - 1) Certified by Manufacturer.

1.4 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Manufacturer's Literature:
 - 1) PEX pipe and PEX pipe fittings.
 - 2) PP-R pipe and PP-R pipe fittings.
 - 3) PP-RCT pipe and PP-RCT pipe fittings.
 - 2. Samples:
 - a. PEX pipe fitting.
- B. Informational Submittals:
 - 1. Test And Evaluation Reports:
 - a. Written report of sterilization test. Submit to Architect within seven days.
 - b. Hydrostatic Pressure Test. Submit compliance to Architect within seven days.

1.5 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Meet NSF International Standards for materials or products that come into contact with drinking water, drinking water treatment chemicals, or both for chemical contaminants and impurities that are indirectly imparted to drinking water from products, components, and materials used in drinking water systems.

1.6 WARRANTY

- A. Manufacturer Warranty:
 - 1. Manufacturer's Warranty covering property damage caused by defective product including renovation costs or replacement costs.

PART 2 - PRODUCTS

2.1 SYSTEMS

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Aquatherm, Inc., Lindon, UT www.aquathermpipe.com.
 - b. Acorn Controls, City of Industry, CA www.acorneng.com

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- c. Cash Acme, Cullman, AL www.cashacme.com
- d. Chicago Faucets, Des Plaines, IL, www.chicagofaucets.com.
- e. Cla-Val Company, Costa Mesa, CA or Cla-Val Canada Ltd, Beamsville, ON www.cla-val.com.
- f. Conbraco Industries Inc, Matthews, NC www.conbraco.com or Conbraco (Honeywell Ltd), Scarborough, ON (416) 293-8111.
- g. Hammond Valve, New Berlin, WI www.hammondvalve.com.
- h. Handy & Harmon Products Div, Fairfield, CT www.handyharmon.com or Handy and Harmon of Canada Ltd, Rexdale, ON (800) 463-1465 or (416) 675-1860.
- i. Harris Products Group, Cincinnati, OH www.harrisproductsgroup.com.
- j. Honeywell Inc, Minneapolis, MN www.honeywell.com.
- k. Milwaukee Valve Co, New Berlin, WI www.milwaukeevalve.com.
- l. Nibco Inc, Elkhart, IN www.nibco.com.
- m. Nupi Americas, Early Branch, SC www.nupiamericas.com.
- n. Powers Controls, Buffalo Grove, IL www.powerscontrols.com
- o. Rehau, Leesburg, VA www.rehau-na.com.
- p. Spence Engineering Co, Walden, NY www.spenceengineering.com.
- q. Symmons Industries, Braintree, MA www.symmons.com.
- r. Uponor Inc, Apple Valley, MN www.uponor-usa.com.
- s. Viega ProPress, Wichita, KS www.viega-na.com.
- t. Watts Regulator Co, Andover, MA www.wattsreg.com.
- u. Wilkins (Zurn Wilkins), Paso Robles, CA www.zurn.com.
- v. Zurn PEX, Inc., Commerce, TX www.zurnpex.com.

B. Materials:

1. Design Criteria:

- a. All drinking water products, components, and materials above and below grade used in drinking water systems must meet NSF International Standards for Lead Free.
- b. No CPVC allowed.

2. Pipe:

a. Copper:

1) Above-Grade:

- a) Meet requirements of ASTM B88, Type L.

2) Below-Grade:

- a) Meet requirements of ASTM B88, Type K. 3/4 inch (19 mm) minimum under slabs.
- b) 2 inches (50 mm) And Smaller: Annealed soft drawn.
- c) 2-1/2 inches (64 mm) And Larger: Hard Drawn.

b. Cross-Linked Polyethylene (PEX):

- 1) Certified with NSF International against NSF Standards NSF/ANSI 14, NSF/ANSI 61, NSF/ANSI 372, and NSF P171 Protocol.
- 2) Copper tube size (CTS) outside dimensions and Standard Dimension Ratio (SDR) of 9.
- 3) Pressure rated for 160 psi (1.10 MPa) at 73 deg F (22.8 deg C), 100 psi (0.69 MPa) at 180 deg F (82 deg C), and 80 psi (0.552 MPa) at 200 deg F (93 deg C).
- 4) Marked with Manufacturer's name, design pressure and temperature ratings, and third party certification stamp for NSF-PW.
- 5) Manufactured by Engel or peroxide method (PEX-A) or by silane method (PEX-B).
- 6) Approved Products:
 - a) `Raupex by Rehau.
 - b) Wirsbo Aquapex by Uponor.
 - c) ViegaPEX by Viega.
 - d) Zurn PEX by Zurn PEX.

c. Polypropylene-Random (PP-R):

1) Above-Grade:

- a) Meet requirements of ASTM F2389 and be certified by NSF International per ASTM F2389, NSF/ANSI 14, and NSF/ANSI 61.
- b) Aquatherm: SDR 7.4 Greenpipe faser for domestic hot water and SDR 7.4 or SDR 11 greenpipe for domestic cold water. Aquatherm Lilac SDR 11 purple piping for recycled/reclaimed water systems.

- c) Nupi Americas: Clima pipe for domestic Hot water SDR-7.3 or cold water SDR 11 Nupi Niron Monolayer purple pipe for recycled/ reclaimed water Systems.
 - 2) Below-Grade:
 - a) Meet requirements of ASTM F2389 and be certified by NSF International per ASTM F2389, NSF/ANSI 14, and NSF/ANSI 61.
 - b) Aquatherm: SDR 7.4 Greenpipe faser for domestic hot water and SDR 7.4 or SDR 11 greenpipe for domestic cold water. Aquatherm Lilac SDR 11 purple piping for recycled/reclaimed water systems.
 - c) Nupi Americas: Clima pipe for domestic Hot water SDR-7.3 or cold water SDR 11 Nupi Niron Monolayer purple pipe for recycled/ reclaimed water Systems.
 - 3) Approved Products:
 - a) Aquatherm Greenpipe, Greenpipe faser, and Lilac by Aquatherm.
 - b) Nupi Americas Clima pipe, and Nupi Niron.
- 3. Fittings:
 - a. For Copper Pipe: Wrought copper.
 - b. For PEX Pipe:
 - 1) Approved Products:
 - a) Everloc by Rehau.
 - b) Viega PEX Press Zero Lead Fittings with attached stainless steel sleeves or Viega PEX Press Radel-R Polymer with attached stainless steel sleeves by Viega.
 - c) ProPEX fittings by Uponor including EP flow-through multiport tees.
 - d) Zurn PEX XL, DZR and CR fittings.
 - c. For PP-R Pipe:
 - 1) Approved Products:
 - a) Greenpipe by Aquatherm.
 - b) Niron Clima by Nupi Americas.
- 4. Connections For Copper Pipe:
 - a. Above-Grade:
 - 1) Sweat copper type with 95/5 or 96/4 Tin-Antimony solder, Bridgit solder, or Silvabrite 100 solder. Use only lead-free solder.
 - 2) Viega ProPress System
 - b. Below Grade:
 - 1) Brazed using following type rods:
 - a) Copper to Copper Connections:
 - (1) AWS Classification BCuP-4 Copper Phosphorus (6 percent silver).
 - (2) AWS Classification BCuP-5 Copper Phosphorus (15 percent silver).
 - 2) Copper to Brass or Copper to Steel Connections: AWS Classification BAg-5 Silver (45 percent silver).
 - 3) Do not use rods containing Cadmium.
 - 4) Brazing Flux:
 - a) Approved Products:
 - (1) Stay-Silv white brazing flux by Harris Product Group.
 - (2) High quality silver solder flux by Handy & Harmon.
 - 5) Joints under slabs acceptable only if allowed by local codes.
- 5. Connections For PP-R Pipe:
 - a. Above-Grade:
 - 1) Socket-fusion, fusion-outlet, electrofusion, butt welding, and mechanical transition fittings including threaded adapters, groove adapters, and flanges.
 - b. Below-Grade:
 - 1) All joints shall be fusion-welded or electro-fusion welded PP-RCT except that flanges may be used when connecting to other piping systems. Mechanical fittings shall not be used below grade.
 - 2) Joints under slabs acceptable only if allowed by local codes.
- 6. Ball Valves:
 - a. Use ball valves exclusively unless otherwise specified. Ball valves shall be by single manufacturer from approved list below.

- b. Valves shall be two-piece, full port for 150 psi (1.03 MPa) SWP.
 - 1) Operate with flow in either direction, suitable for throttling and tight shut-off.
 - 2) Body: Bronze, 150 psig (1.03 MPa) wsp at 350 deg F (177 deg C) and 400 psig (2.76 MPa) wog.
 - 3) Seat: Bubble tight at 100 psig (0.69 MPa) under water.
 - c. Quality Standard: Nibco T585 or S585.
 - 1) Equal by Conbraco 'Apollo,' Hammond, Milwaukee, or Watts.
 - d. PP-R piping if used:
 - 1) Approved Products:
 - a) PP-R fusion-weld ball valves by Aquatherm.
 - b) PP-RCT Fusion by Nupi Americas.
7. Combination Pressure Reducing Valve / Strainer:
- a. Integral stainless steel strainer, or separate 'Y' strainer installed upstream of pressure reducing valve.
 - b. Meet ANSI/ASSE 1003 or CSA B356 requirements.
 - c. Built-in thermal expansion bypass check valve.
 - d. Quality Standard: Watts LFU5B:
 - 1) Equal by Cash Acme, Cla-Val Hi Capacity, Conbraco 36C, Honeywell-Braukmann, Spence Hi Capacity, Watts, or Wilkins. See Section 01 6200.
8. Mixing Valve For Lavatories: **MV-1**
- a. Solid brass construction and CSA B125 certified.
 - b. Includes integral check valves and inlet screen. Features advanced paraffin-based actuation technology.
 - c. Flow of 5.7 GPM (21.58 LPM) with maximum 10 psi (69 kPa) pressure drop. Perform to minimum flow of 0.5 GPM (1.89 LPM) in accordance with ASSE 1070.
 - d. Set for 110 deg F (43 deg C) Service.
 - e. Match Construction Drawings for connection sizes.
 - f. Quality Standard: Powers LFLM495. See Section 01 6200.
 - g. Acceptable Manufacturers: Leonard, Powers, Sloan, Symmons and Watts.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Below Grade:
 - 1. Install piping under slabs without joints where possible.
 - 2. Insulate water piping buried within building perimeter.
 - 3. Bury water piping 6 inches 150 mm minimum below bottom of slab and encase in 2 inches 50 mm minimum of sand.
- B. Locate cold water lines a minimum of 6 inches (150 mm) from hot water line.

3.2 FIELD QUALITY CONTROL

- A. Field Tests:
 - 1. Before pipes are covered, test systems at 125 psig (0.86 MPa) hydrostatic pressure for four (4) hours and show no leaks.
 - 2. Disconnect equipment not suitable for 125 psig (0.86 MPa) pressure from piping system during test period.
 - 3. PP-R Piping:
 - a. Test in accordance with Manufacturer's instructions prior to covering.
 - 1) Provide documentation.
 - 4. Submit test reports to Architect within seven days.

3.3 CLEANING

- A. Sterilize potable water system with solution containing 200 parts per million minimum of available chlorine and maintaining pH of 7.5 minimum. Introduce chlorinating materials into system in manner approved by Architect/Engineer. Allow sterilization solution to remain for twenty-four (24) hours and open and close valves and faucets several times during that time.
- B. After sterilization, flush solution from system with clean water until residual chlorine content is less than 0.2 parts per million.
- C. Water system will not be accepted until negative bacteriological test is made on water taken from system. Repeat dosing as necessary until such negative test is accomplished.

END OF SECTION

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SECTION 22 1119**DOMESTIC WATER PIPING SPECIALTIES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 1. Furnish and install miscellaneous potable water piping specialties as described in Contract Documents.
- B. Related Requirements:
 1. Section 22 0501: 'Common Plumbing Requirements'.

1.2 REFERENCES

- A. Reference Standards:
 1. NSF International Standard / American National Standards Institute:
 - a. NSF/ANSI 61-2014a, 'Drinking Water System Components - Health Effects'.
 - b. NSF/ANSI 372-2011, 'Drinking Water System Components - Lead Content'.

1.3 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 1. Meet NSF International Standards for materials or products that come into contact with drinking water, drinking water treatment chemicals, or both for chemical contaminants and impurities that are indirectly imparted to drinking water from products, components, and materials used in drinking water systems.

PART 2 - PRODUCTS**2.1 ACCESSORIES**

- A. Manufacturers:
 1. Manufacturer Contact List:
 - a. Ashcroft, Stratford, CT www.ashcroftinc.com.
 - b. H O Trerice, Oak Park, MI www.hotco.com.
 - c. IPS Corporation, Compton, CA www.ipscorp.com.
 - d. Josam Co, Michigan City, IN www.josam.com.
 - e. Jay R. Smith Manufacturing Co, Montgomery, AL www.jrsmith.com.
 - f. Prier Products, Inc., Grandview, MD www.prier.com.
 - g. Proset Systems Inc., Lawrenceville, GA www.prosetsystems.com.
 - h. Sioux Chief Manufacturing Co, Peculiar, MO www.siouxchief.com.
 - i. Sure Seal, Tacoma, WA www.thesureseal.com.
 - j. Wade (Division of Tyler Pipe), Tyler, TX www.wadedrains.com.
 - k. Watts Drainage, Spindale, NC www.watts.com or Watts Industries, Burlington, ON, Canada www.wattscda.com.
 - l. Weiss Instruments, Inc., Holtsville, NY www.weissinstruments.com.
 - m. Woodford Manufacturing, Colorado Springs, CO www.woodfordmfg.com.
 - n. Zurn Cast Metals, Erie, PA or Zurn Industries Limited, Mississauga, ON www.zurn.com.

B. Materials:

1. Trap Guard Trap Seal:
 - a. Design Criteria:
 - 1) Not required to meet NSF International Standards for Lead Free.
 - b. Approved Products:
 - 1) Trap Guard by Proset:
 - a) Install per Manufacturer's recommendations.
 - 2) Sure Seal by Sure Seal:
 - a) Install per Manufacturer's recommendation.
2. Pressure Reducing Station:
 - a. Design Criteria:
 - 1) Meet NSF International Standards for Lead Free.
 - b. Pressure Gauges:
 - 1) Gauges shall have following features:
 - a) Cast aluminum case.
 - b) Chrome plated ring.
 - c) Impact resistant window.
 - d) Phosphor bronze alloy steel bourdon tube.
 - e) 1/2 percent scale range accuracy.
 - f) 4-1/2 inch (115 mm) diameter dial face.
 - g) Range 0 to 100 psig.
 - 2) Class OneQuality Standard: 500X by H O Terrice.
 - a) Equal by Ashcroft or Weiss. See Section 01 6200.
 - c. Brass Gauge Cocks:
 - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) 1092 by Ashcroft.
 - b) 865 by H O Terrice.
3. Exterior Hydrants: **H-1**
 - a. Design Criteria:
 - 1) Provide with integral anti-siphon device. Key-operated.
 - 2) Non-freeze: Provide 12 inches (305 mm) minimum from inside face of outside wall into heated space.
 - 3) Not required to meet NSF International Standards for Lead Free.
 - b. Approved Products:
 - 1) Josam: 71050.
 - 2) Jay R. Smith: 5609-QT.
 - 3) Prier: C-634.
 - 4) Wade: W-8600.
 - 5) Watts: HY-725.
 - 6) Woodford: 67.
 - 7) Zurn: Z-1310.
4. Water Hammer Arrestors:
 - a. Design Criteria:
 - 1) Meet NSF International Standards for Lead Free.
 - 2) Nesting type, air pre-charged bellows with casing.
 - 3) Bellows constructed of stabilized 18-8 stainless steel.
 - b. Approved Products:
 - 1) Josam: 75003.
 - 2) Jay R. Smith: 5020.
 - 3) Sioux Chief: 650 Series.
 - 4) Wade: 20.
5. Double Check Valve Backflow Preventer:
 - a. Design Criteria:
 - 1) Meet NSF International Standards for Lead Free.
 - 2) 175 psi (1 207 kPa) maximum working water pressure.
 - 3) 180 deg F (82 deg C) maximum working water temperature.
 - 4) Provide ball valves.
 - 5) Provide inlet strainer.

- b. Approved Products:
 - 1) ConBraco: DCLF4A.
 - 2) Watts: LF007.
 - 3) Zurn: 375XLVSR.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Gauges: Connect to pipe with 1/4 inch (6 mm) connections utilizing gauge cocks.

END OF SECTION

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SECTION 22 1313**FACILITY SANITARY SEWERS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
1. Furnish and install soil, waste, and vent piping systems within building and connect with outside utility lines 5 feet (1.5 m) out from building where applicable.
 2. Perform excavation and backfill required by work of this Section.
- B. Related Requirements:
1. Sections Under 07 3000 Heading: Furnishing and installing of roof jacks and pipe flashing at roof.
 2. Section 07 8400: 'Firestopping' for quality of firestopping material.
 3. Section 22 0501: 'Common Plumbing Requirements'.
 4. Section 22 1319: 'Facility Sanitary Sewer Specialties' for furnishing of sewer specialties.
 5. Section 31 2316: 'Excavation' for criteria for performance of excavation.
 6. Section 31 2323: 'Fill' for criteria for performance of backfill and compaction.
 7. Section 33 3313: 'Sanitary Utility Sewerage' for sewage piping from 5 feet (1.5 m) out from building to main.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference: Participate in pre-installation conference specified in Section 03 3111.

1.3 REFERENCES

- A. Reference Standards:
1. ASTM International:
 - a. ASTM D2321-18, 'Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications'.
 - b. ASTM D2564-12(2018), 'Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems'.
 - c. ASTM D3034-16, 'Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings'.
 - d. ASTM F656-15, 'Standard Specification for Primers for Use in Solvent Cement Joints of Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings'.
 - e. ASTM F891-16, 'Standard Specification for Coextruded Poly(Vinyl Chloride) (PVC) Plastic Pipe With a Cellular Core'.
 2. Cast Iron Soil Pipe Institute:
 - a. CISPI Standard 301-09, 'Standard Specification for Hubless Cast Iron Soil Pipe End Fittings for Sanitary & Storm Drain, Waste, and Vent Piping Applications'.
 - b. CISPI 310-11, 'Standard Specification for Couplings for use in connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications'.
 - c. CISPI Handbook, 'Cast Iron Soil Pipe and Fittings Handbook' (2006).
 3. International Code Council:
 - a. ICC IPC-2018, 'International Plumbing Code'.

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PART 2 - PRODUCTS

2.1 SYSTEMS

- A. Performance:
1. Design Criteria:
 - a. Minimum size of waste piping installed under floor slab on grade shall be 2 inches (50 mm).
- B. Materials:
1. Piping And Fittings: PVC Schedule 40 cellular core plastic pipe and pipe fittings meeting requirements of ASTM F891, joined using cement primer meeting requirements of ASTM F656 and pipe cement meeting requirements of ASTM D2564.
 - a. Furnish wall cleanouts with chrome wall cover and screw.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Excavate and backfill as specified in Sections 31 2316 and 31 2323 with following additional requirements:
1. Locate runs as close as possible to those shown on Drawings.
 2. Excavate to required depth and grade to obtain fall required. Grade soil and waste lines within building perimeter 1/4 inch (6 mm) fall in one foot (300 mm) in direction of flow.
 3. Bottom of trenches shall be hard. Tamp as required.
 4. Remove debris from trench before laying of pipe.
 5. Do not cut trenches near footings without consulting Architect.
- B. Thermoplastic Pipe And Fittings:
1. General: Keep piping and joints clean. Install according to Manufacturer's recommendations. Break down contaminated joints, clean seats and gaskets and reinstall.
 2. Above Grade: Locate pipe hangers every 4 feet (1.2 m) on center maximum and at elbows.
 3. Below Grade:
 - a. Install in accordance with Manufacturer's recommendations and ASTM D2321.
 - b. Stabilize unstable trench bottoms.
 - c. Bed pipe true to line and grade with continuous support from firm base.
 - 1) Bedding depth: 4 to 6 inches (100 to 150 mm).
 - 2) Material and compaction to meet ASTM standard noted above.
 - d. Excavate bell holes into bedding material and uniformly support pipe along its entire length. Blocking to grade pipe is forbidden.
 - e. Trench width at top of pipe:
 - 1) Minimum: 18 inches (450 mm) or diameter of pipe plus 12 inches (300 mm), whichever is greater.
 - 2) Maximum: Outside diameter of pipe plus 24 inches (600 mm).
 - f. Do not use backhoe or power equipment to assemble pipe.
 - g. Initial backfill: 12 inches (300 mm) above top of pipe with material specified in referenced ASTM standard.
 - h. Minimum cover over top of pipe not under building slab:
 - 1) 36 inches (900 mm) before wheel loading.
 - 2) 48 inches (1 200 mm) before compaction.
- C. Arrange piping to install cleanouts as follows:
1. At every 135 degrees of accumulative change in direction for horizontal lines.
 2. Every 100 feet (30 meters) of horizontal run.
 3. Extend piping to accessible surface. Do not install piping so cleanouts must be installed in carpeted floors. In such locations, configure piping so wall type cleanouts may be used.

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- D. Each fixture and appliance discharging water into sanitary sewer or building sewer lines shall have seal trap in connection with complete venting system so gasses pass freely to atmosphere with no pressure or siphon condition on water seal.
- E. Vent entire waste system to atmosphere. Join lines together in fewest practicable numbers before projecting above roof. Set back vent lines to avoid piercing roof near edge or valley. Install vent line terminations as follows:
 - 1. 6 inches (150 mm) minimum above roof and 12 inches (300 mm) minimum from any vertical surface.
 - 2. Same size as vent pipe.
 - 3. In areas where minimum design temperature is below 0 deg F (minus 18 deg C) or where frost or snow closure may be possible:
 - a. Vent line terminations: Same size as vent pipe, except no smaller than 3 inches (50 mm) in diameter.
 - b. Terminate vents 10 inches (250 mm) minimum above roof or higher if required by local codes.
- F. Furnish and install firestopping at penetrations of fire-rated structures as required under Sections 07 8400 and 22 0501.
- G. If test Tees are used for testing, plug Tees so wall finish can be installed. Do not leave as exposed cleanouts.

3.2 FIELD QUALITY CONTROL

- A. Field Tests:
 - 1. Conduct tests for leaks and defective work. Notify Architect before testing.
 - 2. Thermoplastic Pipe System:
 - a. Before backfilling and compacting of trenches, Fill waste and vent system with water to roof level or 10 feet (3 meters) minimum, and show no leaks for two hours. Correct leaks and defective work.
 - b. After backfilling and compacting of trenches is complete but before placing floor slab, re-test as specified above. Uncover pipe and correct leaks and defective work. Re-backfill and compact and re-test.

END OF SECTION

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SECTION 22 1319**FACILITY SANITARY SEWER SPECIALTIES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under this Section as described in Contract Documents.
- B. Related Requirements:
 1. Section 09 3013: 'Ceramic Tile' for floor drains in ceramic tile floors.
 2. Section 22 0501: 'Common Plumbing Requirements'.
 3. Section 22 1119: 'Domestic Water Piping Specialties'.
 4. Section 22 1313: 'Facility Sanitary Sewers' for installation of miscellaneous sanitary sewer specialties.

PART 2 - PRODUCTS**2.1 SYSTEMS**

- A. Manufacturers:
 1. Manufacturer Contact List:
 - a. Josam Co, Michigan City, IN www.josam.com.
 - b. Jay R. Smith Manufacturing Co, Montgomery, AL www.jrsmith.com.
 - c. Mifab Manufacturing Inc, Chicago, IL www.mifab.com.
 - d. Proset Systems, Lawrenceville, GA www.prosetsystems.com.
 - e. Sioux Chief Manufacturing Co, Peculiar, MO www.siouxchief.com.
 - f. Sureseal Manufacturing, Tacoma WA www.thesureseal.com.
 - 1) Contact Information:
 - a) All Areas except Idaho and Utah: Rick Ensley (253) 564-0624, rick@thesureseal.com.
 - b) Idaho and Utah Areas: Mark Evans, phone (801) 748-1222, mark@franklinjames.com.
 - g. Wade Div Tyler Pipe, Tyler, TX www.wadedrains.com.
 - h. Watts Drainage, Spindale, NC www.watts.com or Watts Industries, Burlington, ON, Canada www.wattscda.com.
 - i. Zurn Industries, LLC, Erie PA www.zurn.com. or Zurn Industries Ltd, Mississauga, ON (905) 795-8844.
- B. Performance:
 1. Design Criteria:
 - a. All materials NOT required to be low lead compliant.
- C. Components:
 1. Drains And Drain Accessories:
 - a. Floor Drain **FD-1**:
 - 1) Approved types with deep seal trap and chrome plated or nickel bronze strainer.
 - 2) Approved Products:
 - a) Josam: 30000-50-Z-5A.
 - b) J. R. Smith: 2010-A.
 - c) Mifab: F-1100-C.
 - d) Sioux Chief: 832.
 - e) Wade: 1100.

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- f) Watts: FD-200-A.
- g) Zurn: Z-415.

D. Accessories:

1. Drain Accessories:

a. Condensate Receptor:

1) Approved Products:

- a) Trap seal by Sureseal. Provide model number to match floor drain.

b. Floor Drains:

1) Approved Products:

- a) Trap guard by Proset Systems. Provide model number to match floor drain.
- b) Trap seal by Sureseal. Provide model number to match floor drain.

PART 3 - EXECUTION: Not Used

END OF SECTION

SECTION 22 3423

GAS DOMESTIC WATER HEATERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To:
 - 1. Furnish and install gas-fired storage type water heater as described in Contract Documents.
 - 2. Alternate – If natural gas is not available to project site at time of project completion, provide electric storage tank type water heater. See specifications.

- B. Related Requirements:
 - 1. Section 22 0501: 'Common Plumbing Requirements'.
 - 2. Section 22 1116: 'Domestic Water Piping'.
 - 3. Section 23 5135: 'Air Piping'.

1.2 REFERENCES

- A. Reference Standards:
 - 1. NSF International Standard / American National Standards Institute:
 - a. NSF/ANSI 61-2017, 'Drinking Water System Components - Health Effects'.
 - b. NSF/ANSI 372-2016, 'Drinking Water System Components - Lead Content'.

1.3 SUBMITTALS

- A. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Operations and Maintenance Data:
 - 1) Maintenance and operational instructions.
 - b. Warranty Documentation:
 - 1) Final, executed copy of Warranty.
 - c. Record Documentation:
 - 1) Manufacturers documentation:
 - a) Manufacturer's literature or cut sheet.

1.4 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Seismic Anchoring System:
 - a. Required for Seismic Design Category (SDC) C, D, E, or F or where authority having jurisdiction (AHJ) requires seismic protection use for water heater seismic anchoring systems.
 - b. Seismic Design Category (SDC) shall be determined by Project Structural Engineer.
 - 2. Meet NSF International Standards for materials or products that come into contact with drinking water, drinking water treatment chemicals, or both for chemical contaminants and impurities that are indirectly imparted to drinking water from products, components, and materials used in drinking water systems.
 - 3. Anchoring Components:
 - a. Seismic and California certified/approved and labeled:
 - 1) Straps/anchoring systems.

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2) Fasteners.

1.5 WARRANTY

- A. Manufacturer Warranty:
 - 1. Provide Manufacture standard warranty from date of Substantial Completion covering both tank and component parts for leakage or other malfunction caused by defects in materials and/or workmanship.

PART 2 - PRODUCTS

2.1 EQUIPMENT

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. ACT, Inc, Costa Mesa, CA, (800) 200-1956 www.gothotwater.com
 - b. American Water Heater Co, Johnson City, TN www.americanwaterheater.com.
 - c. Enovative Group, Venice, CA www.enovativegroup.com.
 - d. Heat Transfer Products, East Freetown, MA www.htproducts.com.
- B. Materials:
 - 1. Design Criteria:
 - a. All (wetted) drinking water products, components, and materials used in drinking water systems must meet NSF International Standards for Lead Free.
 - 2. Condensing Type Water Heaters:
 - a. Stainless steel or 90/10 cupronickel heat exchanger, pressure tested and rated for 150 psi w.p. complete with thermostat, high limit control, gas pressure regulator, 100 percent safety shutoff and powered combustion air blower. AGA and CGA approved.
 - b. 94 percent thermal efficiency.
 - c. Temperature and pressure relief valve sized to match heat input and set to relieve at 120 psi.
 - d. Vacuum relief valve meeting requirements of CSA ANSI Z21.22.
 - e. 20 -34 - Gallon: **WH-1**
 - 1) Approved Products:
 - a) Polaris Model PGC3 34-130-2NV by American (34 gallons).
 - b) RGH-100 by Heat Transfer Products (20 gallon).

2.2 ACCESSORIES

- A. Recirculation Pump and Circulation Pump Control: **CP-1**
 - 1. Hot water demand control type.
 - 2. Circulation Pump.
 - 3. Controller with temperature sensor.
 - 4. Hard Wired Motion Sensors.
 - 5. Hard Wired Manual Activation Button.
 - 6. Approved Products
 - a. RO150A AutoHot Controller with 150 series pump, temperature sensor, and push button activator by Enovative Group. Include HM-S-17A hard wired motion sensors.
 - b. SS3-200 with pump, temperature sensor, control box, and hard-wired button by ACT, Inc. Include HWMSRB-O hard wired motion sensors.
- B. Anchoring Components:
 - 1. Seismic and California certified/approved and labeled.

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- a. One inch by 18 ga galvanized steel straps.
 - b. No. 10 by 2-1/2 inch screws.
- C. Thermal Expansion Absorbers:
1. Bladder type for use with potable water systems.
 2. Acceptable Products:
 - a. Therm-X-Trol ST-12 by Amtrol Inc, West Warwick, RI www.amtrol.com.
 - b. Equal as approved by Architect before bidding. See Section 01 6200.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install temperature-pressure relief valve on hot water heater and pipe discharge to directly above funnel of floor drain.
- B. Anchor water heaters to wall using two anchoring straps and specified screws.
 1. Anchors shall be installed with one on vertical upper 1/3 and one on lower 1/3 of water heater.
- C. Install hot water circulation pump and pump controls per manufacturer's instructions:
 1. Coordinate with Contract Drawings for location of hard-wired motion sensors.
 2. Connect hard-wired motion sensors to pump control box.
 3. Verify correct operation of hard-wired motion sensors.
 4. Install manual activation button near pump.
- D. Seismic Anchoring Systems shall be installed following Manufacturers requirements to California certifications or for minimum requirement, use Lag Bolts into studs.

3.2 ADJUSTING

- A. Set discharge water temperature at 140 deg F or as indicated on Contract Drawings.

END OF SECTION

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SECTION 22 4126**RESIDENTIAL DISPOSERS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install disposers as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 22 0501: 'Common Plumbing Requirements'.

PART 2 - PRODUCTS**2.1 MANUFACTURED UNITS**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Anaheim Manufacturing, Anaheim, CA www.anaheimmfg.com.
 - b. In-Sink-Erator, Racine, WI www.insinkerator.com.
- B. Disposer:
 - 1. Heavy-duty residential continuous feed type with adaptor assembly for direct sink mounting.
 - 2. Stainless steel grinding chamber.
 - 3. Motor: 3/4 hp, single phase, 115 volts, totally enclosed, fan cooled.
 - 4. Approved Products:
 - a. CNTR 333 by In-Sink-Erator.
 - b. Waste King 9950 by Anaheim Manufacturing.

PART 3 - EXECUTION: Not Used**END OF SECTION**

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SECTION 22 4213

COMMERCIAL WATER CLOSETS AND URINALS

PART 1 - GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To:
 - 1. Furnish and install plumbing fixtures as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 07 9213: 'Elastomeric Joint Sealants' for sealants used between fixtures and other substrates.
 - 2. Section 22 0501: 'Common Plumbing Requirements'.
 - 3. Section 22 1116: 'Domestic Water Piping'.

1.2 REFERENCES

- A. Definitions:
 - 1. High-Efficiency Toilet (HET): Toilets with effective flush volume of 1.28 gallons (4.8 liters) or less.
 - 2. Maximum Performance (MaP): Toilet testing that rates toilet efficiency and flush performance by measuring number of grams of solid waste (soybean paste and toilet paper) that a toilet can flush and remove completely from fixture in single flush represented as a scale or score. 1000 grams is highest score possible (www.map-testing.com).
- B. Reference Standards:
 - 1. American Society of Mechanical Engineers / CSA Group (Canadian Standards Association):
 - a. ASME A112.19.2-2018/CSA B45.1-18, 'Ceramic Plumbing Fixtures'.

1.3 SUBMITTALS

- A. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Operation and Maintenance Data:
 - 1) Sensor Operated operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 ASSEMBLIES

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. American Standard Brands, Piscataway, NJ www.americanstandard-us.com or American Standard Canada, Mississauga, ON www.americanstandard.ca.
 - b. AMTC - Advanced Modern Technologies Corp, Woodland Hills, CA www.amtcorporation.com.
 - c. Bemis Manufacturing Co, Sheboygan Falls, WI www.bemismfg.com.

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- d. Beneke by Sanderson Plumbing Products, Columbus, MS www.sppi.com.
 - e. Church Seat Co, Sheboygan Falls WI www.churchseats.com.
 - f. Delany Flush Valves, Charlottesville, VA www.delanyproduct.com.
 - g. Delta Faucet Co, Indianapolis, IN www.deltafaucet.com or Delta Faucet Canada, London, ON (519) 659-3626.
 - h. Dearborn Brass, Cleveland, OH www.dearbornbrass.com.
 - i. Gerber Plumbing Fixtures LLC, Woodridge, IL www.gerberonline.com.
 - j. Josam Co, Michigan City, IN www.josam.com.
 - k. Jay R. Smith Mfg. Co, Montgomery, AL www.jrsmith.com.
 - l. Kohler Co Plumbing Div, Kohler, WI www.us.kohler.com.
 - m. McGuire Manufacturing Co, Cheshire, CT www.mcguiremfg.com.
 - n. Mifab Manufacturing Inc, Amherst, NY www.mifab.com.
 - o. Moen Incorporated, North Olmsted, OH, or Moen Canada, Oakville, ON www.moen.com.
 - p. Olsonite Corp, Newnan, GA www.olsonite.net or Olsonite Co Ltd, Tilbury, ON (519) 682-1240.
 - q. Sloan Valve Co, Franklin Park, IL www.sloanvalve.com.
 - r. South Fork Manufacturing, Coalville, UT (801) 953-3001 www.dirt-grabber.com.
 - s. Toto U.S.A., Inc., Morrow, GA www.totousa.com
 - t. Wade Div Tyler Pipe, Tyler, TX www.wadedrains.com.
 - u. Watts Drainage, Spindale, NC www.wattsdrainage.com or Watts Industries, Burlington, ON, Canada www.wattscda.com.
 - v. Zurn Industries, LLC, Erie PA www.zurn.com. or Zurn Industries Ltd, Mississauga, ON (905) 795-8844.
- B. Performance:
- 1. Design Criteria:
 - a. Meet or exceed ASME A112.19.2/CSA B45.1 for Vitreous China Plumbing Fixtures.
 - b. Interior exposed pipe, valves, and fixture trim, including trim behind custom casework doors, shall be chrome plated.
 - c. All materials NOT required to be low lead compliant.
 - d. Do not use toilets with effective flush volume of less than 1.28 gallons (4.8 liters).
- C. Materials:
- 1. Water Closets:
 - a. Floor Mounted (Top Spud) with matched Flush Valve:
 - 1) HET (High-Efficiency Toilet) - ADA Accessible Fixture: **WC-1**
 - a) Water usage of 1.28 gallons (4.8 liters) per flush.
 - b) 18 inch (450 mm) maximum rim height.
 - c) Required HET fixtures for all California Projects.
 - d) MaP Score of 1000 grams.
 - e) Approved Products:
 - (1) American Standard: Madera FloWise Elongated 3461.001 with Flushometer American Standard 6065.121.002.
 - (2) Kohler: Highline EL ADA K-4405 with Tripoint DC 1.28 GPF WC Flushometer K-10956-SV.
 - (3) Sloan ST-2009-A with Flushometer Sloan G2 OPTIMA Plus 8111-1.28.
 - 2. Water Closet Accessories:
 - a. Flush Valves:
 - 1) Water Closets must have required flush valves.
 - b. Seats:
 - 1) Provide split front type with check hinge.
 - 2) Approved Products:
 - a) Standard And Handicap Accessible Fixtures:
 - (1) American Standard: 5905.100SS.
 - (2) Bemis: 1655SSC.
 - (3) Beneke: 527 SS.
 - (4) Church: 9500SSC.

- (5) Kohler: K-4731-C.
- (6) Olsonite: 95SSC.
- (7) Toto SC534.
- c. Flush Valve Filter:
 - 1) Required in following flush valves:
 - a) Sloan.
 - b) Zurn.
 - 2) Approved Products:
 - a) SFDG1 'Dirt Grabber' by South Fork Manufacturing.
- 3. Urinals:
 - a. HEU (High-Efficiency Urinal) - Standard & ADA Accessible Fixture: **U-1**
 - 1) Water usage of 0.5 gallons (1.9 liters) per flush.
 - 2) Approved Products:
 - a) American Standard: Washbrook FloWise 6590.001.
 - b) Gerber: Monitor 27-730.
 - c) Kohler: Bardon K-4904-ET.
 - d) Sloan SU-1009.
 - e) Toto: UT447E.
- 4. Urinal Accessories:
 - a. Carrier / Support:
 - 1) Approved Products:
 - a) Josam.
 - b) Jay R. Smith.
 - c) Mifab.
 - d) Wade.
 - e) Zurn.
 - b. Flush Valve:
 - 1) HEU (High-Efficiency Urinal) - Standard:
 - a) Proximity sensor type with battery.
 - b) Low flow, 0.5 gallon (1.9 liters) per flush maximum.
 - c) Approved Products:
 - (1) American Standard 6063.051.
 - (2) Delany: PL 1451-0.5.
 - (3) Delta: 81T231BTA factory set to 0.5 gallons per flush.
 - (4) Moen: 8315.
 - (5) Sloan: 8186-0.5.
 - (6) Zurn: ZER6003AV-EWS with maintenance override button.
 - c. Flush Valve Filter:
 - 1) Required in following flush valves:
 - a) Sloan.
 - b) Zurn.
 - 2) Approved Products:
 - a) SFDG1 'Dirt Grabber' by South Fork Manufacturing.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install each fixture with separate vent line. Do not circuit vent.
- B. Ensure provisions are made for proper support of fixtures and that rough-in piping is accurately set and protected from movement and damage.
 - 1. Seal wall-mounted fixtures around edges to wall with sealant specified in Section 07 9213 'Elastomeric Joint Sealants'.

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2. Attach wall-hung fixtures to carriers.
 3. Support fixture hanger or arm free of finished wall.
- C. Adjust flush valves for proper flow.
- D. Provide each individual fixture supply with accessible chrome-plated stop valve with hand wheel.
- E. Urinals: Install with accessible stop or control valve in each branch supply line.
- F. Mounting:
1. Urinals:
 - a. Standard: 24 inches (610 mm) from floor to bottom lip.
 - b. ADA Accessible: 17 inches (432 mm) maximum from floor to bottom lip.
- G. Water Closets:
1. Floor or Wall Fixtures:
 - a. Make fixture connections with approved brand of cast iron flange, soldered or caulked securely to waste pipe. Make joints between fixtures and flanges tight with approved fixture setting compound or gaskets. Caulk between fixtures with sealant specified in Section 07 9213. Point edges.
- H. Flush Valve Filters:
1. Install in Sloan and Zurn only flush valves.
 2. Install after water lines have been flushed out, but before turning water into flush valve.

3.2 CLEANING

- A. Polish chrome finish at completion of Project.

END OF SECTION

SECTION 22 4216**COMMERCIAL LAVATORIES AND SINKS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install plumbing fixtures as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 07 9213: 'Elastomeric Joint Sealants' for sealants used between fixtures and other substrates.
 - 2. Section 22 0501: 'Common Plumbing Requirements'.
 - 3. Section 22 1116: 'Domestic Water Piping'.

1.2 REFERENCES

- A. Reference Standard:
 - 1. American National Standards Institute / International Code Council:
 - a. ANSI/ICC A117.1-2017, 'Standard for Accessible and Usable Buildings and Facilities'.
 - 2. American Society of Mechanical Engineers / Canadian Standards Association (CSA Group):
 - a. ASME A112.18.1-2018/CSA B125.1-18, 'Plumbing Supply Fittings'.
 - b. ASME A112.19.1-2018/CSA B45.2-18, 'Enamelled Cast Iron and Enamelled Steel Plumbing Fixtures'.
 - c. ASME A112.19.3-2017/CSA B45.4-17, 'Stainless steel plumbing fixtures'.
 - 3. NSF International Standard / American National Standards Institute:
 - a. NSF/ANSI 61-2017, 'Drinking Water System Components - Health Effects'.
 - b. NSF/ANSI 372-2016, 'Drinking Water System Components - Lead Content'.

1.3 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Meet NSF International Standards for materials or products that come into contact with drinking water, drinking water treatment chemicals, or both for chemical contaminants and impurities that are indirectly imparted to drinking water from products, components, and materials used in drinking water systems.

1.4 SUBMITTALS

- A. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Warranty Documentation:
 - 1) Final, executed copy of Warranty.

1.5 WARRANTY

- A. Manufacturer Warranty:
 - 1. Manufacturer's standard Warranty against material or Manufacturing defects.

PART 2 - PRODUCTS

2.1 ASSEMBLIES

A. Manufacturers:

1. Manufacturer Contact List:
 - a. American Standard Brands, Piscataway, NJ www.americanstandard-us.com or American Standard Canada, Mississauga, ON www.americanstandard.ca.
 - b. Brocar Products Inc, Cincinnati, OH www.brocar.com.
 - c. CECO, Huntington Park, CA www.cecosinks.com.
 - d. Chicago Faucet Co, Des Plaines, IL www.chicagofaucets.com.
 - e. Dearborn Brass, Tyler, TX www.dearbornbrass.com.
 - f. Delta Faucet Co, Indianapolis, IN www.deltafaucet.com or Delta Faucet Canada, London, ON (519) 659-3626.
 - g. Engineered Brass Co. (EBC) (Just Manufacturing Co.), Franklin Park, IL www.justmfg.com.
 - h. Elkay Manufacturing Co, Oak Brook, IL www.elkay.com.
 - i. Gerber Plumbing Fixtures LLC, Woodridge, IL www.gerberonline.com.
 - j. Josam Co, Michigan City, IN www.josam.com.
 - k. Jay R. Smith Manufacturing Co, Montgomery, AL www.jrsmith.com.
 - l. Just Manufacturing Co, Franklin Park, IL www.justsinks.com.
 - m. Keeney Manufacturing Co, Newington, CT www.keeneymfg.com.
 - n. Kindred USA, Midland, ON www.kindred-sinkware.com.
 - o. Kohler Co Plumbing Div, Kohler, WI www.us.kohler.com.
 - p. McGuire Manufacturing Co, Cheshire, CT www.mcguiremfg.com.
 - q. Mifab Manufacturing Inc, Amherst, NY www.mifab.com.
 - r. Moen Incorporated, North Olmsted, OH, or Moen Canada, Oakville, ON www.moen.com.
 - s. Omni Flow Controls, Harbor City, CA www.chronomite.com or www.omniflowcontrols.com.
 - t. Plumberex Specialty Products, Palm Springs, CA www.plumberex.com.
 - u. Sloan Valve Co, Franklin Park, IL www.sloanvalve.com.
 - v. Speakman Company, New Castle, DE www.speakmancompany.com.
 - w. Symmons, Braintree, MA www.symmons.com.
 - x. T & S Brass & Bronze Works Inc, Travelers Rest, SC www.tsbrass.com.
 - y. TrueBro Inc, Collierville, TN www.truebro.com.
 - z. Wade Div Tyler Pipe, Tyler, TX www.wadedrains.com.
 - aa. Watts Drainage, Spindale, NC www.wattsdrainage.com or Watts Industries, Burlington, ON, Canada www.wattscda.com.
 - bb. Zurn Commercial Brass, Sanford, NC www.zurn.com or Zurn Industries Ltd, Mississauga, ON (905) 795-8844.
 - cc. Zurn Cast Metal, Erie, PA www.zurn.com.

B. Performance:

1. Design Criteria:
 - a. Interior exposed pipe, valves, and fixture trim, including trim behind custom casework doors, shall be chrome plated.
 - b. Faucets and other fixture fittings shall conform to requirements of ASME A112.18.1/CSA B125.1.
 - c. Lavatories shall conform to requirements of:
 - 1) Enamelled cast iron and enamelled steel fixtures.
 - a) ASME A112.19.1/CSA B45.2.
 - b) CSA B45.2/ASME A112.19.1.
 - 2) Stainless steel plumbing fixtures:
 - a) ASME A112.19.3/CSA B45.4.
 - b) CSA B45.4/ASME A112.19.3.

C. Components:

1. Lavatories And Fittings:
 - a. ADA Accessible Self Supporting Lavatories: L-1

- 1) Size: 20 by 18 inches (500 by 450 mm) nominal.
- 2) Approved Products:
 - a) American Standard: Lucern 0355.012.
 - b) Kohler: Greenwich K-2032.
- 3) Carrier / Support:
 - a) Approved Products:
 - (1) Josam: 17100.
 - (2) Jay R. Smith: 0700.
 - (3) Mifab: MC-41.
 - (4) Wade: 520-M36.
- b. Lavatory Fittings:
 - 1) Faucet and Drain:
 - a) Design Criteria:
 - (1) Meet NSF International Standards for Lead Free.
 - b) Accessories:
 - (1) Cast brass spout.
 - (2) 0.5 GPM maximum flow.
 - (2) Hard-wired automatic faucet (battery back-up if available).
 - (3) Cast brass spout with chrome finish.
 - (4) 4 inches (100 mm) cover plate.
 - (5) Single supply configuration.
 - (6) Solenoid valve.
 - (7) Remote transformer (multi-use capability).
 - (8) Hermetically sealed electronics.
 - (9) In-line filter.
 - c) Approved Products:
 - (1) Chicago: 116.706.AB.1 with 327 strainer.
 - (2) Delta: 591T0250 with 33T260 grid strainer.
 - (3) Moen: CA8301 with McGuire 155A grid strainer.
 - (4) Symmons: S6080-ACM-12V-G with grid strainer.
 - (5) Zurn: Z6913-XL-CWB with grid strainer.
 - 2) Supply pipes with stops:
 - a) Design Criteria:
 - (1) Meet NSF International Standards for Lead Free.
 - b) Accessories:
 - (1) Provide chrome plated quarter-turn brass ball valve, 12 inches (305 mm) long braided stainless steel riser, and chrome-plated steel flange.
 - c) Approved Products:
 - (1) McGuire: BV2165CC.
 - (2) Zurn: Z8804 LRQ-PC.
 - 3) Trap:
 - a) Description:
 - (1) 17 gauge (1.4 mm) tube 'P' trap, chrome plated.
 - b) Design Criteria:
 - (1) Not required to meet NSF International Standards for Lead Free.
 - c) Approved Products:
 - (1) Dearborn.
 - (2) Engineered Brass Company (EBC).
 - (3) Keeney Manufacturing.
 - (4) McGuire.
 - (5) Zurn.
 - 4) Safety Covers for Handicap Accessible Lavatories:
 - a) Description:
 - (1) Provide protection on water supply pipes and on trap.
 - b) Design Criteria:
 - (1) Not required to meet NSF International Standards for Lead Free.
 - c) Approved Products:
 - (1) Trapwrap by Brocar Products Inc.

- (2) Pro Wrap by McGuire Products.
 - (3) Lav Guard 2 by TrueBro.
 - (4) Pro Extreme by Plumberex.
2. Stainless Steel Sinks And Fittings:
- a. Design Criteria:
 - 1) Not required to meet NSF International Standards for Lead Free.
 - 2) Undermount, 18 gauge (1.2 mm) stainless steel, satin finish.
 - b. Double Compartment Sinks: **S-1**
 - 1) Description:
 - a) Size: 33 by 19.5 inches (559 mm by 495 mm) nominal.
 - 2) Design Criteria:
 - a) Not required to meet NSF International Standards for Lead Free.
 - 3) Approved Products:
 - a) Elkay: ELUH-3116DBG.
 - b) Just: UD-1832-A-J.
 - c) Kindred: QDUA 1831-8N.
 - c. Stainless Steel Sink Fittings:
 - 1) Faucets for Double Compartment Sinks:
 - a) Design Criteria:
 - (1) Meet NSF International Standards for Lead Free.
 - b) Approved Products:
 - (1) American Standard: Colony PRO Two-Handle Kitchen Faucet with Swivel spout 7270.
 - (2) Chicago: 201-A1000ABCP.
 - (3) Delta: 27C2243-S5.
 - (4) Gerber: CO-44-002.
 - (5) Kohler: K-7761-K with handles K-16012-5.
 - (6) Zurn Commercial Brass: Z-831J3.
 - 2) Waste For Standard Stainless Steel Sinks:
 - a) Design Criteria:
 - (1) Not required to meet NSF International Standards for Lead Free.
 - b) Approved Products:
 - (1) Elkay: LK-99.
 - (2) Kindred: 1130.
 - (3) Kohler: K8801.
 - (4) McGuire: 151.
 - (5) Zurn Z-8740-PC.
 - 3) Trap:
 - a) Description:
 - (1) 17 gauge (1.4 mm) tube 'P' trap, chrome plated.
 - b) Design Criteria:
 - (1) Not required to meet NSF International Standards for Lead Free.
 - c) Approved Products:
 - (1) Dearborn.
 - (2) Engineered Brass Company (EBC).
 - (3) Keeney Manufacturing.
 - (4) McGuire: MCT150075NCZN.
 - (5) Zurn.
3. Miscellaneous Sinks And Fittings:
- a. Service Sink: **SS-1**
 - 1) Description:
 - a) Floor Type, enameled cast iron, 28 inches (711 mm) square with vinyl coated rim guard or 24 inches (610 mm) square with Stainless Steel rim guard.
 - 2) Design Criteria:
 - a) Not required to meet NSF International Standards for Lead Free.
 - 3) Approved Products:
 - a) American Standard: Florwell Enameled Cast Iron 7741.000 with vinyl rim guard 7745.811.

- b) CECO: 871.
- c) Kohler: Whitby K-6710.
- d) Zurn: 5850.
- 4) Service Sink Fittings:
 - a) Design Criteria:
 - (1) Not required to meet NSF International Standards for Lead Free.
 - b) Supply:
 - (1) Mounting height of 42 inches (1 050 mm).
 - (2) Provide 48 inch (1 200 mm) hose and clamp unless spout is threaded.
 - (3) Approved Products:
 - (a) American Standard: Exposed Yoke Wall-Mount Utility Faucet with top brace 8344.112 with threaded spout.
 - (b) Chicago: 897 CP.
 - (c) Delta: 28T9 with 28T911 hose and bracket.
 - (d) Gerber: C4-44-654.
 - (d) Kohler: K-8928.
 - (e) Moen: 8124.
 - (f) Speakman: SC-5812.
 - (g) T&S: B-0665-BSTP.
 - (h) Zurn: Z-843M1.
 - c) Drain and Strainer:
 - (1) Approved Products:
 - (a) American Standard: Grid strainer 7721.038.
 - (b) Kohler: K-9146, 3 inch IPS.
 - d) Trap: Cast iron, PVC, or ABS to match piping.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install each fixture with separate vent line. Do not circuit vent.
- B. Ensure provisions are made for proper support of fixtures and that rough-in piping is accurately set and protected from movement and damage.
- C. Seal wall-mounted fixtures around edges to wall with sealant specified in Section 07 9213.
- D. Coordinate power requirements of lavatory electronic sensor faucets, including remote transformer, with Div. 26 during rough-in.
- E. Unless otherwise noted, provide each individual fixture supply with chrome-plated stop valve with hand wheel.
- F. Install fixtures with accessible stop or control valve in each hot and cold water branch supply line.
- G. Self-Supporting Lavatories: Install using carriers. Support carrier free of finished wall.
- H. Install Safety Covers on all under sink / lavatories with exposed water supply pipes and traps.
- I. Install ADA Accessible Lavatories as per ADA height mounting requirements.

3.2 CLEANING

- A. Polish chrome finish at completion of Project.

END OF SECTION

SECTION 22 4700

DRINKING FOUNTAINS AND WATER COOLERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To:
 - 1. Furnish and install drinking water cooling system units as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 22 0501: 'Common Plumbing Requirements'.
 - 2. Section 22 1116: 'Domestic Water Piping'.

1.2 REFERENCES

- A. Reference Standard:
 - 1. American National Standards Institute / International Code Council:
 - a. ANSI/ICC A117.1-2017, 'Standard for Accessible and Usable Buildings and Facilities'.
 - 2. Canadian Standards Association (CA):
 - a. CSA C22.2 No. 120-13 (R2018), 'Refrigeration Equipment'.
 - 3. NSF International Standard / American National Standards Institute:
 - a. Bottle Filling Station:
 - 1) NSF/ANSI 42-2017, 'Drinking Water Treatments Units – Aesthetic Effects'.
 - 2) NSF/ANSI 53-2017, 'Drinking Water Treatments Units – Health Effects'.
 - b. Water Cooler:
 - 1) NSF/ANSI 61-2017, 'Drinking Water System Components - Health Effects'.
 - 2) NSF/ANSI 372-2016, 'Drinking Water System Components - Lead Content'.
 - 4. Underwriters Laboratories (UL):
 - a. UL 399: 'Drinking-Water Coolers'.

1.3 SUBMITTALS

- A. Closeout Submittals:
 - 1. Warranty Documentation:
 - a. Provide Manufacturer Warranty.

1.4 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Handicap Accessible Products to meet ANSI/ICC A117 Accessible requirements.
 - 2. Meet NSF International Standards for materials or products that come into contact with drinking water, drinking water treatment chemicals, or both for chemical contaminants and impurities that are indirectly imparted to drinking water from products, components, and materials used in drinking water systems.

1.5 WARRANTY

- A. Manufacturer standard limited warranty on refrigeration system of unit.

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PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

- A. Manufacturers:
1. Manufacturer Contact List:
 - a. Elkay Manufacturing Co, Oak Brook, IL www.elkay.com.
 - b. Halsey Taylor, Oak Brook, IL www.halseytaylor.com.
 - c. Murdock Manufacturing (Acorn), City of Industry, CA www.murdockmfg.com.
 - d. Oasis, Tri Palm International, Columbus OH www.oasiswatercoolers.com.
- B. Design Criteria:
1. All drinking water products, components, and materials above and below grade used in drinking water systems must meet NSF International Standards for Lead Free.
 2. Interior exposed pipe, valves, and fixture trim shall be chrome plated.
- C. Materials:
1. ADA Accessible Bi-Level Cooler and Bottle Filling Station **DF-1**:
 - a. Design Criteria:
 - 1) Vandal proof operating bar on front and both sides.
 - 2) Vandal proof operating bar on front and both sides.
 - 3) 8 GPH (30.3 LPH) water at 50 deg F (10 deg C) water cooled from 80°F (26.7°C) inlet water and 90°F (32.2°C) ambient per ASHRAE testing.
 - 4) 115-120 V, 60 Hz, single phase.
 - 5) Flexible bubbler.
 - 6) Build-In strainer.
 - 7) Meets state and federal requirements for both children or adults as defined by the Americans with Disabilities Act.
 - b. Approved Products:
 - 1) Elkay: Model LZSTL8WSLK.
 - 2) Halsey Taylor: Model HTHB-HACG8BLPV-WF.
 - 3) Murdock Manufacturing: Model A172.8UBL-BF12.
 - 4) Oasis: Model PGEBFSL

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install fixtures with accessible stop or control valve.
- B. Mounting:
1. General:
 - a. Coordinate location of fountain with location and height of electrical outlet to ensure concealment of outlet by fountain.
 - b. Anchor bottom of fountain to wall.
 - c. Install 3/8 inch (9.5 mm) IPS union connection and Chicago No. 441 stop to building supply line.
 - d. Install 1-1/4 inch (32 mm) IPS slip cast brass 'P' trap. Install trap so it is concealed.
 2. Accessible Drinking Fountains:
 - a. Spout outlets of wheelchair accessible drinking fountains shall be 36 inches (915 mm) maximum above floor.
 - b. Spout outlets of drinking fountains for standing persons shall be 38 inches (965 mm) maximum above floor.

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3.2 CLEANING

- A. Polish chrome finish at completion of Project.

END OF SECTION

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SECTION 23 0501

COMMON HVAC REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To:
 - 1. Common requirements and procedures for HVAC systems.
 - 2. Responsibility for proper operation of electrically powered equipment furnished under this Division.
 - 3. Interface with Testing And Balancing Agency.
 - 4. Furnish and install sealants relating to installation of systems installed under this Division.
 - 5. Furnish and install Firestop Penetration Systems for HVAC system penetrations as described in Contract Documents.
 - 6. Furnish and install sound, vibration, and seismic control elements.

- B. Products Furnished But Not Installed Under This Section:
 - 1. Sleeves, inserts, and equipment for mechanical systems installed under other Sections.

- C. Related Requirements:
 - 1. Section 03 3111: 'Cast-In-Place Structural Concrete' for exterior concrete pads and bases for mechanical equipment.
 - 2. Section 05 0523: 'Metal Fastening' for quality and requirements for welding.
 - 3. Section 07 8400: 'Firestopping' for quality of Penetration Firestop Systems to be used on Project and submittal requirements.
 - 4. Section 07 9213: 'Elastometric Joint Sealant' for quality of sealants used at building exterior.
 - 5. Section 07 9219: 'Acoustical Joint Sealants' for quality of acoustical sealants.
 - 6. Sections Under 09 9000 Heading: Painting of mechanical items requiring field painting.
 - 7. Division 26: Raceway and conduit, unless specified otherwise, line voltage wiring, outlets, and disconnect switches.
 - 8. Slots and openings through floors, walls, ceilings, and roofs provided under other Divisions in their respective materials.
 - 9. Sections Under 33 5000 Heading: Fuel Distribution Utilities.

1.2 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Manufacturer's catalog data for each manufactured item.
 - 1) Provide section in submittal for each type of item of equipment. Include Manufacturer's catalog data of each manufactured item and enough information to show compliance with Contract Document requirements. Literature shall show capacities and size of equipment used and be marked indicating each specific item with applicable data underlined.
 - 2) Include name, address, and phone number of each supplier.
 - 2. Shop Drawings:
 - a. Schematic control diagrams for each separate fan system, heating system, control panel, etc. Each diagram shall show locations of all control and operational components and devices. Mark correct operating settings for each control device on these diagrams.
 - b. Diagram for electrical control system showing wiring of related electrical control items such as firestats, fuses, interlocks, electrical switches, and relays. Include drawings showing electrical power requirements and connection locations.

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- c. Drawing of each temperature control panel identifying components in panels and their function.
 - d. Other shop drawings required by Division 23 trade Sections.
 - 1) Provide Qualification documentation if requested by Architect or Owner.
- B. Informational Submittals:
- 1. Qualification Statement:
 - a. HVAC Firm:
 - 1) Provide Qualification documentation if requested by Architect or Owner.
 - b. Installer:
 - 1) Provide Qualification documentation if requested by Architect or Owner.
- C. Closeout Submittals:
- 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Operations and Maintenance Data (Modify and add to requirements of Section 01 7800):
 - 1) At beginning of HVAC section of Operations And Maintenance Manual, provide master index showing items included.
 - a) Provide name, address, and phone number of Architect, Architect's Mechanical Engineer, General Contractor, and HVAC, Sheet Metal, Refrigeration, and Temperature Control subcontractors.
 - b) Identify maintenance instructions by using same equipment identification used in Contract Drawings. Maintenance instructions shall include:
 - (1) List of HVAC equipment used indicating name, model, serial number, and nameplate data of each item together with number and name associated with each system item.
 - (2) Manufacturer's maintenance instructions for each piece of HVAC equipment installed in Project. Instructions shall include name of vendor, installation instructions, parts numbers and lists, operation instructions of equipment, and maintenance and lubrication instructions.
 - (3) Summary list of mechanical equipment requiring lubrication showing name of equipment, location, and type and frequency of lubrication.
 - (4) Manual for Honeywell LCBS System published by Honeywell.
 - c) Provide operating instructions to include:
 - (1) General description of each HVAC system.
 - (2) Step by step procedure to follow in putting each piece of HVAC equipment into operation.
 - (3) Provide diagrams for electrical control system showing wiring of items such as smoke detectors, fuses, interlocks, electrical switches, and relays.
 - b. Warranty Documentation:
 - 1) Include copies of warranties required in individual Sections of Division 23.
 - c. Record Documentation:
 - 1) Manufacturers documentation:
 - a) Copies of approved shop drawings.
 - b) Copies of equipment start-up sheets.
 - 2. Equipment invoices required for energy rebates:
 - a. Provide dated invoices specifying make, model number, and serial number for each gas-fired furnace.

1.3 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
- 1. Perform work in accordance with applicable provisions of Building Code and Gas Ordinances applicable to Project. Provide materials and labor necessary to comply with rules, regulations, and ordinances.
 - 2. In case of differences between building codes, laws, local ordinances, utility company regulations, and Contract Documents, the most stringent shall govern. Notify Architect in writing of such differences before performing work affected by such differences.
 - 3. Identification:

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- a. Motor and equipment name plates as well as applicable UL / ULC and AGA / CGA labels shall be in place when Project is turned over to Owner.
- B. Qualifications: Requirements of Section 01 4301 applies, but not limited to following:
 - 1. Company:
 - a. Company specializing in performing work of this section.
 - 1) Minimum five (5) years experience in HVAC installations.
 - 2) Minimum five (5) satisfactorily completed installations in past three (3) years of projects similar in size, scope, and complexity required for this project before bidding.
 - b. Upon request, submit documentation.
 - 2. Installer:
 - a. Licensed for area of Project.
 - b. Designate one (1) individual as project foremen who shall be on site at all times during installation and experienced with installation procedures required for this project.
 - c. Upon request, submit documentation.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
 - 1. Accept valves on site in shipping containers with labeling in place.
- B. Storage And Handling Requirements:
 - 1. In addition to requirements specified in Division 01:
 - a. Stored material shall be readily accessible for inspection by Architect until installed.
 - b. Store items subject to moisture damage, such as controls, in dry, heated spaces.
 - c. Provide temporary protective coating on cast iron and steel valves.
 - d. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
 - 2. Protect bearings during installation. Thoroughly grease steel shafts to prevent corrosion.

1.5 WARRANTY

- A. Manufacturer Warranty:
 - 1. Provide certificates of warranty for each piece of equipment made out in favor of Owner. Clearly record 'start-up' date of each piece of equipment on certificate.
- B. Special Warranty:
 - 1. Guarantee HVAC systems to be free from noise in operation that may develop from failure to construct system in accordance with Contract Documents.
 - 2. If HVAC sub-contractor with offices located more than 150 miles (240 km) from Project site is used, provide service / warranty work agreement for warranty period with local HVAC sub-contractor approved by Architect. Include copy of service / warranty agreement in warranty section of Operation And Maintenance Manual.

PART 2 - PRODUCTS

2.1 COMPONENTS

- A. Components shall bear Manufacturer's name and trade name. Equipment and materials of same general type shall be of same make throughout work to provide uniform appearance, operation, and maintenance.
- B. Pipe And Pipe Fittings:
 - 1. Use domestic made pipe and pipe fittings on Project.

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- 2. Weld-O-Let and Screw-O-Let fittings are acceptable.
- C. Sleeves:
 - 1. In Framing: Standard weight galvanized iron pipe, Schedule 40 PVC, or 14 ga (2 mm) galvanized sheet metal two sizes larger than bare pipe or insulation on insulated pipe.
 - 2. In Concrete And Masonry: Sleeves through outside walls, interior shear walls, and footings shall be schedule 80 black steel pipe with welded plate.
- D. Valves:
 - 1. Valves of same type shall be of same manufacturer.

PART 3 - EXECUTION

3.1 INSTALLERS

- A. Acceptable Installers. See Section 01 4301:
 - 1. Meet Quality Assurance Installer Qualifications as specified in Part 1 of this specification.

3.2 EXAMINATION

- A. Drawings:
 - 1. HVAC Drawings show general arrangement of piping, ductwork, equipment, etc. Follow as closely as actual building construction and work of other trades will permit.
 - 2. Consider Architectural and Structural Drawings part of this work insofar as these drawings furnish information relating to design and construction of building. These drawings take precedence over HVAC Drawings.
 - 3. Because of small scale of Drawings, it is not possible to indicate all offsets, fittings, and accessories that may be required. Investigate structural and finish conditions affecting this work and arrange work accordingly, providing such fittings, valves, and accessories required to meet conditions.
- B. Verification Of Conditions:
 - 1. Examine premises to understand conditions that may affect performance of work of this Division before submitting proposals for this work. Examine adjoining work on which mechanical work is dependent for efficiency and report work that requires correction.
 - 2. No subsequent allowance for time or money will be considered for any consequence related to failure to examine site conditions.
 - 3. Ensure that items furnished fit space available. Make necessary field measurements to ascertain space requirements including those for connections and furnish and install equipment of size and shape so final installation suits true intent and meaning of Contract Documents. If approval is received by Addendum or Change Order to use other than originally specified items, be responsible for specified capacities and for ensuring that items furnished will fit space available.
 - 4. Check that slots and openings provided under other Divisions through floors, walls, ceilings, and roofs are properly located. Perform cutting and patching caused by neglecting to coordinate with Divisions providing slots and openings at no additional cost to Owner.

3.3 PREPARATION

- A. Changes Due To Equipment Selection:
 - 1. Where equipment specified or otherwise approved requires different arrangement or connections from that shown in Contract Documents, submit drawings, if requested by Architect, showing proposed installations.

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2. If proposed changes are approved, install equipment to operate properly and in harmony with intent of Contract Documents. Make incidental changes in piping, ductwork, supports, installation, wiring, heaters, panelboards, and as otherwise necessary.
3. Provide any additional motors, valves, controllers, fittings, and other additional equipment required for proper operation of system resulting from selection of equipment.
4. Be responsible for the proper location of roughing-in and connections provided under other Divisions.

3.4 INSTALLATION

- A. Interface With Other Work:
1. Furnish sleeves, inserts, supports, and equipment that are to be installed by others in sufficient time to be incorporated into construction as work proceeds. Locate these items and see they are properly installed.
 2. Electrical: Furnish exact location of electrical connections and complete information on motor controls to installer of electrical system.
 3. Testing And Balancing:
 - a. Put HVAC systems into full operation and continue their operation during each working day of testing and balancing.
 - b. Make changes in pulleys, belts, fan speeds, and dampers or add dampers as required for correct balance as recommended by Testing And Balancing Agency and at no additional cost to Owner.
- B. Cut carefully to minimize necessity for repairs to previously installed or existing work. Do not cut beams, columns, or trusses.
- C. Locating Equipment:
1. Arrange pipes, ducts, and equipment to permit ready access to valves, cocks, unions, traps, filters, starters, motors, control components, and to clear openings of doors and access panels.
 2. Adjust locations of pipes, ducts, switches, panels, and equipment to accommodate work to interferences anticipated and encountered.
 3. Install HVAC work to permit removal of equipment and parts of equipment requiring periodic replacement or maintenance without damage to or interference with other parts of equipment or structure.
 4. Determine exact route and location of each pipe and duct before fabrication.
 - a. Right-Of-Way:
 - 1) Lines that pitch shall have right-of-way over those that do not pitch. For example, steam, steam condensate, and drains shall normally have right-of-way.
 - 2) Lines whose elevations cannot be changed shall have right-of-way over lines whose elevations can be changed.
 - b. Offsets, Transitions, and Changes in Direction:
 - 1) Make offsets, transitions, and changes in direction in pipes and ducts as required to maintain proper head room and pitch of sloping lines whether or not indicated on Drawings.
 - 2) Furnish and install all traps, air vents, sanitary vents, and devices as required to effect these offsets, transitions, and changes in direction.
- D. Piping:
1. Furnish and install complete system of piping, valved as indicated or as necessary to completely control entire apparatus.
 - a. Pipe drawings are diagrammatic and indicate general location and connections. Piping may have to be offset, lowered, or raised as required or directed at site. This does not relieve this Division from responsibility for proper erection of systems of piping in every respect.
 - b. Arrange piping to not interfere with removal of other equipment, ducts, or devices, or block access to doors, windows, or access openings.
 - 1) Arrange so as to facilitate removal of tube bundles.
 - 2) Provide accessible flanges or ground joint unions, as applicable for type of piping specified, at connections to equipment and on bypasses.

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- a) Make connections of dissimilar metals with di-electric unions.
- b) Install valves and unions ahead of traps and strainers. Provide unions on both sides of traps.
- 3) Do not use reducing bushings, street elbows, bull head tees, close nipples, or running couplings.
- 4) Install piping systems so they may be easily drained. Provide drain valves at low points and manual air vents at high points in hot water heating and cooling water piping.
- 5) Install piping to insure noiseless circulation.
- 6) Place valves and specialties to permit easy operation and access. Valves shall be regulated, packed, and glands adjusted at completion of work before final acceptance.
- c. Do not install piping in shear walls.
- 2. Properly make adequate provisions for expansion, contraction, slope, and anchorage.
 - a. Cut piping accurately for fabrication to measurements established at site. Remove burr and cutting slag from pipes.
 - b. Work piping into place without springing or forcing. Make piping connections to pumps and other equipment without strain at piping connection. Remove bolts in flanged connections or disconnect piping to demonstrate that piping has been so connected, if requested.
 - c. Make changes in direction with proper fittings.
 - d. Expansion of Thermoplastic Pipe:
 - 1) Provide for expansion in every 30 feet (9 meters) of straight run.
 - 2) Provide 12 inch (300 mm) offset below roof line in each vent line penetrating roof.
- 3. Provide sleeves around pipes passing through concrete or masonry floors, walls, partitions, or structural members. Do not place sleeves around soil, waste, vent, or roof drain lines passing through concrete floors on grade. Seal sleeves with specified sealants.
 - a. Sleeves through floors shall extend 1/4 inch (6 mm) above floor finish in mechanical equipment rooms above basement floor. In other rooms, sleeves shall be flush with floor.
 - b. Sleeves through floors and foundation walls shall be watertight.
- 4. Provide spring clamp plates (escutcheons) where pipes run through walls, floors, or ceilings and are exposed in finished locations of building. Plates shall be chrome plated heavy brass of plain pattern and shall be set tight on pipe and to building surface.
- 5. Remove dirt, grease, and other foreign matter from each length of piping before installation.
 - a. After each section of piping used for movement of water or steam is installed, flush with clean water, except where specified otherwise.
 - b. Arrange temporary flushing connections for each section of piping and arrange for flushing total piping system.
 - c. Provide temporary cross connections and water supply for flushing and drainage and remove after completion of work.
- E. Penetration Firestops: Install Penetration Firestop System appropriate for penetration at HVAC system penetrations through walls, ceilings, roofs, and top plates of walls.
- F. Sealants:
 - 1. Seal openings through building exterior caused by penetrations of elements of HVAC systems.
 - 2. Furnish and install acoustical sealant to seal penetrations through acoustically insulated walls and ceilings.

3.5 REPAIR / RESTORATION

- A. Each Section of this Division shall bear expense of cutting, patching, repairing, and replacing of work of other Sections required because of its fault, error, tardiness, or because of damage done by it.
 - 1. Patch and repair walls, floors, ceilings, and roofs with materials of same quality and appearance as adjacent surfaces unless otherwise shown.
 - 2. Surface finishes shall exactly match existing finishes of same materials.

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3.6 FIELD QUALITY CONTROL

- A. Field Tests:
 1. Perform tests on HVAC piping systems. Furnish devices required for testing purposes.
- B. Non-Conforming Work:
 1. Replace material or workmanship proven defective with sound material at no additional cost to Owner.
 2. Repeat tests on new material, if requested.

3.7 SYSTEM START-UP

- A. Off-Season Start-up:
 1. If Substantial Completion inspection occurs during heating season, schedule spring start-up of cooling systems. If inspection occurs during cooling season, schedule autumn start-up for heating systems.
 2. Notify Owner seven days minimum before scheduled start-up.
 3. Time will be allowed to completely service, test, check, and off-season start systems. During allowed time, train Owner's representatives in operation and maintenance of system.
 4. At end of off-season start-up, furnish Owner with letter confirming that above work has been satisfactorily completed.
- B. Preparations that are to be completed before start up and operation include, but are not limited to, following:
 1. Dry out electric motors and other equipment to develop and properly maintain constant insulation resistance.
 2. Make adjustments to insure that:
 - a. Equipment alignments and clearances are adjusted to allowable tolerances.
 - b. Nuts and bolts and other types of anchors and fasteners are properly and securely fastened.
 - c. Packed, gasketed, and other types of joints are properly made up and are tight and free from leakage.
 - d. Miscellaneous alignments, tightenings, and adjustments are completed so systems are tight and free from leakage and equipment performs as intended.
 3. Motors and accessories are completely operable.
 4. Inspect and test electrical circuitry, connections, and voltages to be properly connected and free from shorts.
 5. Adjust drives for proper alignment and tension.
 6. Make certain filters in equipment for moving air are new and of specified type.
 7. Properly lubricate and run-in bearings in accordance with Manufacturer's directions and recommendations.
- C. Preparations that are to be completed after start up of gas-fired furnaces:
 1. Run all furnaces in high heat mode for a minimum of 2 consecutive hours to burn off dust and oils on furnace heat exchanger prior to Substantial Completion

3.8 CLEANING

- A. Clean exposed piping, ductwork, and equipment.
- B. No more than one week before Final Inspection, flush out bearings and clean other lubricated surfaces with flushing oil. Provide best quality and grade of lubricant specified by Equipment Manufacturer.
- C. Replace filters in equipment for moving air with new filters of specified type no more than one week before Final Inspection.

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3.9 CLOSEOUT ACTIVITIES

- A. Instruction Of Owner:
 - 1. Instruct building maintenance personnel and Stake Physical Facilities Representative in operation and maintenance of mechanical systems utilizing Operation And Maintenance Manual when so doing:
 - a. Minimum Instruction Periods:
 - 1) HVAC: Eight (8) hours.
 - 2) Temperature Control: Six (6) hours. (refer to Section 23 0933 for Training Requirements).
 - 3) Refrigeration: Four (4) hours.
 - b. Conduct instruction periods after Substantial Completion inspection when systems are properly working and before final payment is made. None of these instructional periods shall overlap another.

3.10 PROTECTION

- A. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system. Cap or plug open ends of pipes and equipment to keep dirt and other foreign materials out of system. Do not use plugs of rags, wool, cotton waste, or similar materials.
- B. Do not operate pieces of equipment used for moving supply air without proper air filters installed properly in system.
- C. After start-up, continue necessary lubrication and be responsible for damage to bearings while equipment is being operated up to Substantial Completion.

3.11 SEISMIC RESTRAINT

- A. Restrain all equipment, piping, and ductwork in compliance with the Authority Having Jurisdiction and the Building Code.

END OF SECTION

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SECTION 23 0529

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To:
 - 1. Common hanger and support requirements and procedures for HVAC systems.
- B. Related Requirements:
 - 1. Section 05 0523: 'Metal Fastening' for quality and requirements for welding.
 - 2. Section 07 8400: 'Firestopping' for quality of Penetration Firestop Systems to be used on Project and submittal requirements.
 - 3. Slots and openings through floors, walls, ceilings, and roofs provided under other Divisions in their respective materials.
- C. Products Installed But Not Furnished Under This Section:
 - 1. Stencils and band colors of gas piping used in HVAC equipment.
- D. Related Requirements:
 - 1. Section 09 9124: 'Interior Painted Metal' for providing field painting of identification of piping used with HVAC equipment.
 - 2. Section 23 0553: 'Identification For HVAC Piping And Equipment' for HVAC piping and equipment identification signage requirements.
 - 3. Sections Under 09 9000 Heading: Painting of mechanical items requiring field painting.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Section 09 9124 to coordinate with Section 23 0529 for location of identification of HVAC piping and equipment to be field painted and Section 23 0553 for painting requirements of HVAC piping and equipment.
 - 2. Section 23 0529 to coordinate with Section 23 0553 for stencil and band color locations and identification requirements of HVAC piping and equipment for field application.

1.3 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Manufacturer's catalog data for each manufactured item.

PART 2 - PRODUCTS

2.1 ASSEMBLIES

- A. Manufacturers:
 - 1. Approved Manufacturers:
 - a. Anvil International, Portsmouth, NH www.anvilintl.com.
 - b. Cooper B-Line, Highland, IL www.cooperblin.com.

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- c. Erico International, Solon, OH www.erico.com.
- d. Hilti Inc, Tulsa, OK www.hilti.com.
- e. Minerallac, Hampshire, IL www.minerallac.com.
- f. Thomas & Betts, Memphis, TN www.superstrut.com.
- g. Unistrut, Wayne, MI www.unistrut.com.

B. Performance:

1. Design Criteria:

- a. Support rods for single pipe shall be in accordance with following table:

Rod Diameter	Pipe Size
3/8 inch	2 inches and smaller
1/2 inch	2-1/2 to 3-1/2 inches
5/8 inch	4 to 5 inches

- b. Support rods for multiple pipes supported on steel angle trapeze hangers shall be in accordance with following table:

Rods		Number of Pipes per Hanger for Each Pipe Size						
No.	Diameter	2 Inch	2.5 Inch	3 Inch	4 Inch	5 Inch	6 Inch	8 Inch
2	3/8 Inch	Two	0	0	0	0	0	0
2	1/2 Inch	Three	Three	Two	0	0	0	0
2	5/8 Inch	Six	Four	Three	Two	0	0	0

- 1) Size trapeze angles so bending stress is less than 10,000 psi .

C. Materials:

1. Hangers, Rods, Channels, Attachments, And Inserts:

- a. Galvanized and UL approved for service intended.
- b. Support horizontal piping from clevis hangers or on roller assemblies with channel supports, except where trapeze type hangers are explicitly shown on Drawings. Hangers shall have double nuts.
- c. Quality Standards:
 - 1) Support insulated pipes with clevis hanger equal to Anvil Fig 260 or roller assembly equal to Anvil Fig 171 with an insulation protection shield equal to Anvil Fig 167. Gauge and length of shield shall be in accordance with Anvil design data.
 - 2) Except uninsulated copper pipes, support uninsulated pipes from clevis hanger equal to Anvil Fig 260. Support uninsulated copper pipe from hanger equal to Anvil Fig CT-65 copper plated hangers and otherwise fully suitable for use with copper tubing.
- d. Riser Clamps For Vertical Piping:
 - 1) Quality Standard: Anvil Figure 261.

EXECUTION

2.2 INSTALLATION

A. Piping:

- 1. Properly support piping and make adequate provisions for expansion, contraction, slope, and anchorage.
 - a. Except for underground pipe, suspend piping from roof trusses or clamp to vertical walls using support channels and clamps. Do not hang pipe from other pipe, equipment, or ductwork. Laying of piping on any building element is not allowed.
 - b. Supports For Horizontal Piping:
 - 1) Support metal piping at 96 inches mm on center maximum for pipe 1-1/4 inches or larger and 72 inches on center maximum for pipe 1-1/8 inch or less.
 - 2) Support thermoplastic pipe at 48 inches on center maximum.
 - 3) Provide support at each elbow. Install additional support as required.
 - c. Supports for Vertical Piping:
 - 1) Place riser clamps at each floor or ceiling level.

- 2) Securely support clamps by structural members, which in turn are supported directly from building structure.
- 3) Provide clamps as necessary to brace pipe to wall.
- d. Insulate hangers for copper pipe from piping by means of at least two layers of Scotch 33 plastic tape.
- e. Expansion of Thermoplastic Pipe:
 - 1) Provide for expansion in every 30 feet of straight run.
 - 2) Provide 12 inch offset below roof line in each vent line penetrating roof.

END OF SECTION

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SECTION 23 0553

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Products Furnished But not Installed Under This Section:
 - 1. Identification of HVAC piping and equipment as described in Contract Documents including:
 - a. Paint identification for gas piping used in HVAC equipment.
 - b. Stencils and band colors for gas piping used in HVAC equipment.
- B. Related Requirements:
 - 1. Section 09 9124: 'Interior Painted Metal' for providing field painting of identification of piping used with HVAC equipment.
 - 2. Section 22 0529: 'Hangers And Supports For Plumbing' for field installation of pipe stencils and band colors for identification for piping used with HVAC equipment.

PART 2 - PRODUCTS

2.1 SYSTEMS

- A. Description:
 - 1. Abbreviations for Pipe Stencils and Equipment Identification and Band Colors for Pipe Identification:
 - a. Apply stenciled symbols and continuous painting as follows:

Pipe Type	Pipe Color	Symbol
Gas	Yellow	GAS
- B. Materials:
 - 1. Approved Products and Manufacturers:
 - a. Products listed in edition of MPI Approved Product List current at time of bidding and later are approved, providing they meet VOC requirements in force where Project is located.
 - 2. Description:
 - a. Ferrous Metal:
 - 1) New Surfaces: Use MPI(a) INT 5.1B Waterborne Light Industrial Finish system.
 - 3. Performance Requirements:
 - a. New Surfaces: MPI Premium Grade finish requirements.
 - b. Maintain specified colors, shades, and contrasts.
 - 4. Paint (one coat):
 - a. Primer:
 - 1) Ferrous Metal:
 - a) MPI 107, 'Primer, Rust-Inhibitive, Water Based'.
 - (1) Color: white.
 - b. Finish Coat (two coats):
 - 1) Ferrous Metal:
 - a) MPI 153, 'Light Industrial Coating, Interior, Water Based, Semi-Gloss (MPI Gloss Level 5)'.
 - 5. Labels:
 - a. Equipment Identification:
 - 1) Black formica, with white reveal when engraved.
 - 2) Lettering to be 3/16 inch high minimum.

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PART 3 - EXECUTION

3.1 APPLICATION

- A. Labels:
1. Identify following items with specified labels fastened to equipment with screws (unless noted otherwise):
 - a. Packaged Rooftop Units.
 - b. Unitary Controllers.
 2. Engrave following data from Equipment Schedules on Drawings onto labels:
 - a. Equipment mark.
 - b. Area served.
 - c. Thermostat zone number, when different from equipment mark.
 - d. Panel and breaker from which unit is powered.
- B. Painting:
1. New Surfaces:
 - a. Remove rust spots by sanding and immediately spot prime. If all traces of rust cannot be removed, apply rust blocker recommended by Paint Manufacturer before applying full primer coat.
 2. Leave equipment in like-new appearance.
 3. Only painted legends, directional arrows, and color bands are acceptable.
 4. Locate identifying legends, directional arrows, and color bands at following points on exposed piping of each piping system:
 - a. Adjacent to each item of equipment.
 - b. At point of entry and exit where piping goes through wall.
 - c. On each riser and junction.
 - d. Every 25 feet on long continuous lines.
 - e. Stenciled symbols shall be one inch high and black.

END OF SECTION

SECTION 23 0713**DUCT INSULATION****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
1. Furnish and install thermal wrap duct insulation as described in Contract Documents.
- B. Related Requirements:
1. Section 23 3114: 'Low-Pressure Metal Ducts'.
 2. Section 23 3300: 'Acoustic Duct Accessories' for duct liner.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Manufacturer Contact List:
1. Certainteed St Gobain, Valley Forge, PA www.certainteed.com.
 2. Johns-Manville, Denver, CO www.jm.com.
 3. Knauf Fiber Glass, Shelbyville, IN www.knauffiberglass.com or Toronto, ON (416) 593-4322.
 4. Manson Insulation Inc, Brossard, QB www.isolationmanson.com.
 5. Owens-Corning, Toledo, OH or Owens-Corning Canada Inc, Willowdale, ON www.owenscorning.com.

2.2 MATERIALS

- A. Thermal Wrap Duct Insulation:
1. 1-1/2 inch or 3 inch thick fiberglass with factory-laminated, reinforced aluminum foil scrim kraft facing and density of 0.75 lb / per cu ft Thermal Conductivity: 0.27 BTU in/HR SF deg F at 75 deg F maximum.
 3. Acceptable Products:
 - a. Type 75 standard duct insulation by Certainteed St Gobain.
 - b. Microlite FSK by Johns-Manville.
 - c. Duct Wrap FSK by Knauf Fiber Glass.
 - d. Alley Wrap FSK by Manson Insulation Inc.
 - e. FRK by Owens-Corning.
 - f. Equal as approved by Architect before bidding. See Section 01 6200.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Thermal Wrap Duct Insulation:
1. Install insulation as follows:
 - a. Within Building Insulation Envelope:
 - 1) 1-1/2 inches thick on all rigid (unlined) round supply and return air ducts.
 - 2) 1-1/2 inches thick on all other air ducts where indicated on drawings.

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- b. Outside Building Insulation Envelope:
 - 1) 3 inch thick on unlined supply and return air ducts.
 - 2) 1-1/2 inch thick on acoustically lined supply and return air ducts.
 - 2. Wrap insulation tightly on ductwork with circumferential joints butted and longitudinal joints overlapped minimum 2 inches.
 - a. Do not compress insulation except in areas of structural interference. Minimum thickness at corners shall be one inch thick.
 - b. Remove insulation from lap before stapling.
 - c. Staple seams at approximately 16 inches on center with outward clenching staples.
 - d. Seal seams with foil vapor barrier tape or vapor barrier mastic. Seal penetrations of facing to provide vapor tight system.
- B. Insulate outside of ceiling diffusers and diffuser drops same as ductwork.

END OF SECTION

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SECTION 23 0933

ELECTRIC AND ELECTRONIC CONTROL SYSTEM FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:

- 1. Furnish and install automatic temperature control system as described in Contract Documents.
- 2. Furnish and install conductors and make connections to control devices, motors, and associated equipment.
- 3. Assist in air test and balance procedure.

B. Related Requirements:

- 1. Section 01 4546: Duct testing, adjusting, and balancing of ductwork.
- 2. Section 23 0501: Common HVAC Requirements.
- 3. Section 23 3300: Furnishing and installing of temperature control dampers.
- 4. Division 26:
 - a. Furnishing and installing of raceway, conduit, and junction boxes, including pull wires, for temperature control system except as noted above.
 - b. Power wiring to magnetic starters, disconnect switches, and motors.
 - c. Motor starters and disconnect switches, unless integral with packaged equipment.

1.2 SUBMITTALS

A. Action Submittals:

- 1. Product Data:
 - a. Installer to provide product literature or cut sheets for all products specified in Project.
 - b. Installer to provide questions of control equipment locations to Mechanical Engineer prior to installation.

B. Informational Submittals:

- 1. Certificates:
 - a. Installer must provide 'Certificate of Sponsorship' signed from Approved Distributor with bid confirming Installer sponsorship.

C. Closeout Submittals:

- 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Operations and Maintenance Data:
 - 1) Leave with O&M Manual specified in Section 23 0501.
 - b. Record Documentation:
 - 1) Installer's 'Certificate of Sponsorship'.

1.3 QUALITY ASSURANCE

A. Qualifications: Requirements of Section 01 4301 applies, but is not limited to the following:

- 1. Installer:
 - a. Before bidding, obtain sponsorship from a local, Approved Distributor specified under PART 2 PRODUCTS of this specification. Initial requirements for sponsorship are:
 - 1) Receive LCBS Connect product training from Approved Distributor.

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- 2) Installer to provide Distributor sponsorship by submitting 'Certificate of Sponsorship' as Informational Submittal with bid. Certificate available as Attachment in this Specification.

PART 2 - PRODUCTS

2.1 SYSTEMS

A. Manufacturers:

1. Manufacturer Contact List:
 - a. Honeywell Inc, Minneapolis, MN www.honeywell.com.

B. Distributors: Obtain LCBS Connect control devices, RP panels, sensors, actuators and other control equipment from following Sponsoring Approved Distributors. See Section 01 4301:

1. Utah:
 - a. Control Equipment Co: (800) 452-1457.
 - b. Building Controls and Solutions LLC: (801) 214-3316; Dan.Craner@building-controls.com; Dan Craner.

C. Performance:

1. Design Criteria:
 - a. Honeywell LCBS Connect control system with cloud based gateway:
 - 1) General Requirements:
 - a) Controls multistage equipment, dehumidification and ventilation with 2 wire connection to controller interface location in occupied space.
 - b) Adjustable backlight to controller interface module from 15%-100%en after 30 seconds of setting adjustments.
 - c) System controllers can be programmed from the interface module or from the cloud service.
 - d) LCBS Connect controller utilizes echelon communication network with the controller located near the mechanical equipment and the system interface located in the occupied space.
 - e) System shall control outdoor ventilation air based upon system occupancy of electric / electronic actuation of dampers.
 - f) LCBS Connect devices access via internet Chrome browser via gateway.
 - g) Wired room temperature sensors may be added as specified.
 - 2) System Requirements:
 - a) Up to 3 Heat/2 Cool Heat Pumps; Up to 3 Heat/2 Cool Conventional Systems.
 - b) Tri-Lingual display (Selectable for English, Spanish, or French).
 - c) 18 to 30 Vac.
 - d) 50 Hz; 60 Hz.
 - e) System switch to include Auto changeover for Heat-Cool.
 - f) 7-Day Programming.
 - g) 365-Day Event Scheduling.
 - h) Display Security Lockout options.
 - i) Minimum/ Maximum Temperature Range Stops.
 - j) Configurable over-ride option.
 - k) Remote Access via internet.

D. Components:

1. Controller, Wall Module:
 - a. Controller and Display Kit:
 - 1) Approved Product:
 - a) Part Number Honeywell YCRL6438SR1000 consisting of following:
 - (1) Unitary Controller: Honeywell CRL6438SR1000
 - (2) Wall Module: Honeywell TS120

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- (3) Averaging Sensor: TR40 Sbus / Sylk bus temperature sensor
- (4) Discharge Air / Return Air Sensors: Honeywell C7041B2005 20k ohms.
- (5) Outdoor Air Sensor: Honeywell C7041F2006.
- (6) Wall Cover Plate: Honeywell. 50002883-001/U.
- b. Internet Gateway Module(s): One (1) module per thirty (30) controllers.
 - 1) Approved Product:
 - a) LCBS Connect Gateway Module: Honeywell LGW1000.
- 2. Sealant Compound:
 - a. Description:
 - 1) Non hardening waterproof, vapor proof, self-adhesive for hot or cold application for sealing conduit openings against drafts, dust moisture and noise.
 - b. Approved Product:
 - 1) Duct Seal Compound No. DS-130 by Gardner Bender, Menomonee Falls , WI. www.gardnerbender.com.
 - 2) Thumb-Tite Sealing Compound No. 4216-92 by Nu-Calgon, St. Louis, MO www.nucalgon.com.
- 3. Transformer:
 - a. 120 / 24 V, 50VA Honeywell AT150F.
- 4. Conductors:
 - a. Color-coded and No. 16 and No. 12 AWG Type TWN, TFN, or THHN, stranded.
 - b. Controller Cable: 12, 8, or 4 conductor, 18AWG solid copper wire, insulated with high-density polyethylene. Conductors parallel enclosed in brown PVC jacket (22 AWG cable not allowed).
 - c. Echelon Network Ebus Communicating Cable:
 - 1) Quality Standard:
 - a) CAT 4, 22 gauge (0.025 in) (0.645 mm), twisted pair, non-plenum and non-shielded cable.
- 5. Control for Electric Wall Heater:
 - a. Electric Heater Control:
 - 1) Approved Product:
 - a) Switching Relay: Part Number Functional Devices: Relay RIB2401B 20 amp rating.
 - b) Disconnect Heater Overload: FMS-TAX5, 2-Pole 1 HP starter switch.
- 6. Combination Equipment and Thermal Overload Switch Panel:
 - a. CEO panel must be provided by approved panel builder.
- E. Operation Sequences:
 - 1. Programmable controller shall control Unoccupied and Occupied status of fan system based on adjustable seven-day program. Fan shall run continuously in Occupied Mode and cycle in Unoccupied Mode.
 - 2. Adjustable heating and cooling set points shall control space temperature by activating either heating or cooling equipment. Programmable controller provides automatic change over between heating and cooling.
 - 3. Controller provides optional override by allowing timed override of program by pushing override on controller touch screen. This shall activate controller to Occupied Mode and system shall control to Occupied set point.
 - 4. Minimum outdoor ventilation air damper, spring return type, shall open in controller Occupied Mode and remain closed in Unoccupied Mode.

PART 3 - EXECUTION

3.1 INSTALLERS

- A. Acceptable Installers. See Section 01 4301:
 - 1. Meet Quality Assurance Qualifications as specified in Part 1 of this specification.

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3.2 INSTALLATION

A. Interface With Other Work:

- 1. Calibrate room controllers as required during air test and balance. Insulate sensor J-box with fiberglass insulation; expandable/ foam insulation is NOT acceptable.
- 2. Instruct air test and balance personnel in proper use and setting of control system components.
- 3. Install low voltage electrical wiring in accordance with Division 26 of these Specifications.

B. Echelon Communication: Ebus

- 1. Ebus cable needs to be installed at least 12 inches (300 mm) from lighting, motors, or low voltage switching cables.

C. Control for Electric Wall Heater.

- 1. Install according to local code the electric heater RIB with overload disconnect into electric heater unit.
- 2. Commission controller to be seen by gateway and webpage.

3.3 FIELD QUALITY CONTROL

A. Field Tests:

- 1. Calibrate, adjust, and set controls for proper operation, operate systems, and be prepared to prove operation of any part of control system. This work is to be completed before pre-substantial completion inspection.
- 2. Test each individual heating, cooling, and damper control for proper operation using control system.

3.4 SYSTEM STARTUP

A. For systems with LCBS Controller.

- 1. Contractor is responsible for a fully functioning control system accessible via internet web browser. Contractor is responsible to coordinate Network start up with assistance from local IT technician. Local IT technician shall provide available ports on network switch for LCBS gateway.
- 2. Contractor is responsible configuring all controllers with proper zone names, zone scheduling, proper Church conference / holiday scheduling, all to be coordinated with local FM manager. Set proper clock setting including day/month/year.
- 3. Set Heating / Cooling to proper stages
- 4. Set heat cycle rates to 9 cph and cooling to 4 cph.
- 5. Set DO1 relay to "Occupancy".
- 6. Set System switch operation to "Automatic" changeover.
- 7. Set fan switch operation to "ON".
- 8. Set minimum UnOcc start time for all days. No days shall be scheduled Unconfigured.
- 9. Set Occupied start times to match meeting start times; provided by local FM manager.
- 10. Place all zone over-ride durations to one (1) hour.
- 11. Set Occupied default heating setpoints to 70 degrees, cooling setpoints to 74 degrees.
- 12. Set Unoccupied default heating setpoint to 60 degrees, cooling setpoints to 90 degrees.

3.5 ADJUSTING

A. LCBS controller configuration settings; the following are configuration guidelines for consistent installations:

- 1. Temperature Units Fahrenheit/ Celsius
- 2. Equipment Type Conventional/heat pump.
 - a. Stages of Heat 1,2
 - b. Stages of Cool 1,2
 - c. Fan operation in heat mode Enable Fan w/ Heat

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3. Equipment Options
 - a. Leave at Default
 - b. Heating Cycles per Hour 6-9 cph
 - c. Cooling Cycles per Hour 3-4 cph
4. Recovery
 - a. Leave at Default
5. Economizer / DLC
 - a. Configure as required by control equipment.
6. Sensor Selection
 - a. Set according to averaging sensors
 - b. Set to multi sensor "Smart" when averaging.
 - c. Set Occupancy Sensor to "Disable".
7. Terminal Assignment
 - a. Set according to equipment
 - b. Set Terminal DO1 to Occupancy to control fresh air damper based upon scheduled occupancy or over-ride.
8. Dehumidification
 - a. Leave at default
 - b. See Accessory Loops
9. Miscellaneous
 - a. Leave at default
10. Sensor setting
 - a. Leave at default
 - b. Set as Required
11. Accessory Loops – Set as required
 - a. Hot water valve
 - b. Dehumidification
 - c. Other
12. Configure Zone Name (display on Home Screen).
13. Set Password to ABCD.
14. Set Occupied Setpoint
15. Set Unoccupied Setpoint
16. Set Schedule

3.6 CLOSEOUT ACTIVITIES

- A. Instruction Of Owner:
 1. Include as part of training required in Section 23 0501, following training:
 - a. Training shall be by personnel of installing company and utilize operator's manuals and as-built documentation.
 - b. Provide training in (2) two sessions including LCBS Connect sight & smart Apps for up to six (6) hours total:
 - 1) First session will occur between system completion and Substantial Completion.
 - 2) Second session will occur within forty-five (45) days of Substantial Completion when agreed upon by Owner.
 - c. Training shall include sequence of operation review, selection of displays, modification of schedules and setpoints, troubleshooting of sensors, etc, as follows:
 - 1) Control System Overview:
 - a) Show access to system through both individual controllers and Internet browser and how network works. Scheduling building at minimum for school schedule and special events.
 - 2) Controller Programming from Keypad: Instructions on developing setpoints and schedules and adjusting local zone temperatures.
 - 3) Web Internet training with local Facilities Manager during two (2) sessions.
 - a) Review all features accessible from the 'Settings' tab including Alarm points, user access, scheduling and humidity setpoints (where applied).

END OF SECTION

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ATTACHMENTS

CERTIFICATE OF SPONSORSHIP
Electric and Electronic Control System for HVAC Installer

PROJECT INFORMATION (To be filled out by Installer - available from project specification):

Project Name: _____
 Project Number: _____
 Project Address: _____

INSTALLER INFORMATION (To be filled out by Installer):

Installer Name: _____
 Installer Firm: _____
 Installer Address: _____

I acknowledge and confirm the above listed Installer has received training and exhibit LCBS Connect System skills and is qualified to install the automation control system as specified for Project identified above. Our company will stand behind the Installer meeting the legal specified performance requirements.

Sponsoring Approved Honeywell Distributor Name: _____

Signature: _____ Printed Signature: _____

Date: _____

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SECTION 23 1123

FACILITY NATURAL-GAS PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To:
 - 1. Furnish and install gas piping and fittings within building and from building to meter including connection to meter as described in Contract Documents.
- B. Related Requirements:
 - 1. Sections Under 09 9000 Heading: 'Paints And Coatings' for painting of exterior piping.
 - 2. Section 23 0501: 'Common HVAC Requirements'.
 - 3. Section 23 0553: 'Identification for HVAC Piping and Equipment'.

1.2 REFERENCES

- A. Reference Standards:
 - 1. American National Standards Institute / CSA Group:
 - a. ANSI LC 4-2012 (2017) / CSA 6.32-2012 (R2016), 'Press-Connect Metallic Fittings for Use in Fuel Gas Distribution Systems'.
 - 2. ASTM International:
 - a. ASTM A53/A53M-12, 'Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless'.
 - b. ASTM A234/A234M-16, 'Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service'.
 - 3. International Code Council (ICC):
 - a. ICC IFGC-2015: 'International Fuel Gas Code'.

1.3 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Conform to requirements of requirements of IFGC International Fuel Gas Code.
 - 2. Viega MegaPressG fittings:
 - a. Conform to requirements of Canadian Standards Association CSA B149.1 and to requirements of IFGC International Fuel Gas Code.
- B. Qualifications:
 - 1. Welders:
 - a. Welders shall be certified and bear evidence of certification thirty (30) days before commencing work on project.
 - b. If there is doubt as to proficiency of welder, Owner's Representative may require welder to take another test. This shall be done at no cost to Owner. Certification shall be by Pittsburgh Testing Laboratories or other approved authority.

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PART 2 - PRODUCTS

2.1 SYSTEM

A. Manufacturers:

1. Manufacturer Contact List:
 - a. BrassCraft, Novi, MI www.brasscraft.com.
 - b. Cimberio Valve Co Inc, Malvern, PA www.cimberio.com.
 - c. ConBraCo Industries, Inc, Matthews, NC www.conbraco.com or ConBraCo / Honeywell Ltd, Scarborough, ON (416) 293-8111.
 - d. Dormont Manufacturing Company, Export, PA www.dormont.com.
 - e. Jenkins-NH-Canada, Brantford, ON www.jenkins-nh-canada.com.
 - f. Jomar International, Madison Heights, MI www.jomar.com.
 - g. Viega LLC, Broomfield, CO www.viega.com.
 - h. Watts Regulator Co, North Andover, MA www.wattsreg.com or Watts Industries (Canada) Inc, Burlington, ON (888) 208-8927.

B. Materials:

1. Above-Ground Pipe:
 - a. Black carbon steel, butt welded, Schedule 40 pipe meeting requirements of A53/A53M.
2. Above-Ground Pipe Fittings:
 - a. Welded forged steel fittings meeting requirements of ASTM A234/A234M.
 - b. Standard weight malleable iron screwed.
 - c. Viega MegaPressG fittings.
3. Valves:
 - a. 125 psi (862 kPa) bronze body ball valve, UL listed.
 - b. Approved Products:
 - 1) CIM 102.1 by Cimbrio Valve.
 - 2) Apollo Series 80-100 by ConBraCo.
 - 3) 'Red Cap' R602 by Jenkins NH Canada.
 - 4) Model T-204 by Jomar International.
 - 5) Model B-6000-UL by Watts Regulator.
4. Flexible Connector:
 - a. Type 304 stainless steel corrugated tube coated for corrosion protection.
 - b. Approved Products:
 - 1) Dormont Supr-Safe.
 - 2) BrassCraft Procoat.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Steel pipe installed through air plenums, in walls:
 1. Pipes 2-1/2 inches (64 mm) and larger shall have welded fittings and joints.
 2. Other steel pipe may have screwed or welded fittings.
 3. Viega MegaPressG:
 - a. Install MegaPressG fittings according to Manufacture’s recommendations and with Manufacture’s recommended tools.
- B. After gas meter, valves and etc, gas piping should rise inside outside wall and not be visible to public.
- C. On lines serving gas-fired equipment, install gas valves adjacent to equipment outside of equipment cabinet and easily accessible.

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- D. Install 6 inch (150 mm) long minimum dirt leg, with pipe cap, on vertical gas drop serving each gas-fired equipment unit.
- E. Use fittings for changes of direction in pipe and for branch runouts.
- F. Visible gas piping inside building shall be painted yellow and labeled.

3.2 FIELD QUALITY CONTROL

- A. Field tests:
 - 1. Subject all portions of gas piping system, in sections or in entirety, to air pressure of 75 psig (0.52 MPa) and prove airtight for four (4) hours.
 - 2. Disconnect equipment not suitable for 75 psig (0.52 MPa) pressure from piping system during test period.

END OF SECTION

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SECTION 23 3001

COMMON DUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To:
 - 1. General procedures and requirements for ductwork.
 - 2. Repair leaks in ductwork, as identified by duct testing, at no additional cost to Owner.
- B. Related Requirements:
 - 1. Section 01 4546: 'Duct Testing, Adjusting, and Balancing' for ductwork.
 - 2. Section 07 9219: 'Acoustical Joint Sealants' for quality of acoustic sealant.
 - 3. Section 23 0501: 'Common HVAC Requirements'.

1.2 REFERENCES

- A. Reference Standards:
 - 1. Sheet Metal And Air Conditioning Contractors' National Association / American National Standards Institute:
 - a. SMACNA, 'HVAC Duct Construction Standards - Metal and Flexible' (4th Edition).

1.3 SUBMITTALS

- A. Informational Submittals:
 - 1. Manufacturer Instructions:
 - a. Installation manuals providing detailed instructions on assembly, joint sealing, and system pressure testing for leaks.

PART 2 - PRODUCTS

2.1 ASSEMBLIES

- A. Performance:
 - 1. Design Criteria:
 - a. Standard Ducts: Construction details not specifically called out in Contract Documents shall conform to applicable requirements of SMACNA, 'HVAC Duct Construction Standards - Metal and Flexible'.
- B. Materials:
 - 1. Duct Hangers:
 - a. One inch (25 mm) by 18 ga (1.27 mm) galvanized steel straps or steel rods as shown on Drawings, and spaced not more than 96 inches (2 400 mm) apart. Do not use wire hangers.
 - b. Attaching screws at trusses shall be 2 inch (50 mm) No. 10 round head wood screws. Nails not allowed.

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PART 3 - EXECUTION

3.1 INSTALLATION

- A. During installation, protect open ends of ducts by covering with plastic sheet tied in place to prevent entrance of debris and dirt.

- B. Make necessary allowances and provisions in installation of sheet metal ducts for structural conditions of building. Revisions in layout and configuration may be allowed, with prior written approval of Architect. Maintain required airflows in suggesting revisions.

- C. Hangers And Supports:
 - 1. Install pair of hangers as required by spacing indicated in table on Drawings.
 - 2. Install upper ends of hanger securely to floor or roof construction above by method shown on Drawings.
 - 3. Attach strap hangers to ducts with cadmium-plated screws. Use of pop rivets or other means will not be accepted.
 - 4. Secure vertical ducts passing through floors by extending bracing angles to rest firmly on floors without loose blocking or shimming. Support vertical ducts, which do not pass through floors, by using bands bolted to walls, columns, etc. Size, spacing, and method of attachment to vertical ducts shall be same as specified for hanger bands on horizontal ducts.

3.2 CLEANING

- A. Clean interior of duct systems before final completion.

END OF SECTION

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SECTION 23 3114

LOW-PRESSURE METAL DUCTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To:
 - 1. Furnish and install above-grade low-pressure steel ducts and related items as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 01 4546: 'Duct Testing, Adjusting, And Balancing' for duct test, balance, and adjust air duct systems services provided by Owner.
 - 2. Section 23 0713: 'Duct Insulation' for thermal insulation for ducts, plenum chambers, and casings.
 - 3. Section 23 3001: 'Common Duct Requirements'.
 - 4. Section 23 0933: 'Electric And Electronic Control System For HVAC':
 - a. Temperature control damper actuators and actuator linkages.

1.2 REFERENCES

- A. Association Publications:
 - 1. Sheet Metal And Air Conditioning Contractors' National Association / American National Standards Institute:
 - 2. SMACNA, 'HVAC Duct Construction Standards - Metal and Flexible' (4th edition).
- B. Reference Standards:
 - 1. ASTM International:
 - a. ASTM A653/A653M-18, 'Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process'.
 - b. ASTM E84-18b, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
 - 2. Underwriters Laboratories, Inc.:
 - a. UL 723: 'Standard for Safety Test for Surface Burning Characteristics of Building Materials'; (11th Edition - 2018).

1.3 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Duct Sealer:
 - a. Meet Class A flame spread rating in accordance with ASTM E84 or UL 723.
 - b. Handle, store, and apply materials in compliance with applicable regulations and material safety data sheets (MSDS).

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Storage and Handling Requirements:
 - 1. Duct Sealer:
 - a. Handle, store, and apply materials in compliance with applicable regulations and material safety data sheets (MSDS).

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- b. Handle to prevent inclusion of foreign matter, damage by water, or breakage.
- c. Store in a cool dry location, but never under 35 deg F (1.7 deg C) or subjected to sustained temperatures exceeding 110 deg F (43 deg C) or as per Manufacturer's written recommendations.
- d. Do use sealants that have exceeded shelf life of product.

1.5 FIELD CONDITIONS

A. Ambient Conditions:

- 1. Duct Sealer:
 - a. Do not apply under 35 deg F (1.7 deg C) or subjected to sustained temperatures exceeding 110 deg F (43 deg C) or as per Manufacturer's written recommendations.
 - b. Do not apply when rain or freezing temperatures will occur within seventy two (72) hours.

PART 2 - PRODUCTS

2.1 SYSTEM

A. Materials:

- 1. Sheet Metal:
 - a. Fabricate ducts, plenum chambers and casings of zinc-coated, lock-forming quality steel sheets meeting requirements A653/A653M, with G 60 coating.
- 2. Duct Sealer For Interior Ducts:
 - a. Approved Products:
 - 1) Duct Butter or ButterTak by Cain Manufacturing Co Inc, Pelham, AL www.cainmfg.com.
 - 2) DP 1010, DP 1030 or DP 1015 by Design Polymerics, Fountain Valley, CA www.designpoly.com.
 - 3) PROseal, FIBERseal, EVERseal, or EZ-seal by Ductmate Industries, Inc., Charleroi, PA www.ductmate.com.
 - 4) SAS by Duro Dyne, Bay Shore, NY or Duro Dyne Canada, Lachine, QB www.durodyne.com.
 - 5) Iron Grip 601 by Hardcast Inc, Wylie, TX www.hardcast.com.
 - 6) MTS100 or MTS 200 by Hercules Mighty Tough, Denver CO, www.herculesindustries.com.
 - 7) 15-325 by Miracle / Kingco, Div ITW TACC, Rockland, MA www.taccint.com.
 - 8) 44-39 by Mon-Eco Industries Inc, East Brunswick, NJ www.mon-ecoindustries.com.
 - 9) Airseal Zero by Polymer Adhesive Sealant Systems Inc, Weatherford, TX www.polymeradhesives.com.
 - 10) Airseal #22 Water Base Duct Sealer by Polymer Adhesive Sealant Systems Inc, Weatherford, TX www.polymeradhesives.com.

B. Fabrication:

- 1. General:
 - a. Straight and smooth on inside with joints neatly finished.
 - b. Duct drops to diffusers shall be round, square, or rectangular to accommodate diffuser neck. Drops shall be same gauge as branch duct. Seal joints air tight.
- 2. Standard Ducts:
 - a. General:
 - 1) Ducts shall be large enough to accommodate inside acoustic duct liner. Dimensions shown on Drawings are net clear inside dimensions after duct liner has been installed.
 - b. Rectangular Duct:
 - 1) Duct panels through 48 inch (1 200 mm) dimension having acoustic duct liner need not be cross-broken or beaded. Cross-break unlined ducts, duct panels larger than 48 inch

- (1 200 mm) vertical and horizontal sheet metal barriers, duct offsets, and elbows, or bead 12 inches (300 mm) on center.
- a) Apply cross-breaking to sheet metal between standing seams or reinforcing angles.
 - b) Center of cross-break shall be of required height to assure surfaces being rigid.
 - c) Internally line square and rectangular drops. Externally insulate round drops.
- c. Round Duct:
- 1) Spiral Seam:
 - a) 28 ga (0.38 mm) minimum for ducts up to and including 14 inches (355 mm) in diameter.
 - b) 26 ga (0.46 mm) minimum for ducts over 14 inches (355 mm) and up to and including 26 inches (660 mm) in diameter.
 - 2) Longitudinal Seam:
 - a) 28 ga (0.38 mm) minimum for ducts up to and including 8 inches (200 mm) in diameter.
 - b) 26 ga (0.46 mm) minimum for ducts over 8 inches (200 mm) and up to 14 inches (355 mm) in diameter.
 - c) 24 ga (0.61 mm) minimum for ducts over 14 inches (355 mm) up to and including 26 inches (660 mm) in diameter.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Metal duct surface must be clean and free of moisture, contamination and foreign matter before applying duct sealer for interior and exterior ducts.

3.2 INSTALLATION

- A. Install internal ends of slip joints in direction of flow. Seal transverse and longitudinal joints air tight using specified duct sealer as per Manufacturer's written instructions. Cover horizontal and longitudinal joints on exterior ducts with two layers of specified tape installed with specified adhesive.
- B. Securely anchor ducts and plenums to building structure with specified duct hangers attached with screws. Do not hang more than one duct from a duct hanger. Brace and install ducts so they shall be free of vibration under all conditions of operation.
- C. Ducts shall not bear on top of structural members.
- D. Paint ductwork visible through registers, grilles, and diffusers flat black.
- E. Under no conditions will pipes, rods, or wires be allowed to penetrate ducts.

3.3 FIELD QUALITY CONTROL

- A. Field Tests:
 1. Air Test and Balance Testing as specified in Section 01 4546: 'Duct Testing, Adjusting, and Balancing'.
- B. Non-Conforming Work:
 1. Reseal transverse joint duct leaks and seal longitudinal duct joint leaks discovered during air test and balance procedures at no additional cost to Owner.

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END OF SECTION

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SECTION 23 3300**AIR DUCT ACCESSORIES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
1. Furnish and install duct accessories in specified ductwork as described in Contract Documents.
- B. Related Requirements:
1. Section 23 3001: 'Common Duct Requirements'.

1.2 REFERENCES

- A. Reference Standards:
1. ASTM International:
 - a. ASTM A653/A653M-18, 'Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process'.
 - b. ASTM C1071-16, 'Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material)'.
 - c. ASTM C1338-14, 'Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings'.

PART 2 - PRODUCTS**2.1 ACCESSORIES**

- A. Manufacturers:
1. Manufacturer Contact List:
 - a. AGM Industries, Brockton, MA www.agmind.com.
 - b. Air Balance Inc, Holland, OH www.airbalance.com.
 - c. Air-Rite Manufacturing, Bountiful, UT (801) 295-2529.
 - d. American Warming & Ventilating, Holland, OH www.american-warming.com.
 - e. Arrow United Industries, Wyalusing, PA www.arrowunited.com.
 - f. Cain Manufacturing Company Inc, Pelham, AL www.cainmfg.com.
 - g. C & S Air Products, Fort Worth, TX www.csairproducts.com.
 - h. CertainTeed Corp, Valley Forge, PA www.certainteed.com.
 - i. Cesco Products, Florence, KY www.cescoproducts.com.
 - j. Design Polymerics, Fountain Valley, CA www.designpoly.com.
 - k. Ductmate Industries Inc, East Charleroi, PA www.ductmate.com.
 - l. Duro Dyne, Bay Shore, NY www.durodyne.com.
 - m. Dyn Air Inc. Lachine, QB www.dynair.ca
 - n. Elgen Manufacturing Company, Inc. East Rutherford, NJ www.elgenmfg.com
 - o. Flexmaster USA Inc, Houston, TX www.flexmasterusa.com.
 - p. Greenheck Corp, Schofield, WI www.greenheck.com.
 - q. Gripnail Corp, East Providence, RI www.gripnail.com.
 - r. Hardcast Inc, Wylie, TX www.hardcast.com.
 - s. Hercules Industries, Denver, CO, www.herculesindustries.com.
 - t. Honeywell Inc, Minneapolis, MN www.honeywell.com.
 - u. Johns-Manville, Denver, CO www.jm.com.

- v. Kees Inc, Elkhart Lake, WI www.kees.com.
- w. Knauf Fiber Glass, Shelbyville, IN www.knauffiberglass.com.
- x. Manson Insulation Inc, Brossard, QB www.isolationmanson.com.
- y. Metco Inc, Salt Lake City, UT (801) 467-1572 www.metcospiral.com.
- z. Miracle / Kingco, Rockland, MA www.taccint.com.
- aa. Mon-Eco Industries Inc, East Brunswick, NJ www.mon-ecoindustries.com.
- bb. Nailor Industries Inc, Houston, TX www.nailor.com.
- cc. Owens Corning, Toledo, OH www.owenscorning.com.
- dd. Polymer Adhesive Sealant Systems Inc, Irving, TX www.polymeradhesives.com.
- ee. Pottorff Company, Fort Worth, TX www.pottorff.com.
- ff. Ruskin Manufacturing, Kansas City, MO www.ruskin.com.
- gg. Sheet Metal Connectors Inc, Minneapolis, MN www.smconnectors.com.
- hh. Tamco, Stittsville, ON www.tamco.ca.
- ii. Techno Adhesive, Cincinnati, OH www.technoadhesives.com.
- jj. Titus, Richardson, TX (972) 699-1030. www.titus-hvac.com
- kk. McGill AirSeal, Columbus, OH www.mcgillairseal.com.
- ll. Utemp Inc, Salt Lake City, UT (801) 978-9265.
- mm. Ventfabrics Inc, Chicago, IL www.ventfabrics.com.
- nn. Ward Industries, Grand Rapids MI www.wardind.com.
- oo. Young Regulator Co, Cleveland, OH www.youngregulator.com.

B. Materials:

1. Acoustical Liner System:

a. Duct Liner:

- 1) One inch (25 mm) thick, 1-1/2 lb (0.68 kg) density fiberglass conforming to requirements of ASTM C1071. Liner will not support microbial growth when tested in accordance with ASTM C1338.
- 2) Approved Products:
 - a) ToughGard by CertainTeed.
 - b) Duct Liner E-M by Knauf Fiber Glass.
 - c) Akousti-Liner by Manson Insulation.
 - d) Quiet R by Owens Corning.
 - e) Linacoustic RC by Johns-Manville.

b. Adhesive:

- 1) Approved Water-Based Products:
 - a) Cain: Hydrotak.
 - b) Design Polymeric: DP2501 or DP2502 (CMCL-2501).
 - c) Duro Dyne: WSA.
 - d) Elgen: A-410-WB.
 - e) Hardcast: Coil-Tack.
 - f) Hercules: Mighty Tough Adhesives MTA500 or MTA600.
 - g) Miracle / Kingco: PF-101.
 - h) Mon-Eco: 22-67 or 22-76.
 - i) Polymer Adhesive: Glasstack #35.
 - j) Techno Adhesive: 133.
 - k) McGill AirSeal: Uni-tack.
- 2) Approved Solvent-Based (non-flammable) Products:
 - a) Cain: Safetak.
 - b) Duro Dyne: FPG.
 - c) Hardcast: Glas-Grip 648-NFSE.
 - d) Miracle / Kingco: PF-91.
 - e) Mon-Eco: 22-24.
 - f) Polymer Adhesive: Q-Tack.
 - g) Techno Adhesive: 'Non-Flam' 106.
- 3) Approved Solvent-Based (flammable) Products:
 - a) Cain: HV200.
 - b) Duro Dyne: MPG.

- c) Hardcast: Glas-Grip 636-SE.
 - d) Miracle / Kingco: PF-96.
 - e) Mon-Eco: 22-22.
 - f) Polymer Adhesive: R-Tack.
 - g) Techno Adhesive: 'Flammable' 106.
- c. Fasteners:
- 1) Adhesively secured fasteners not allowed.
 - 2) Approved Products:
 - a) AGM Industries: 'DynaPoint' Series RP-9 pin.
 - b) Cain.
 - c) Duro Dyne.
 - d) Gripnail: May be used if each nail is installed by 'Grip Nail Air Hammer' or by 'Automatic Fastener Equipment' in accordance with Manufacturer's recommendations.
2. Flexible Equipment Connections:
- a. 30 oz closely woven UL approved glass fabric double coated with neoprene.
 - b. Fire retardant, waterproof, air-tight, resistant to acids and grease, and withstand constant temperatures of 200 deg F (93 deg C).
 - c. Approved Products:
 - 1) Cain: N-100.
 - 2) Duro Dyne: MFN.
 - 3) Dyn Air: CPN with G-90 galvanized off-set seam.
 - 4) Elgen: ZLN / SDN.
 - 5) Ventfabrics: Ventglas.
 - 6) Ductmate: ProFlex.
3. Duct Access Doors:
- a. General:
 - 1) Factory built insulated access door with hinges and sash locks, as necessary. Construction shall be galvanized sheet metal, 24 ga (0.635 mm) minimum.
 - 2) Fire and smoke damper access doors shall have minimum clear opening of 12 inches (300 mm) square or larger as shown on Drawings.
 - b. Rectangular Ducts:
 - 1) Approved Products:
 - a) Air Balance: Fire/Seal FSA 100.
 - b) Air-Rite: Model HAD-2.
 - c) Cesco: HDD.
 - d) Elgen: TAB Type / Hinge and Cam.
 - e) Flexmaster: Spin Door.
 - f) Kees: ADH-D.
 - g) Nailor: 08SH.
 - h) Pottorff: 60-HAD.
 - i) Ruskin: ADH-24.
 - j) United Enertech: L-95.
4. Dampers And Damper Accessories:
- a. Locking Quadrant Damper Regulators:
 - 1) Approved Products:
 - a) Duro Dyne: KS-385.
 - b) Dyn Air: QPS-385.
 - c) Elgen: EQR-4.
 - d) Ventfabrics: Ventline 555.
 - e) Young: No. 1.
 - b. Concealed Ceiling Damper Regulators:
 - 1) Approved Products:
 - a) Cain.
 - b) Duro Dyne.
 - c) Elgen.
 - d) Metco Inc.

- e) Ventfabrics: 666 Ventlok.
- f) Young: 301.
- c. Volume Dampers:
 - 1) Rectangular Duct:
 - a) Factory-manufactured 16 ga (1.6 mm) galvanized steel, single blade and opposed blade type with 3/8 inch (9.5 mm) axles and end bearings. Blade width 8 inches (200 mm) maximum. Blades shall have 1/8 inch (3 mm) clearance all around.
 - b) Damper shall operate within acoustical duct liner.
 - c) Provide channel spacer equal to thickness of duct liner.
 - d) Dampers above removable ceiling and in Mechanical Rooms shall have locking quadrant on bottom or side of duct. Otherwise, furnish with concealed ceiling damper regulator and cover plate.
 - e) Approved Products:
 - (1) Air-Rite: Model CD-2.
 - (2) American Warming: VC-2-AA.
 - (3) Arrow: OBDAF-207.
 - (4) C & S: AC40.
 - (5) Cesco: AGO.
 - (6) Daniel: CD-OB.
 - (7) Greenheck: VCD-20.
 - (8) Nailor: 1810 or 1820.
 - (9) Pottorff: CD-42.
 - (10) Ruskin: MD-35.
 - (11) United Enertech: MD-115.
 - (12) Utemp: CD-OB.
 - 2) Round Duct:
 - a) Factory-manufactured 20 ga (1.0 mm) galvanized steel, single blade with 3/8 inch (9.5 mm) axles and end bearings.
 - b) For use in outside air ducts.
 - c) Approved Products:
 - (1) Air Balance: Model AC-22.
 - (2) Air-Rite: Model CD-8.
 - (3) American Warming: V-22.
 - (4) Arrow: Type-70.
 - (5) C & S: AC21R.
 - (6) Cesco: MGG.
 - (7) Nailor: 1890.
 - (8) Pottorff: CD-21R.
 - (9) Ruskin: MDRS-25.
 - (10) United Enertech: RD.
- d. Backdraft Dampers:
 - 1) Backdraft blades shall be nonmetallic neoprene coated fiberglass type.
 - 2) Stop shall be galvanized steel screen or expanded metal, 1/2 inch (13 mm) mesh.
 - 3) Frame shall be galvanized steel or extruded aluminum alloy.
 - 4) Approved Products:
 - a) Air-Rite: Model BDD-3.
 - b) American Warming: BD-15.
 - c) C & S: BD30.
 - d) Pottorff: BD-51.
 - e) Ruskin: NMS2.
 - f) Utemp: BFEA.
- 5. Air Turns:
 - a. Single thickness vanes. Double thickness vanes not acceptable.
 - b. 4-1/2 inch (115 mm) wide vane rail. Junior vane rail not acceptable.
- 6. Branch Tap for Flexible Ductwork:

- a. Factory-manufactured rectangular-to-round 45 degree leading tap fabricated of 24 ga (0.635 mm) zinc-coated lock-forming quality steel sheets meeting requirements of ASTM A653, with G-90 coating.
 - b. One inch wide mounting flange with die formed corner clips, pre-punched mounting holes, and adhesive coated gasket.
 - c. Manual Volume Damper:
 - 1) Single blade, 22 ga (0.79 mm) minimum
 - 2) 3/8 inch (9.5 mm) minimum square rod with brass damper bearings at each end.
 - 3) Heavy-duty locking quadrant on 1-1/2 inch (38 mm) high stand-off mounting bracket attached to side of round duct.
 - d. Approved Products:
 - 1) ST-1HD by Air-Rite:
 - a) Nylon damper bearings approved for Air-Rite.
 - 2) STO by Flexmaster.
 - 3) HET by Sheet Metal Connectors.
- C. Fabrication:
- 1. Duct Liner:
 - a. Install mat finish surface on airstream side. Secure insulation to cleaned sheet metal duct with continuous 100 percent coat of adhesive and with 3/4 inch (19 mm) long mechanical fasteners 12 inches (300 mm) on center maximum unless detailed otherwise on Drawings. Pin all duct liner.
 - b. Accurately cut liner and thoroughly coat ends with adhesive. Butt joints tightly. Top and bottom sections of insulation shall overlap sides. If liner is all one piece, folded corners shall be tight against metal. Ends shall butt tightly together.
 - c. Coat longitudinal and transverse edges of liner with adhesive.
 - 2. Air Turns:
 - a. Permanently install vanes arranged to permit air to make abrupt turn without appreciable turbulence, in 90 degree elbows of above ground supply and return ductwork.
 - b. Quiet and free from vibration when system is in operation.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Duct Liner:
 - 1. Furnish and install acoustic lining in following types of rectangular ducts unless noted otherwise on Contract Documents:
 - a. Supply air.
 - b. Return air.
 - c. Transfer air.
 - d. Elbows, fittings, and diffuser drops greater than 12 inches (300 mm) in length.
 - 2. Do not install acoustic lining in round ducts.
- B. Flexible Connections: Install flexible inlet and outlet duct connections to each RTU.
- C. Dampers And Damper Accessories:
 - 1. Install concealed ceiling damper regulators.
 - a. Paint cover plates to match ceiling tile.
 - b. Do not install damper regulators for dampers located directly above removable ceilings or in Mechanical Rooms.
 - 2. Provide each take-off with an adjustable volume damper to balance that branch.
 - a. Anchor dampers securely to duct.
 - b. Install dampers in main ducts within insulation.

- c. Dampers in branch ducts shall fit against sheet metal walls, bottom and top of duct, and be securely fastened. Cut duct liner to allow damper to fit against sheet metal.
- d. Where concealed ceiling damper regulators are installed, provide cover plate.

END OF SECTION

SECTION 23 3346

FLEXIBLE DUCTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To:
 - 1. Furnish and install supply air branch duct runouts to diffusers as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 23 3001: Common Duct Requirements.

1.2 REFERENCES

- A. Reference Standards:
 - 1. National Fire Protection Association / American National Standards Institute:
 - a. NFPA 90A: 'Installation of Air-Conditioning and Ventilating Systems' (2018 or most recent edition adopted by AHJ).
 - 2. Underwriters Laboratories:
 - a. UL 181, 'Factory-Made Ducts and Air Connectors' (11th Edition).
 - b. UL 181B, 'Closure Systems for Use With Flexible Air Ducts and Air Connectors' (3rd Edition).

PART 2 - PRODUCTS

2.1 SYSTEM

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. JP Lamborn Co., Fresno CA www.jpflex.com.
 - b. Flexmaster USA Inc, Houston, TX www.flexmasterusa.com or Flexmaster Canada Ltd, Richmond Hill, ON (905) 731-9411.
 - c. Thermaflex by Flexible Technologies, Abbeville, SC or Mississauga, ON www.thermaflex.net.
- B. Materials:
 - 1. Ducts:
 - a. Formable, flexible, circular duct which shall retain its cross-section, shape, rigidity, and shall not restrict airflow after bending.
 - b. Insulation:
 - 1) Nominal 1-1/2 inches (38 mm), 3/4 lb per cu ft (12 kg per cu m) density fiberglass insulation with air-tight, polyethylene or polyester core, sheathed in seamless vapor barrier jacket factory installed over flexible assembly.
 - c. Assembly, including insulation and vapor barrier, shall meet Class I requirement of NFPA 90A and be UL 181 rated, with flame spread of 25 or less and smoke developed rating of 50 or under.
 - d. Approved Products:
 - 1) PR-25 by JP Lambornes.
 - 2) Flex-Vent KP by Thermaflex by Flexible Technologies.

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- 3) Type 1B Insulated by Flexmaster.
- 2. Cinch Bands: Nylon, 3/8 inch (9.5 mm) removable and reusable type.
 - a. Listed and labeled in accordance with Standard UL 181B and labeled 'UL 181 B-C'.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install duct in fully extended condition free of sags and kinks, using 72 inch (1 800 mm) maximum lengths.
- B. Make duct connections by coating exterior of duct collar for 3 inches (75 mm) with duct sealer and securing duct in place over sheet metal collar with specified cinch bands.

END OF SECTION

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SECTION 23 3401

EXHAUST FANS

PART 1 - GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To:
 1. Furnish and install exhaust fans as described in Contract Documents.
- B. Related Requirements:
 1. Section 23 3001: Common Duct Requirements.
 2. Division 26: Control device and electrical connection.

1.2 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 1. Bear AMCA seal and UL label.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer Contact List:
 1. Acme Engineering & Manufacturing Corp, Muskogee, OK www.acmefan.com.
 2. Broan-Nu Tone LLC, Harford, WI www.broan.com.
 3. Carnes Co., Verona, MI www.carnes.com.
 4. Loren Cook Co., Springfield, MO www.lorencook.com.
 5. Soler & Palau (S&P USA Ventilation Systems, LLC), Jacksonville FL www.solerpalau-usa.com.

2.2 MANUFACTURED UNITS

- A. Ceiling Mounted Exhaust Fans:
 1. Acoustically insulated housings. Sound level rating of 5.0 sones maximum for CFM and static pressure listed on Contract Drawings.
 2. Include chatterproof integral back-draft damper with no metal-to-metal contact.
 3. True centrifugal wheels.
 4. Entire fan, motor, and wheel assembly shall be easily removable without disturbing housing.
 5. Suitably ground motors and mount on rubber-in shear vibration isolators.
 6. Provide wall or roof cap, if required.
 7. Approved Products:
 - a. Acme: VQ.
 - b. Broan: LoSone.
 - c. Carnes: VCD.
 - d. Cook: Gemini.
 - e. Soler & Palau: FF.

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PART 3 - EXECUTION

3.1 INSTALLATION

- A. Anchor fan units securely to structure.

END OF SECTION

14922 / 2022 New Construction Master	23 3401 - 2	Exhaust Fans
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SECTION 23 3713**DIFFUSERS, REGISTERS, AND GRILLES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
1. Furnish and install diffusers, registers, and grilles connected to ductwork as described in Contract Documents.
- B. Related Requirements:
1. Section 23 3001: 'General Duct Requirements'.

1.2 SUBMITTALS

- A. Maintenance Material Submittals:
1. Tools: Leave tool for removing core of each different type of grille for building custodian.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Manufacturer Contact List:
1. Carnes Co, Verona, MI www.carnes.com.
 2. J & J Register, Grand Rapids, MI www.jandjreg.com.
 3. Krueger Air System Components, Richardson, TX www.krueger-hvac.com.
 4. Metal*Aire by Metal Industries Inc, Clearwater, FL www.metalaire.com.
 5. Nailor Industries Inc, Houston, TX or Weston, ON www.nailor.com.
 6. Price Industries Inc, Suwanee, GA www.price-hvac.com or E H Price Ltd, Winnipeg, MB (204) 669-4220.
 7. Titus, Richardson, TX www.titus-hvac.com.
 8. Tuttle & Bailey, Richardson, TX www.tuttleandbailey.com.

2.2 MANUFACTURED UNITS

- A. Ceiling Return And Transfer Grilles:
1. Finish: Off-white baked enamel.
 2. 1/2 inch (12.7 mm) spacing.
 3. Provide 12x24 or 24x24 ceiling module for lay-in ceiling locations.
 4. Approved Products:
 - a. Carnes: RSLA.
 - b. J & J: S90H.
 - c. Krueger: S85H.
 - d. Metal*Aire: SRH.
 - e. Nailor: 6155H.
 - f. Price: 535.
 - g. Titus: 355RL or 355 RS.
 - h. Tuttle & Bailey: T75D.

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- B. Low Sidewall Return Grilles:
1. Finish: Off-white baked enamel.
 2. 38 or 45 degree deflection.
 3. Approved Products:
 - a. Carnes: RSHA.
 - b. J & J: S-590.
 - c. Krueger: S480H.
 - d. Metal*Aire: HD-RH.
 - e. Nailor: 6145H-HD.
 - f. Price: 91.
 - g. Titus: 33RL or 33RS.
 - h. Tuttle & Bailey: T115D.
- C. Hard Ceiling Diffusers:
1. Finish: Off-white baked enamel.
 2. Approved Products:
 - a. Carnes: SKSA.
 - b. J & J: R-1400.
 - c. Krueger: SH.
 - d. Metal*Aire: 5500S.
 - e. Nailor: 65OOB.
 - f. Price: SMD-6.
 - g. Titus: TDC-6.
 - h. Tuttle & Bailey: M.
- D. Lay-In Ceiling Diffusers:
1. Finish: Off-white baked enamel.
 2. Removable inner core assembly.
 3. Performance Standard: Titus TMSA Border Type 3.
 4. Approved Manufacturers:
 - a. Carnes.
 - b. Krueger.
 - c. Metal*Aire.
 - d. Nailor.
 - e. Price.
 - f. Titus.
 - g. Tuttle & Bailey.
- E. Ceiling Slot Diffusers:
1. Linear slot type with (4)1" slots, 180 deg adjustable air pattern and aluminum construction.
 2. Provide non-insulated plenum and Type 1B border for lay-in ceiling.
 3. Finish: Off-white baked enamel.
 4. Class One Quality Standard: Titus MLT-39.
 5. Approved Manufacturers. See Section 01 6200.
 - a. Krueger.
 - b. Metal*Aire.
 - c. Titus.
 - d. Nailor: 5010.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Anchor securely into openings. Secure frames to ductwork by using four sheet metal screws, one per side.

END OF SECTION

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SECTION 23 3723

HVAC GRAVITY VENTILATORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To:
 - 1. Furnish and install roof vents as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 23 3001: 'Common Duct Requirements'.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer List:
 - 1. Air-Rite Manufacturing, Bountiful, UT (801) 295-2529.
 - 2. Breidert Air Products, Jacksonville, FL www.breidert.com.
 - 3. Carnes Company, Verona, WI www.carnes.com.
 - 4. Greenheck Fan Corporation, Schofield, WI www.greenheck.com.
 - 5. Loren Cook Co, Springfield, MO www.lorencook.com.
 - 6. United Enertech Corporation, Chattanooga, TN www.unitedenertech.com.
 - 7. Vent Products Co, Inc, Chicago, IL www.ventprod.com.

2.2 MANUFACTURED UNITS

- A. Louvered Penthouses:
 - 1. Fabricated from (0.081 inch **2.15 mm**) extruded aluminum.
 - a. All welded construction.
 - b. Screws or rivets will not be allowed.
 - 2. Blades:
 - a. Horizontal at 45 degree angle with return bends at upper edges.
 - b. Welded, mitered corners for continuous blade effect.
 - 3. Bird Screens: 1/2 inch (**13 mm**) square mesh 16 ga (**1.6 mm**) aluminum in extruded aluminum, rewirable frames on interior of louvers.
 - 4. Penthouse Finish: Clear anodized aluminum.
 - 5. Curbs:
 - a. Galvanized steel, insulated, factory-fabricated curb.
 - b. Insulation: Minimum 1-1/2 inches (**38 mm**) thick, 3 lb **48 kg per cubic m** density fiber glass.
 - c. Curb Extension: 8 inches (**200 mm**) above finished roof level.
 - 6. Provide gravity back draft damper on Exhaust Air Penthouses.
 - 7. Approved Products:
 - a. Air-Rite Manufacturing: Model LPE-1.
 - b. Breidert: Model RLX.
 - c. Carnes: GLAB.
 - d. Cook: Type TRE.
 - e. Greenheck: WIH/WRH.
 - f. United Enertech: Model PEL-4.
 - g. Vent Products: Model 7100.

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PART 3 - EXECUTION: Not Used

END OF SECTION

SECTION 23 4100**AIR FILTERS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install filters used in mechanical equipment.
- B. Related Requirements:
 - 1. Section 23 3001: 'Common Duct Requirements'.
 - 2. Section 23 7413: 'Packaged, Outdoor, Central-Station Air Handling Units'.

PART 2 - PRODUCTS**2.1 MANUFACTURED UNITS**

- A. Packaged RTU Units:
 - 1. Two inch (50 mm) thick pleated throw-away type as recommended by Unit Manufacturer with ANSI/ASHRAE 52.2 MERV rating of 8 or higher.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Provide ample access for filter removal.

3.2 FIELD QUALITY CONTROL

- A. Inspection: At date of Substantial Completion, air filters shall be new, clean, and approved by Owner's representative.

END OF SECTION

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SECTION 23 5135**AIR PIPING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
1. Furnish and install heating equipment exhaust piping and combustion air intake piping as described in Contract Documents.
- B. Related Requirements:
1. Sections Under 09 9000 Heading: Painting.
 2. Section 22 3423: 'Gas Domestic Water Heaters'.
 3. Section 23 0501: 'Common HVAC Requirements'.

1.2 REFERENCES

- A. Reference Standards:
1. ASTM International:
 - a. ASTM D1785-12, 'Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120'.
 - b. ASTM D2564-12, 'Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems'.
 - c. ASTM D2661-11, 'Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings'.
 - d. ASTM D2665-14, 'Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings'.

PART 2 - PRODUCTS**2.1 ASSEMBLIES**

- A. Manufacturers:
1. Manufacturer Contact List:
 - a. Armaflex by Armacell, Mebane, NC www.armaflex.com.
 - b. Nomaco, Youngsville, NC www.nomacokflex.com.
- B. Materials:
1. Air Piping: Schedule 40 pipe and fittings meeting requirements of ASTM D1785, ASTM D2661, or ASTM D2665.
 2. Solvent Cement and Adhesive Primer:
 - a. Use PVC solvent cement that has a VOC content of 510 g/L or less if required by local AHJ if required.
 - b. Use adhesive primer that has a VOC content of 550 g/L or less if required by local AHJ if required.
 - c. Meet requirements of ASTM F656 for cement primer and ASTM D2564 for pipe cement.
 3. Flexible Foamed Pipe Insulation:
 - a. Thickness:
 - 1) **1/2 inch (13 mm)** for **2 through 3 inch (50 through 75 mm)** outside diameter pipe.
 - 2) **1/2 inch (13 mm)** sheet for fittings as recommended by Manufacturer.
 - b. Approved Products:

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- 1) Tubolit by Armaflex.
- 2) ImcoLock or Therma-Cel by Nomaco K-Flex.
- 4. Insulation Joint Sealer:
 - a. Approved Products:
 - 1) 520 by Armaflex.
 - 2) R-320 by Nomaco K-Flex.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation For Condensing Water Heaters:
 - 1. Run individual vent and individual combustion intake piping from each water heater to roof termination as recommended by Water Heater Manufacturer. Concentric roof termination kit may be used if approved by and provided by Water Heater Manufacturer. Slope lines downward toward water heater.
 - 2. Slope combustion chamber exhaust drain downward to floor drain.
- B. Support:
 - 1. Support concentric roof termination kit at ceiling or roof line with 20 ga (0.912 mm) sheet metal straps as detailed on Drawings.
 - 2. Support horizontal and sloping sections of pipe with 1 inch (25 mm) wide 20 ga (1.0058 mm) galvanized steel straps. Anchor securely to structure, not allowing pipe to sway.
- C. Insulation:
 - 1. General:
 - a. Install insulation in snug contact with pipe and in accordance with Manufacturer's recommendations.
 - b. Slip insulation on piping before piping sections and fittings are assembled keeping slitting of insulation to a minimum.
 - c. Joints:
 - 1) Place 'slit' joint seams of insulation exposed outside building on bottom of pipe.
 - 2) Stagger joints on layered insulation.
 - 3) Seal joints in insulation.
 - d. Paint exterior exposed insulation with two coats of finish recommended by Insulation Manufacturer, color selected by Architect.
 - 2. Install specified insulation on PVC air piping serving mechanical equipment as follows
 - a. Combustion air PVC piping in truss space and in attic.
 - b. Combustion vent PVC piping in attic, in truss space, and above roof.
 - c. Insulate fittings with sheet insulation and as recommended by Manufacturer.

END OF SECTION

14922 / 2022 New Construction Master	23 5135 - 2	Air Piping
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SECTION 23 7413

PACKAGED, OUTDOOR, CENTRAL-STATION AIR HANDLING UNITS

PART 1 - GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To:
 - 1. Furnish and install packaged air conditioning units as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 23 0501: 'Common HVAC Requirements'.

1.2 REFERENCES

- A. Definitions:
 - 1. Compressor: Pump that increases vapor (refrigerant or air) pressure from one level to a higher level of pressure.
 - 2. Condenser: Device used to condense refrigerant in a cooling system.
 - 3. Condenser Coils: In an air conditioner, the coil dissipates heat from the refrigerant, changing the refrigerant from vapor to liquid.
 - 4. Condensing Unit: Outside section of an air conditioning system which pumps vaporized refrigerant from the evaporator, compresses it, liquefies it in the condenser and returns it to the evaporator coil. The outdoor portion of a split system air conditioner contains the compressor and outdoor coil.
 - 5. EER (Energy Efficiency Rating): Rating that lists how many BTU's per hour are used for each watt of power it draws.
 - 6. Refrigerant: Absorbs heat by a change of state (evaporation) from liquid to a gas, and releases heat by a change of state (condenses) from gas back to a liquid.
 - 7. SEER (Seasonal Energy Efficiency Ratio): Measure of cooling efficiency for air conditioners and heat pumps. A ratio of total cooling in comparison to electrical energy input in watts per hour. Higher the seer, the more energy efficient the unit.

1.3 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Air-Cooled Condensing Unit Section shall be UL approved and rated according to ARI Standards.
 - 2. Air delivery of units certified in accordance with standard test code for centrifugal fans adopted by AMCA.
 - 3. Furnace sections shall be AGA approved.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
 - 1. Ship units with lifting angles and fully charged with refrigerant R-410a.

1.5 WARRANTY

- A. Manufacturer Warranty:
 - 1. 5 year warranty on compressors.

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PART 2 - PRODUCTS

2.1 PERFORMANCE

- A. Capacities:
 - 1. SEER rating, as defined by ARI, shall be not less than 14.0 for units 5 tons and smaller.

2.2 MANUFACTURED UNITS

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Carrier Corporation:
 - 1) Carrier National: Bradley Brunner (270) 282-1241 Bradley.M.Brunner@Carrier.utc.com.
 - 2) Carrier Utah: Rich Carpenter (Contractors HVAC Supply) (801) 410-6077 e-mail rcarpent@mtncom.net.
 - b. Lennox Industries:
 - 1) For pricing and information call: Lennox National Account at 1-800-367-6285.
 - 2) Lennox National Contact: Cody Jackson (801) 736-8904 Cody.Jackson@LennoxInd.com.
 - c. Honeywell Minneapolis, MN www.honeywell.com.
 - d. Trane Company:
 - 1) Salt Lake Trane, attention: Jason Bradford (801) 486-0500 www.Jason.Bradford@trane.com.
- B. Air Conditioning Units:
 - 1. Units shall be completely factory assembled and tested. Units shall include following components and features:
 - a. Condenser coils.
 - b. Condenser fans and motors.
 - c. Interconnected wiring.
 - d. Pre-wired control panel.
 - e. Filter section.
 - f. Factory installed 100 percent modulating economizer cycle including motorized dampers and controls with modulating power exhaust for unit of 3 tons and larger.
 - g. Corrosion-resistant all-weather cabinet.
 - 2. Air-Cooled Condensing Unit Section:
 - a. Strainer-dryer.
 - b. Time delay or cycle protection to prevent short cycling.
 - c. Condenser Coil: **1/2 inch (13 mm)** outside diameter copper tube with aluminum fins. Include condenser coil hail guard assembly.
 - d. Compressors:
 - 1) Equip with crankcase heater.
 - 2) Fully hermetic, two-stage, scroll type internally protected. Independent circuits for units 7-1/2 tons and larger.
 - 3) On units 3 tons and larger, mount on factory rubber-shock, internal spring vibration isolators.
 - e. Condenser Fan: Direct driven type propeller fan.
 - f. Refrigerant Coils: Constructed of copper tubes with mechanically bonded aluminum plate fins.
 - g. Refrigerant lines shall have:
 - 1) Flexible connections.
 - 2) Suction and liquid line service valves.
 - 3) Charging valves.
 - 4) Receiver valve.
 - 3. Furnace Section:
 - a. Units Smaller Than 3 Tons:
 - 1) Aluminized or chromized heat exchanger.

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- 2) Induced-draft motor with solid-state sensor for adequate airflow.
- b. Units 3 Tons And Larger:
 - 1) Tubular section type of 20 ga (0.95 mm) steel minimum with 1.2 mil (0.03 mm) nominal aluminum-silicone alloy coating.
 - 2) Factory-installed induced draft blower.
- c. Gas shut-off valve.
- d. High limit switches.
- e. Fan switch safety pilot and control transformer.
- f. Automatic electric ignition.
- 4. Fan Section:
 - a. Indoor Blower (evaporator fan):
 - 1) Vane Axial fan design with slow ramp up to speed capabilities.
 - 2) ECM motor with permanently lubricated bearings.
 - 3) Automatic-reset thermal overload protection.
 - b. Condenser fan shall be direct-driven propeller type and discharge upward. Condenser fan shall have high impact composite blades formed into one piece without blade fasteners or connectors and be dynamically balanced. Condenser motor shall be totally enclosed.
 - c. Constructed and tested in accordance with AMCA requirements.
 - d. Furnish with flexible connections with weather protection on supply and return air take-offs.
 - e. Evaporator-fan cabinet interior shall be insulated with 1/2 inch (13 mm) thick minimum fiber glass insulation coated on air side. Use Aluminum foil-faced insulation in heating compartment.
- 5. Controls:
 - a. Low ambient and dual pressure.
 - b. Pre-wired.
 - c. Low voltage control circuit with fuse protection on 24 V transformer side.
 - d. Solid state compressor protection for following factory-supplied safeties:
 - 1) Compressor over-temperature, over-current.
 - 2) Loss of charge / low-pressure switch.
 - 3) Freeze protection thermostat, evaporator coil.
 - 4) High-pressure switch.
 - e. Following minimum protection for heating section:
 - 1) High temperature limit switch.
 - 2) Flame rollout switch.
 - 3) Flame proving controls on units 3 tons and larger.
- 6. Safety Controls:
 - a. Factory Supplied Duct Smoke Detectors mounted in Supply Air Section of Roof top Cabinet:
 - 1) Description:
 - a) Intelligent low-flow photoelectric duct smoke detector with flashscan. Photo electric smoke detector mounted in systems with airflow greater than 2000 CFM.
 - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) Model FSD-751 RP by Notifier by Honeywell.
- 7. Cabinets:
 - a. 3 Ton And Larger Units: Galvanized and weatherproof, with baked enamel finish on externally exposed surfaces and primed interior panel surfaces. Evaporator fan, compressor, and filter panels shall be hinged.
- 8. Acceptable Manufacturers:
 - a. Class One Quality Standard: Carrier 48FC:
 - 1) Carrier.
 - 2) Lennox.
 - 3) Trane.
 - 4) Equal as approved by Architect before installation. See Section 01 6200.

2.3 ACCESSORIES

- A. Roof Curbs:
 - 1. Description:
 - a. Manufacturer's 14 inch tall roof curb.

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- b. Refer to Architectural details for installation to structure.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install units on accessory roof curbs.
- B. Set minimum outside air set point.
- C. Install gas regulator so that it is not in direct path of power exhaust discharge.
- D. Do not install electrical disconnect so it interferes with access to units.

3.2 FIELD QUALITY CONTROL

- A. Manufacturer Services:
 - 1. Equipment Manufacturer to provide factory start-up service. This includes package roof top unit and economizer with power or barometric exhaust.

END OF SECTION

14922 / 2022 New Construction Master	23 7413 - 4	Packaged, Outdoor, Central-Station Units
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**SECTION 23 8333
ELECTRIC RADIANT HEATERS**

PART 1 - GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To:
 - 1. Furnish and install wall heaters as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 23 0501: 'Common HVAC Requirements'.
 - 2. Section 23 0933: 'Electric and Electronic Control System for HVAC'.
 - 3. Division 26: Electrical service and connections.

1.2 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Units shall be UL listed and comply with NEC.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

- A. Manufacturers:
 - 1. Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories:
 - a. Berko, Marley Electric Co, Bennettsville. SC www.berkomeh.com.
 - b. QMark, Marley Electric Co, Bennettsville, SC www.qmarkmeh.com.
 - c. Raywall, Johnson, TN www.raywall.com.
- B. Wall Heaters:
 - 1. Surface mounting.
 - 2. Sheet metal casing.
 - 3. Heating element shall be encased in steel finned casting and protected by thermal switch.
 - 4. Fan motor shall be permanently lubricated, and dust protected bearings.
 - 5. Fan shall be vibration free.
 - 6. Units shall be controlled automatically by external thermostat provided as specified in Section 23 0933 'Electric and Electronic Control System for HVAC'.
 - 7. UL listed.
 - 8. Open coil element or enclosed in steel casing.
 - 9. Thermal cutout with indicator light and one time thermal fuse.
 - 10. Finish: Baked-on enamel.
 - 11. Design Standard. Q Mark QFG22281F (2.2KW) controller used with these plans can only handle 12.5 amps.
 - 12. Surface mounting, include backbox (Catalog number GFRBB).

PART 3 - EXECUTION: Not Used

END OF SECTION

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SECTION 26 0501**COMMON ELECTRICAL REQUIREMENTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
1. General electrical system requirements and procedures.
 2. Perform excavating and backfilling work required by work of this Division as described in Contract Documents.
 3. Make electrical connections to equipment provided under other Sections. Furnish and install Penetration Firestop Systems at electrical system penetrations as described in Contract Documents.
- B. Products Furnished But Not Installed Under This Section:
1. Anchor bolts and templates for exterior lighting equipment bases.
- C. Related Requirements:
1. Section 07 8400: 'Firestopping' for quality of Penetration Firestop Systems to be used on Project and submittal requirements.
 2. Section 31 2316: 'Excavation' for criteria for performance of excavating.
 3. Section 31 2323: 'Fill' for criteria for performance of backfilling.

1.2 REFERENCES

- A. Reference Standards:
1. National Fire Protection Association / American National Standards Institute:
 - a. NFPA 70, 'National Electrical Code (NEC)' (2017 or most recent edition adopted by AHJ).
 2. National Electrical Manufacturing Association Standards (NEMA):
 - a. NEMA 250-2018, 'Enclosure for Electrical Equipment (1000 Volts Maximum)'.

1.3 SUBMITTALS

- A. Action Submittals:
1. Product Data:
 - a. Provide following information for each item of equipment:
 - 1) Catalog Sheets.
 - 2) Assembly details or dimension drawings.
 - 3) Installation instructions.
 - 4) Manufacturer's name and catalog number.
 - 5) Name of local supplier. Furnish such information for following equipment:
 - 1) Section 26 2417: 'Circuit-Breaker Panelboards'.
 - 2) Section 26 2726: 'Wiring Devices' for lighting control equipment.
 - 3) Section 26 2773: 'Chime systems'.
 - 4) Section 26 2816: 'Enclosed Switches And Circuit Breakers'.
 - 5) Section 26 5100: 'Interior Lighting Fixtures'.
 - 6) Section 26 5200: 'Emergency Lighting' for battery units.
 - 7) Section 26 5600: 'Exterior Lighting' for fixtures, poles, and associated control equipment.
 - c. Do not purchase equipment before approval of product data.

2. Shop Drawings:
 - a. Submit on Panelboards:
 - b. Indicate precise equipment to be used, including all options specified. Indicate wording and format of nameplates where applicable. Submit in three-ring binder with hard cover.

- B. Informational Submittals:
 1. Test And Evaluation Reports:
 - a. Report of site tests, before Substantial Completion.
 2. Qualification Statement:
 - a. Electrical Subcontractor:
 - 1) Provide Qualification documentation if requested by Architect or Owner.
 - b. Installer:
 - 1) Provide Qualification documentation if requested by Architect or Owner.

- C. Closeout Submittals:
 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Operations and Maintenance Data:
 - 1) Provide operating and maintenance instructions for each item of equipment submitted under Product Data.
 - b. Record Documentation:
 - 1) Manufacturers documentation:
 - a) Manufacturer's literature.
 - b) Include copy of approved shop drawings.

1.4 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 1. NEC and local ordinances and regulations shall govern unless more stringent requirements are specified.
 2. Material and equipment provided shall meet standards of NEMA or UL and bear their label wherever standards have been established and label service is available.

- B. Qualifications: Requirements of Section 01 4301 applies, but not limited to following:
 1. Electrical Subcontractor:
 - a. Company specializing in performing work of this section.
 - 1) Minimum five (5) years experience in electrical installations.
 - 2) Minimum five (5) satisfactorily completed installations in past three (3) years of projects similar in size, scope, and complexity required for this project before bidding.
 - b. Upon request, submit documentation.
 2. Installer:
 - a. Licensed for area of Project.
 - b. Designate one (1) individual as project foremen who shall be on site at all times during installation and experienced with installation procedures required for this project.
 - c. Upon request, submit documentation.

PART 2 - PRODUCTS

2.1 SYSTEMS

- A. Performance:
 1. Design Criteria:
 - a. Materials and equipment provided under following Sections shall be by same Manufacturer:
 - 1) Section 26 2417: Panelboards.
 - 2) Section 26 2816: Enclosed Switches And Circuit Breakers.

PART 3 - EXECUTION

3.1 INSTALLERS

- A. Acceptable Installers. See Section 01 4301:
1. Meet Quality Assurance Installer Qualifications as specified in Part 1 of this specification.

3.2 EXAMINATION

- A. Verification Of Conditions:
1. Confirm dimensions, ratings, and specifications of equipment to be installed and coordinate these with site dimensions and with other Sections.

3.3 INSTALLATION

- A. General:
1. Locations of electrical equipment shown on Drawings are approximate only. Field verify actual locations for proper installation.
 2. Coordinate electrical equipment locations and conduit runs with those providing equipment to be served before installation or rough in.
 - a. Notify Architect of conflicts before beginning work.
 - b. Coordinate locations of power and lighting outlets in mechanical rooms and other areas with mechanical equipment, piping, ductwork, cabinets, etc, so they will be readily accessible and functional.
 3. Work related to other trades which is required under this Division, such as cutting and patching, trenching, and backfilling, shall be performed according to standards specified in applicable Sections.
- B. Install Penetration Firestop System appropriate for penetration at electrical system penetrations through walls, ceilings, and top plates of walls.

3.4 FIELD QUALITY CONTROL

- A. Field Tests:
1. Test systems and demonstrate equipment as working and operating properly. Notify Architect before test. Rectify defects at no additional cost to Owner.
 2. Measure current for each phase of each motor under actual final load operation, i.e. after air balance is completed for fan units, etc. Record this information along with full-load nameplate current rating and size of thermal overload unit installed for each motor.

3.5 CLOSEOUT ACTIVITIES

- A. Training:
1. Provide competent instructor for three (3) days to train Owner's maintenance personnel in operation and maintenance of electrical equipment and systems. Factory representatives shall assist this instruction as necessary. Schedule instruction period at time of final inspection.

END OF SECTION

SECTION 26 0503**ELECTRICAL UTILITY SERVICES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install service as described in Contract Documents and as required by local serving agency.
 - 2. Complete cost of service.

- B. Related Requirements:
 - 1. Section 03 3053: Transformer pad.
 - 2. Section 26 0501: Common Electrical Requirements.
 - 3. Local utility shall furnish and install primary underground service including transformer, conductors, current transformers, metering conductors, and meter.

PART 2 - PRODUCTS: Not Used**PART 3 - EXECUTION****3.1 INSTALLATION**

- A. Interface With Other Work: Coordinate with serving agency on all items, especially service entrance fittings, meter sockets, and current transformer (C/T) boxes where required.

END OF SECTION

SECTION 26 0519**LINE-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 1. Quality of conductors used on Project except as excluded below.
- B. Related Requirements:
 1. Section 23 0933: 'Electric and Electronic Control System for HVAC' for conductors and cables for temperature control system.
 2. Section 26 0501: 'Common Electrical Requirements'.

1.2 REFERENCES

- A. Definitions:
 1. Line Voltage: Over 70 Volts.
- B. Reference Standards:
 1. National Fire Protection Association:
 - a. NFPA 70, 'National Electric Code (NEC)' (2017 or most recent edition adopted by AHJ including all applicable amendments and supplements).
 - 1) Article 334, "Nonmetallic-Sheathed Cable, Types NM, NMC And NMS".

PART 2 - PRODUCTS**2.1 SYSTEMS**

- A. Line Voltage Conductors:
 1. Copper with AWG sizes as shown:
 - a. Minimum size shall be No. 12 except where specified otherwise.
 - b. Conductor size No. 8 and larger shall be stranded.
 2. Insulation:
 - a. Standard Conductor Size No. 10 And Smaller: 600V type THWN or XHHW (75 deg F (24 deg C)).
 - b. Standard Conductor Size No. 8 And Larger: 600V Type THW, THWN, or XHHW (75 deg F (24 deg C)).
 - c. Higher temperature insulation as required by NFPA 70 or local codes.
 3. Colors:
 - a. 208Y / 120 V System:
 - 1) Black: Phase A.
 - 2) Red: Phase B.
 - 3) Blue: Phase C.
 - 4) Green: Ground.
 - 5) White: Neutral.
 - b. Conductors size No. 10 and smaller shall be colored full length. Tagging or other methods for coding of conductors size No. 10 and smaller not allowed.
 - c. For feeder conductors larger than No. 10 at pull boxes, gutters, and panels, use painted or taped band or color tag color-coded as specified above.

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- B. Line Voltage Cables:
1. Non-Metallic Sheathed Cable (NM) and Metal Clad Cable (MC) may be used as restricted below:
 - a. Copper conductors.
 - b. Sizes #12 through #8.
 - c. Use only in indoor dry locations where:
 - 1) Not subject to damage.
 - 2) Not in contact with earth.
 - d. Not in concrete.
 - e. Not where exposed, visible, accessible or not concealed inside a 15 minute fire barrier (such as sheet rock walls).
 - f. Not over suspended ceilings.
 - g. As restricted by NFPA 70 Article 334.
 2. Metal Clad Cable (MC) may be used as restricted below:
 - a. Copper conductors.
 - b. Sizes #12 through #8.
 - c. Use only in indoor dry locations where:
 - 1) Not subject to damage.
 - 2) Not in contact with earth.
 - 3) Not in concrete.
- C. Cord Sets For Ranges: Three pole, 4 wire grounding, 125/250V, NEMA 14-50P plug, 48 inch (1 200 mm) cord length minimum.
- D. Standard Connectors:
1. Conductors No. 8 And Smaller: Steel spring wire connectors.
 2. Conductors Larger Than No. 8: Pressure type terminal lugs.
 3. Connections Outside Building: Watertight steel spring wire connections with waterproof, non-hardening sealant.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General:
1. Conductors and cables shall be continuous from outlet to outlet.
 2. Do not use direct burial cable.
- B. Line Voltage Conductors:
1. Install conductors in raceway where indicated on Contract Drawings. Run conductors of different voltage systems in separate conduits.
 2. Route circuits at own discretion, however, circuiting shall be as shown in Panel Schedules. Group circuit homeruns to panels as shown on Contract Drawings.
 3. Neutrals:
 - a. On three-phase, 4-wire systems, do not use common neutral for more than three circuits.
 - b. On single-phase, 3-wire systems, do not use common neutral for more than two circuits.
 - c. Run separate neutrals for each circuit where specifically noted on Contract Drawings.
 - d. Where common neutral is run for two or three home run circuits, connect phase conductors to breakers in panel which are attached to separate phase legs:
 - 1) Provide breaker tie so that all circuits that share common neutral are simultaneously disconnected.
 - 2) Neutral conductors shall be of same size as phase conductors unless specifically noted otherwise.
 4. Pulling Conductors:
 - a. Do not pull conductors into conduit until raceway system is complete and cabinets and outlet boxes are free of foreign matter and moisture.
 - b. Do not use heavy mechanical means for pulling conductors.

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- c. Use only listed wire pulling lubricants.
- C. Line Voltage Cables:
1. Route circuits at own discretion, however, circuiting and numbering shall be as shown in Panel Schedules.
 2. Support cables using approved staples, cable ties, straps, hangers, or similar fittings, spaced as required.
 3. Where installing in framing, do not bore holes in joists or beams outside center 1/3 of member depth or within 24 inches (600 mm) of bearing points. Do not bore holes in vertical framing members outside center 1/3 of member width. Holes shall be one inch diameter maximum.
 4. Conceal cables within ceilings and walls of finished areas. Cables may be exposed in unfinished areas but not run on floors of mechanical equipment spaces or in such a way that they obstruct access to, operation of, or servicing of equipment.
 5. Install exposed cables parallel to or at right angles to building structure lines.
 6. Keep cables 6 inches (150 mm) minimum from hot water pipes.
 7. Do not support cables from mechanical ducts or duct supports without Architect's written approval.
 8. Prohibited procedures:
 - a. Boring holes for installation of cables in vertical truss members.
 - b. Notching of structural members for installation of cables.

END OF SECTION

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SECTION 26 0523**CONTROL-VOLTAGE ELECTRICAL CABLES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install control-voltage electrical cables as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 23 0933: 'Electric And Electronic Control System For HVAC' for cables for Temperature Control System cables.
 - 2. Section 26 0501: 'Common Electrical Requirements'.
 - 3. Section 26 0924: 'Lighting Control System'.
 - 4. Section 27 1501: 'Communications Horizontal Cabling' for voice and data system cables.
 - 5. Section 27 4117: 'Video Systems' for cables.
 - 6. Section 27 5117: 'Audio Systems' for cables.
 - 7. Section 28 3101: 'Fire Detection And Alarm System' for cables.

1.2 REFERENCES

- A. Definitions:
 - 1. Control Voltage: 70 Volts and under.

PART 2 - PRODUCTS**2.1 SYSTEM**

- A. Manufacturers:
 - 1. Category Four Approved Cable Manufacturers. See Section 01 6200 for definitions of Categories:
 - a. Alpha Wire Co, Elizabeth, NJ www.alphawire.com.
 - b. Belden Wire & Cable Co, Richmond, IN www.belden.com.
 - c. Liberty Wire & Cable, Colorado Springs, CO www.libertycable.com.
 - d. West Penn Wire Corp, Washington, PA www.westpenn-cdt.com.
- B. Components:
 - 1. Building Control System Cables.
 - a. CAT 5E, 24 AWG, solid bare copper, four pair, UTP, white cable jacket.
 - b. Sheath Colors:
 - 1) Lighting Control: Yellow.
 - c. Meet requirements of EIA / TIA 568 Standard.
 - 2. Lighting Control Cables and Conductors:
 - a. Provide cable per Lighting Control Panel Manufacturer's recommendations and requirements.
 - b. Lighting Control Cables ran in same raceway as line voltage cables shall have same insulation voltage rating as line voltage conductors.
 - c. Cable Jacket shall be yellow.

PART 3 - EXECUTION**3.1 INSTALLATION****A. General:**

1. Cables shall be continuous and without splices from source to outlet.
2. Run cables in raceway as indicated on Contract Drawings.
3. Run exposed cables parallel to or at right angles to building structure lines.
4. Keep cables **6 inch (150 mm)** minimum from hot water pipes.
5. Support cables using approved staples, cable ties, straps, hangers, or similar fittings spaced every **3 feet (900 mm)**.
6. Where installing in framing, do not bore holes in joists or beams outside center 1/3 of member depth or within **24 inches (600 mm)** of bearing points. Do not bore holes in vertical framing members outside center 1/3 of member width. Holes shall be **1/2 inch (13 mm)** diameter maximum.
7. Bundle only cables of same systems together.
8. Do not run cables within **10 inches (255 mm)** of line voltage conductors/raceways.
9. Extend cables **18 inches (450 mm)** from wall or ceiling at all outlet locations. Extend cables to twice vertical length of cabinet at each cabinet location.
10. Pulling cables into conduit:
 - a. Do not pull cables until raceway system is complete and cabinets and outlet boxes are free of foreign matter and moisture.
 - b. Do not use heavy mechanical means for pulling cables.
 - c. Use only listed wire pulling lubricants.
11. Prohibited procedures:
 - a. Boring holes for installation of cables in vertical truss members.
 - b. Notching of structural members for installation of cables.

B. Control Cables:

1. For cables not installed in raceway, do not run cables within **10 inches (255 mm)** of line voltage conductors / raceways. Also, maintain **10 inches (255 mm)** minimum between following exposed cable groups:
 - a. Microphone cables.
 - b. CAT-6, sound system control, telephone, video, or ATC cables.
 - c. Loudspeaker cables.

END OF SECTION

SECTION 26 0526

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To:
 1. Furnish and install grounding for electrical installation as described in Contract Documents except as excluded below.
- B. Related Requirements:
 1. Section 03 3111: 'Cast-In-Place Structural Concrete'.
 - a. Pre-installation conference held jointly with other concrete related sections.
 2. Section 26 0501: 'Common Electrical Requirements'.
 3. Section 26 4301: 'Surge Protection Devices'.

1.2 REFERENCES

- A. Reference Standards:
 1. Institute of Electrical and. Electronics Engineers (IEEE):
 - a. IEEE 837-2014, 'Standard for Qualifying Permanent Connections Used in Substation Grounding'.
 2. National Fire Protection Association:
 - a. NFPA 70, 'National Electric Code (NEC)' (2017 or most recent edition adopted by AHJ including all applicable amendments and supplements).
 - b. NFPA 780, 'Standard for the Installation of Lightning Protection Systems' (2014 or latest approved edition).
 3. Telecommunications Industry Association:
 - a. TIA-942 A, 'Telecommunications Infrastructure Standard for Data Centers' (2014).
 4. Section 27 1116: 'Communications Cabinets, Racks, Frames, and Enclosures'.
 5. Section 27 1501: 'Communications Horizontal Cabling' for cables for Telephone and Data Systems.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference:
 1. Participate in pre-installation conference as specified in Section 03 3111.
 2. In addition to agenda items specified in Section 01 3100 and 31 3111, review following:
 - a. Review Architect's inspection of grounding conductor installation before placement of concrete.

1.4 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 1. Requirements of Section 27 1501 applies, but is not limited to following:
 - a. Cable assemblies shall be UL / CE Listed and CSA Certified. Cables shall be a distinctive green or green/yellow in color, and all jackets shall be UL, VW-1 flame rated.
 - b. Grounding shall conform to all required Commercial Building Grounding and Bonding Requirements for Telecommunications, Electrical Codes, and Manufacturer's grounding requirements.
 2. Systems shall be installed per NFPA 780 and NFPA 70.

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3. All Bonds shall comply with most current version of IEEE 837 Standard.
- B. Qualifications: Requirements of Section 01 4301 applies, but is not limited to following:
1. Installers Qualifications:
 - a. Grounding and Bonding:
 - 1) Licensed electrical contractor shall perform installation and termination of main bonding conductor to building service entrance ground.
 - 2) Licensed in State that Work is to be performed.

PART 2 - PRODUCTS

2.1 SYSTEM

- A. Manufacturers:
1. Type One Acceptable Products:
 - a. 'Cadweld' by Erico International, Solon, OH www.erico.com.
 - b. 'ThermOweld' by Continental Industries, Tulsa, NE www.conind.com.
 - c. Equal as approved by Architect before bidding. See Section 01 6200.
- B. Performance:
1. Design Criteria:
 - a. Size materials as shown on Drawings and in accordance with applicable codes.
 - b. Bonding System Workmanship:
 - 1) The ground/earthing system shall be designed for high reliability and shall meet following criteria:
 - a) Local electrical codes shall be adhered to.
 - b) All grounding/earthing conductors shall be copper.
 - c) Regulatory Agency Sustainability Approvals requirements are required.
 - c. Rack and Cabinet Grounding/Earthing:
 - 1) Equipment and racks shall be bonded in accordance with methods prescribed in TIA-942.
 - 2) All grounding backbone should be #6 AWG copper cable.
 - 3) In telecommunications spaces with small number of racks or cabinets, rack/cabinet grounding/earthing jumper cable directly to telecommunications ground bus is permitted. Large spaces shall utilize mesh Common Bonding network, or overhead grounding backbone.
 - 4) Equipment racks, housings, messenger cables, and raceways:
 - a) Connect cabinets, racks, frames and terminal boards to single-point ground which is connected to building ground system proper sized, bonded and tested green insulated copper grounding conductor.
- C. Materials:
1. Grounding And Bonding Jumper Conductors: Bare copper or with green insulation.
 2. Make grounding conductor connections to ground rods and foundation ground loop using approved bolted clamps listed for such use.
 3. Service Grounding Connections And Cable Splices: Make by exothermic process.
 4. Telecommunications ground bus bar (TGB): copper.
 - a. Grounding bus bar:
 - 1) Technology Room shall be provided with telecommunications ground bus bar (TGB).
 - 2) Ground loop current potential is minimized between telecommunications equipment and electrical system to which it is attached.
 - b. All racks, metallic backboards, cable sheaths, metallic strength members, splice cases, cable trays, etc. entering or residing in Technology Room shall be grounded to respective TGB using minimum #6 AWG stranded copper bonding conductor and compression connectors.

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PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Interface With Other Work: Coordinate with Section 03 3111 in installing grounding conductor and placing concrete. Do not allow placement of concrete before Architect's inspection of grounding conductor installation.
- B. Grounding conductors and bonding jumper conductors shall be continuous from terminal to terminal without splice. Provide grounding for following.
 - 1. Electrical service, its equipment and enclosures.
 - 2. Conduits and other conductor enclosures.
 - 3. Neutral or identified conductor of interior wiring system.
 - 4. Main panelboard, power and lighting panelboards.
 - 5. Non-current-carrying metal parts of fixed equipment such as motors, starter and controller cabinets, instrument cases, and lighting fixtures.
 - 6. Lightning protection down conductors.
- C. Provide concrete-encased electrode system by embedding **20 feet (6.10 m)** minimum of No. 2/0 bare copper conductor in concrete footing that is in direct contact with the earth, **2 inches (50 mm)** minimum below concrete surface. Extend No. 2/0 copper conductor to main panel as shown on Drawings.
- D. Ground identified common conductor of electrical system at secondary side of main transformer supplying building. Ground identified grounded (neutral) conductor of electrical system on supply side of main service disconnect.
- E. Pull grounding conductors in non-metallic raceways, in flexible steel conduit exceeding **72 inches (1 800 mm)** in length, and in flexible conduit connecting to mechanical equipment.
- F. Provide grounding bushings on all feeder conduit entrances into panelboards and equipment enclosures.
- G. Bond conduit grounding bushings to enclosures with minimum #10 AWG conductor.
- H. Connect equipment grounds to building system ground.
 - 1. Use same size equipment grounding conductors as Phased conductors up through #10 AWG.
 - 2. Use NEC Table 250-95 for others unless noted otherwise in Drawings.
- I. Run separate insulated grounding cable from each equipment cabinet to electrical panel. Do not use intermediate connections or splices. Affix directly to cabinet.
- J. On motors, connect ground conductors to conduit with approved grounding bushing and to metal frame with bolted solderless lug.
- K. Ground cabinet of transformers to conduit and ground wires, if installed. Bond transformer secondary neutral conductor to cabinet.
- L. TGB shall be **1/4 inch (6.4 mm)** thick x **2 inches (50 mm)** high x **12 inches (305 mm)** long installed with insulated standoffs at location directed.
- M. Ground rack to TGB using #6 copper conductor and compression connector.
 - 1. Equipment bonding for Baptismal Fonts:
 - a. Copper Lug Mechanical Connector:
 - 1) Connect all metallic elements of baptismal font as shown in Contract Drawings.
 - b. Grounding Clamps and Connectors:
 - 1) Connect to structural reinforcing bars as per NFPA 70 Article 680 and as shown in Contract Drawings.

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3.2 FIELD QUALITY CONTROL

- A. Field Inspections:
 - 1. Notify Architect for inspection two (2) days minimum before placing concrete over grounding conductor.
 - 2. Grounding Well integrity shall be tested separately and together with Lightning Protection System integrity.

END OF SECTION

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SECTION 26 0533

RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To:
 1. Quality of material and installation procedures for raceway, boxes, and fittings used on Project but furnished under other Divisions.
 2. Furnish and install raceway, conduit, and boxes used on Project not specified to be installed under other Divisions.
 3. Furnish and install air-vapor barrier boxes as described in Contract Documents.
 4. Furnish and install main electrical service raceway as described in Contract Documents and comply with electrical utility company requirements.
 5. Furnish and install main telephone service raceway as described in Contract Documents and comply with telephone company requirements.

- B. Related Requirements:
 1. See Section 07 8400: 'Firestopping' for raceways penetrating fire rated walls, ceilings, and barriers'.
 2. Section 23 0933: 'Electric and Electronic Control System for HVAC' for concealed raceway and extensions for temperature control system.
 3. Section 26 0501: 'Common Electrical Requirements' for general electrical requirements'.
 4. Section 26 0503: 'Electrical Utility Services' for electrical primary underground service requirements.
 5. Section 27 1501: 'Communications Horizontal Cabling' for raceway for telephone and data systems.
 6. Section 27 4117: 'Video Systems' for system wiring.
 7. Section 27 5117: 'Audio Systems' for sound system wiring.

1.2 REFERENCES

- A. Reference Standards:
 1. National Fire Protection Association:
 - a. NFPA 70, 'National Electric Code (NEC)' (2017 or most recent edition adopted by AHJ including all applicable amendments and supplements).

PART 2 - PRODUCTS

2.1 SYSTEM

- A. Manufacturers:
 1. Manufacturer Contact List:
 - a. Cooper B-Line, Highland, IL www.b-line.com.
 - b. Hubbell Incorporated, Milford, CT www.hubbell-wiring.com or Hubbell Canada Inc, Pickering, ON (905) 839-4332.
 - c. Square D, Palatine, IL www.squared.com.
 - d. Thomas & Betts, Memphis, TN www.tnb.com or Thomas & Betts Ltd, Iberville, PQ (450) 347-5318.
 - e. Walker Systems Inc, Williamstown, WV (800) 240-2601 or Walker Systems Inc / Wiremold Canada Inc, Fergus, ON (519) 843-4332.

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f. Wiremold Co, West Hartford, CT www.wiremold.com.

B. Materials:

1. Raceway And Conduit:

a. Sizes:

- 1) **3/4 inch (19 mm)** for exterior use, unless indicated otherwise.
- 2) **1/2 inch (13 mm)** for interior use, unless indicated otherwise.

b. Types: Usage of each type is restricted as specified below by product.

- 1) Galvanized rigid steel or galvanized intermediate metal conduit (IMC) is allowed for use in all areas. Where in contact with earth or concrete, wrap buried galvanized rigid steel and galvanized IMC conduit and fittings completely with vinyl tape.
- 2) Galvanized Electrical Metallic Tubing (EMT), Flexible Steel Conduit, and Electrical Non-Metallic Tubing (ENT):
 - a) Allowed for use only in indoor dry locations where it is:
 - (1) Not subject to damage.
 - (2) Not in contact with earth.
 - (3) Not in concrete.
 - b) For metal conduit systems, flexible steel conduit is required for final connections to indoor mechanical equipment.
- 3) Schedule 40 Polyvinyl Chloride (PVC) Conduit:
 - a) Allowed for use only underground or below concrete with galvanized rigid steel or IMC elbows and risers.
- 4) Listed, Liquid-Tight Flexible Metal Conduit:
 - a) Use in outdoor final connections to mechanical equipment, length not to exceed **36 inches (900 mm)**.
- 5) Pre-wired **3/8 Inch (9.5 mm)** Flexible Fixture Whips: Allowed only for connection to recessed lighting fixtures, lengths not to exceed **72 inches (1 800 mm)**.

c. Prohibited Raceway Materials:

- 1) Aluminum conduit.
- 2) Armored cable type AC (BX) cable.
- 3) Armored cable type AC (BX) cable.

2. Raceway And Conduit Fittings:

- a. Rigid Steel Conduit And IMC: Threaded and designed for conduit use.
- b. EMT:
 - 1) Compression type.
 - 2) Steel set screw housing type.
- c. PVC Conduit:
 - 1) PVC type. Use PVC adapters at all boxes.
 - 2) PVC components, (conduit, fittings, cement) shall be from same Manufacturer.
- d. Flexible Steel Conduit: Screw-in type.
- e. Liquid-tight Flexible Metal Conduit: Sealrite type.
- f. Expansion fittings shall be equal to OZ Type AX sized to raceway and including bonding jumper.
- g. Prohibited Fitting Materials:
 - 1) Crimp-on, tap-on, indenter type fittings.
 - 2) Cast set-screw fittings for EMT.
 - 3) Spray (aerosol) PVC cement.

3. Outlet Boxes:

- a. Galvanized steel of proper size and shape are acceptable for all systems. Where metal boxes are used, provide following:
 - 1) Provide metal supports and other accessories for installation of each box.
 - 2) Equip ceiling and bracket fixture boxes with fixture studs where required.
 - 3) Equip outlets in plastered, paneled, and furred finishes with plaster rings and extensions to bring box flush with finish surface.
- b. Non-metallic boxes may be used only for control voltage wiring systems.
- c. Telephone / data outlet boxes shall be single device outlet boxes.
- d. HVAC Instrumentation And Control:
 - 1) Junction boxes in mechanical equipment areas shall be **4 inches (100 mm)** square.

- 2) Boxes for remote temperature sensor devices shall be recessed single device.
- 3) Boxes for thermostats shall be 4 inches (100 mm) square with raised single device cover.
4. Power Floor Boxes:
 - a. Type Two Acceptable Products:
 - 1) 887 cast iron box 885 brass duplex cover plate for carpet by Walker Systems.
 - 2) B-2537 cast iron box with SF3925 brass duplex cover plate for carpet by Hubbell.
 - 3) Equal as approved by Architect before installation. See Section 01 6200.
5. Air-Vapor Barrier Boxes:
 - a. Pre-molded polyethylene box installed in all exterior framing walls (thermal envelope) around recessed outlet boxes.
 - b. Class Two Quality Standard:
 - 1) Approved Manufacturer. See Section 01 6200 for definitions of Classes.
 - a) Lessco Low Energy Systems Supply Company, Inc., Campbellsport, WI
www.lessco-airtight.com.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification Of Conditions:
 1. Confirm dimensions, ratings, and specifications of materials to be installed and coordinate these with site dimensions and with other Sections.

3.2 INSTALLATION

- A. Interface With Other Work:
 1. Coordinate with Divisions 22 and 23 for installation of raceway for control of plumbing and HVAC equipment.
 2. Before rough-in, verify locations of boxes with work of other trades to insure that they are properly located for purpose intended.
 - a. Coordinate location of outlet for water coolers with Division 22.
 - b. Coordinate location of outlets adjacent to or in millwork with Division 06 before rough-in. Refer conflicts to Architect and locate outlets under his direction.
 3. Coordinate installation of floor boxes in carpeted areas with carpet installer to obtain carpet for box covers.
 4. Install pull wires in raceways installed under this Section where conductors or cables are to be installed under other Divisions.
- B. General:
 1. Sound and video system electrical components furnished and installed under this Section include following items:
 - a. Metal equipment cabinet and control cabinets.
 - b. Factory-fabricated speaker enclosures.
 - c. Fittings.
- C. Conduit And Raceway:
 1. Conceal raceways within ceilings, walls, and floors, except at Contractor's option, conduit may be exposed on walls or ceilings of mechanical equipment areas and above acoustical panel suspension ceiling systems. Install exposed raceway runs parallel to or at right angles to building structure lines.
 2. Seal all raceways penetrating fire rated walls, ceilings and barriers. See Section 07 8400.
 3. Keep raceway runs 6 inches (150 mm) minimum from hot water pipes.
 4. Make no more than four quarter bends, 360 degrees total, in any conduit run between outlet and outlet, fitting and fitting, or outlet and fitting.

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- a. Make bends and offsets so conduit is not injured and internal diameter of conduit is not effectively reduced.
 - b. Radius of curve shall be at least minimum indicated by NFPA 70.
 5. Cut conduit smooth and square with run and ream to remove rough edges. Cap raceway ends during construction. Clean or replace raceway in which water or foreign matter have accumulated.
 6. Run two spare conduits from each new panelboard to ceiling access area or other acceptable accessible area and cap for future use.
 7. Bend PVC conduit by hot box bender and, for PVC 2 inches (50 mm) in diameter and larger, expanding plugs. Apply PVC adhesive only by brush.
 8. Installation In Framing:
 - a. Do not bore holes in joists or beams outside center 1/3 of member depth or within 24 inches (600 mm) of bearing points. Do not bore holes in vertical framing members outside center 1/3 of member width.
 - b. Holes shall be one inch (25 mm) diameter maximum.
 9. Underground Raceway And Conduit:
 - a. Bury underground raceway installed outside building 24 inches (600 mm) deep minimum.
 - b. Bury underground conduit in planting areas 24 inches (600 mm) deep minimum. It is permissible to install conduit 6 inch (150 mm) below concrete sidewalks, however, conduit must be buried 24 inches (600 mm) deep at point of exit from planting areas.
 10. Conduit And Raceway Support:
 - a. Securely support raceway with approved straps, clamps, or hangers, spaced as required.
 - b. Do not support from mechanical ducts or duct supports without Architect's written approval. Securely mount raceway supports, boxes, and cabinets in an approved manner by:
 - 1) Expansion shields in concrete or solid masonry.
 - 2) Toggle bolts on hollow masonry units.
 - 3) Wood screws on wood.
 - 4) Metal screws on metal.
 11. Prohibited Procedures:
 - a. Use of wooden plugs inserted in concrete or masonry units for mounting raceway, supports, boxes, cabinets, or other equipment.
 - b. Installation of raceway that has been crushed or deformed.
 - c. Use of torches for bending PVC.
 - d. Spray applied PVC cement.
 - e. Boring holes in truss members.
 - f. Notching of structural members.
 - g. Supporting raceway from ceiling system support wires.
 - h. Nail drive straps or tie wire for supporting raceway.
- D. Telephone / Data Systems:
1. Install raceway from terminal board to each telephone and data outlet as indicated on Contract Drawings.
- E. Boxes:
1. Boxes shall be accessible and installed with approved cover.
 2. Do not locate device boxes that are on opposite sides of framed walls in the same stud space. In other wall construction, do not install boxes back to back.
 3. Locate boxes so pipes, ducts, or other items do not obstruct outlets.
 4. Install outlets flush with finished surface and level and plumb.
 5. Support switch boxes larger than two-gang with side brackets and steel bar hangers in framed walls.
 6. At time of substantial completion, install blank plates on uncovered outlet boxes that are for future use.
 7. Install air-vapor barrier boxes.
 - a. Follow Manufacturer's installation instructions.
 - b. Care should be taken to cut above grade vapor barrier and seal around recessed outlet boxes to minimize air infiltration.
 8. Location:

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- a. Install boxes at door locations on latch side of door, unless explicitly shown otherwise on Contract Drawings. Verify door swings shown on electrical drawings with architectural drawings, and report discrepancies to Architect before rough-in. Distance of box from jamb shall be 6 inches (150 mm) from door jamb.
 - b. Properly center boxes located in walls with respect to doors, panels, furring, trim and consistent with architectural details. Where two or more outlets occur, space them uniformly and in straight lines with each other, if possible.
 - c. Center ceramic tile boxes in tile.
- F. Support factory-fabricated speaker enclosures from structure or ceiling suspension system.

END OF SECTION

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SECTION 26 0613

ELECTRICAL EQUIPMENT MOUNTING HEIGHT SCHEDULE

PART 1 - GENERAL: Not Used

PART 2 - PRODUCTS: Not Used

PART 3 - EXECUTION

3.1 INSTALLATION

A. Unless otherwise indicated, mount center of outlets or boxes at following heights above finish floor. Refer special conditions to Architect before rough-in and locate outlet under his direction.

B. Mounting Heights:

1. HVAC:

- a. Temperature Control Junction Boxes: As indicated on Drawings.
- b. Thermostats not mounted in occupied space: As indicated on Drawings.
- c. Remote Temperature Sensors and thermostats mounted in occupied space:
 - 1) Wall-Mounted **50 inches (1 270 mm)** to top.
- d. Indoor Motor Disconnects: **60 inches (1 525 mm)**.
- e. Outdoor Motor Disconnects: As indicated on Drawings.
- f. Motor Controls: **60 inches (1 525 mm)**.

2. Plumbing:

- a. Electric Water Cooler Outlets: Mount so outlet and cord are hidden by water cooler and outlet is accessible for resetting for GFCI trip.

3. Electrical:

- a. Distribution Panels: **72 inches (1 830 mm)** to top.
- b. Receptacles: **18 inches (450 mm)**.
- c. Wall Switches: **42 inches (1 065 mm)**.
- d. Wall-Mounted Exit Lights: **90 inches (2 285 mm)**.
- e. Emergency Lighting Units: **60 inches (1 525 mm)**.

4. Communications

- a. Sound Distribution System Components: As indicated on Drawings.
- b. Satellite Distribution System Components: As indicated on Drawings.
- c. TV Distribution System Components: As indicated on Drawings.
- d. Computer and TV: **18 inches (450 mm)**.
- e. Telephone / Data Terminal Boards: **72 inches (1 800 mm)** to top.
- f. Telephones (wall type): **60 inches (1 500 mm)**.
- g. Telephones (desk type): **18 inches (450 mm)**.
- h. Telephone / Data (desk type): **18 inches (450 mm)**.
- i. Data (desk type): **18 inches (450 mm)**.
- j. Signal Chimes: **84 inches (2 100 mm)**.

END OF SECTION

SECTION 26 0924**LIGHTING CONTROL SYSTEM****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install complete lighting control system as described in Contract Documents consisting of the following:
 - a. Lighting Control Panel.
 - b. Programmable Digital Control Switches.
 - c. Photocells.
- B. Related Requirements:
 - 1. Section 26 0501: 'Common Electrical Requirements'.
 - 2. Section 26 0523: 'Control-Voltage Electrical Cables'.

1.2 REFERENCES

- A. Definitions:
 - 1. Class A: Equipment has been tested and found to comply with limits for Class A digital device, pursuant to part 15 of FCC Rules. These limits provide reasonable protection against harmful interference when equipment is operated in commercial environment.
- B. Reference Standards:
 - 1. Federal Communications Commission (FCC):
 - a. Emission requirements for Class A applications.
 - 2. Underwriters Laboratories:
 - a. UL 916, 'Energy Management Equipment' (2015).

1.3 SUBMITTALS

- A. Informational Submittals:
 - 1. Certifications:
 - a. Technician Certification that equipment has been installed, adjusted and tested in accordance with Manufacturer's recommendations.
- B. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Operations and Maintenance Data:
 - 1) Equipment operation and maintenance manual(s).

1.4 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. All control equipment shall be in compliance with FCC emissions' standards in Part 15 Subpart J for Class A application.
 - 2. Programmable panelboards shall be UL listed under UL 916 Energy Management Equipment.
- B. Qualifications:

1. Manufacturer Qualifications:
 - a. Manufacturer of assembly shall be manufacturer of major components with assembly.
 - b. Manufacturer of this equipment shall have minimum of five (5) years manufacturing experience.
 2. Technician Qualifications:
 - a. Authorized by Manufacturer and trained.
 - b. Have thorough knowledge of software, hardware and system programming.
- C. Certifications:
1. Provide Technician Certification that equipment has been installed, adjusted and tested in accordance with Manufacturer's recommendations.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
1. Equipment shall be delivered, handled and stored in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.1 ASSEMBLIES

- A. Manufacturers:
1. Type One Acceptable Manufacturer:
 - a. Acuity Brands Inc., Atlanta, GA www.acuitybrands.com.
 - b. Douglas Lighting Controls, Burnaby, BC www.douglaslightingcontrols.com.
 - c. Hubbell Building Automation, Austin, TX www.hubbell-automation.com.
 - d. Leviton Manufacturing Co, Little Neck, NY www.leviton.com or Leviton Manufacturing of Canada Ltd, Pointe-Claire, QB (800) 461-2002 or (514) 954-1840.
 - e. Lutron Electronics Co Inc, Coopersburg, PA www.lutron.com.
 - f. Watt Stopper Inc., Santa Clara, CA www.wattstopper.com.
 - g. Equal as approved by Architect before bidding. See Section 01 6200.
- B. Design Criteria:
1. Lighting Control System shall meet or exceed following capabilities:
 - a. Capable of switching for specific lighting zone for following:
 - 1) Time-of-day scheduling
 - 2) Daylight savings time adjustments.
 - 3) Light level sensors.
- C. Components:
1. Light Control Panel:
 - a. Enclosure/tub shall be NEMA 1 unless indicated otherwise on Drawings, sized to accommodate required components.
 - b. Cover shall have hinged and lockable door and be configured for flush mounting of panel.
 - c. Panel shall include power supply and interior assembly with motherboard and control electronics.
 - 1) Interior construction shall provide isolation between line voltage and low voltage (class
 - 2) wiring.
 - d. Panel shall be factory assembled and designed for disassembly for mounting enclosure first and reassembly after conduit installation.
 - e. Panel shall utilize mechanically held latching relays rated for 30A ballast load at 120/277VAC with 10,000A short circuit current rating and shall include contactor for exterior lighting control.
 - 1) Visual LED status and manual override for each relay shall be included.

- f. Panel shall contain network clock/programmer and photocell control module for interface with interior and exterior photocell controls.
 - 1) Network clock shall provide menu driven control for seven (7) day repeating schedules and holiday provisions.
 - 2) Clock shall provide user selectable pre-programmed scenarios for: Scheduled on/off, Manual on/off, Scheduled off, and on/off when used with photocell control module.
- g. Panel shall contain automation intelligence card for program, monitor, and control functions and group cards as required for control of groups of relays.
- 2. Programmable Digital Control Switches:
 - a. Programmable digital control switches shall be provided with number of control buttons as indicated on Contract Drawings.
 - 1) Each button shall be capable of individual programming without use of computer or other programming device.
 - 2) Each button shall be able to control individual relay or group of relays.
 - 3) Individual buttons shall allow for permanent labeling.
 - b. Switches shall be illuminated for ease of location in dark.
- 3. Photocells:
 - a. Weatherproof Class 2 photocell shall be provided for exterior light levels.
 - b. Adjustable interior photo cell shall be provided for day-lighting control.
 - 1) Photocell shall provide output suitable for controlling continuously dimming loads.
 - 2) Refer to Contract Drawings for fixtures to be controlled.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General:
 - 1. Install switches flush with wall, straight and level.
 - 2. Permanently label switches as shown on drawing schedule in Contract Drawings.
- B. Interface With Other Work:
 - 1. Coordinate with appropriate Sections of Divisions 26.
 - 2. Program system to meet the local energy code.
- C. Space Control Requirements:
 - 1. Unless relevant provisions of applicable local Energy codes are more stringent, provide minimum application of lighting controls as follows:
 - a. Provide occupancy/vacancy sensors with Manual-ON/OFF functionality in all.
 - b. Provide Manual-ON occupancy/vacancy sensors for any enclosed office, conference room, meeting room or classroom. For spaces with multiple occupants, or where line-of-sight may be obscured, provide ceiling-mounted sensors and Manual-ON switches, if necessary.

3.2 FIELD QUALITY CONTROL

- A. Field Testing:
 - 1. Manufacturer shall provide Manufacturer's authorized Technician to adequately test supplied equipment and software to ensure system performs as intended including the following:
 - a. Test start-up system and confirm proper installation, operation, and adjustment of all system components.
 - 2. Submit Certification in writing that equipment has been installed, adjusted and tested in accordance with Manufacturer's recommendations.
- B. Non-Conforming Work: Non-conforming work as covered in the General Conditions applies, but is not limited to following:

1. Correct any work found defective or not complying with Contract Document requirements at no additional cost to the Owner.

3.3 CLOSE-OUT ACTIVITIES

A. Instruction of Owner:

1. Provide Manufacturer's authorized Technician training session for Owner's Representative(s) for demonstrating operation and programming of completed system.
 - a. Training program shall include instructions on control system, programming, and other major components. Provide Manufacturer Manual(s) to be submitted to Owner to assist training.
 - b. Training program shall include:
 - 1) System review of all system components and their function.
 - 2) System review of all management software and its function.
 - 3) Operator training to develop experience with control applications.

END OF SECTION

SECTION 26 2417**CIRCUIT-BREAKER PANELBOARDS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install circuit-breaker panelboards as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 26 0501: 'Common Electrical Requirements'.
 - 2. Section 26 4301: 'Surge Protection Devices'.

1.2 REFERENCES

- A. Reference Standards:
 - 1. National Fire Protection Association:
 - a. NFPA 70E: 'Standard for Electrical Safety in the Workplace' (2018 or most recent edition adopted by AHJ).

PART 2 - PRODUCTS**2.1 EQUIPMENT**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Cutler-Hammer Inc, Pittsburgh, PA www.eatonelectric.com.
 - b. General Electric Industrial Systems, Charlotte, NC www.geindustrial.com.
 - c. Siemens Energy & Automation, Alphrata, GA www.sea.siemens.com.
 - d. Square D Co, Palatine, IL www.us.squared.com.
- B. Performance:
 - 1. Capacities:
 - a. Panelboard:
 - 1) Minimum integrated equipment short circuit rating of 22,000 amperes for 120 / 208 Volts.
 - 2) Rated for use as service entrance equipment.
 - b. Lighting And Appliance Panelboards:
 - 1) Minimum integrated equipment short circuit rating of 10,000 amperes for 120 / 208 Volts.
 - c. Load Centers:
 - 1) 125 Amp main lugs, 120 / 208 Volt, three-phase.
 - 2) Minimum integrated equipment short circuit rating of 10,000 Amps.
- C. Material:
 - 1. Circuit-breaker type.
 - 2. Galvanized steel cabinets
 - 3. Bussing and lugs arranged as required.
 - 4. Multi-pole circuit-breakers shall be common trip.
 - 5. Circuit-breakers shall be molded case thermal magnetic type with inverse time characteristics.
 - 6. Main Panelboard:
 - a. Surface-mounted and front accessible.

- b. Enclosures:
 - 1) Exterior of Building:
 - a) NEMA / CEMA Type 3R with locking door.
 - 2) Interior of Building:
 - a) NEMA / CEMA Type 1.
 - c. Minimum dimensions of 32 inches (800 mm) wide by 8 inches (200 mm) deep.
 - d. Space designation on Drawings indicates bus hardware and panelboard capacity for future acceptance of one 100 Amp, three-pole circuit-breaker.
 - e. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Type PRL4B by Cutler-Hammer.
 - 2) Spectra Series by General Electric.
 - 3) Type P4 by Siemens.
 - 4) I-Line by Square D.
7. Lighting And Appliance Panelboards:
- a. Plug-on or bolt-on breakers. Multi-pole breakers shall be common trip.
 - b. Factory installed or provided circuit number identification for each breaker and space.
 - c. Cabinets shall be locking type with no exposed latches or screws when door is closed. Key panels alike and provide minimum of three keys.
 - d. Minimum dimensions of 20 inches (500 mm) wide by 5-3/4 inches (146 mm) deep.
 - e. Space designation on Drawings indicates bus hardware and panelboard capacity for future acceptance of one 20 Amp, single-pole circuit-breaker.
 - f. Breakers specified to be shunt trip and shall include shunt trip accessories to remotely trip breaker using separate 120 V power source. Trip coil shall include coil-clearing contact to break coil current when breaker opens.
 - g. Use equipment from same manufacturer as main panelboard.
 - h. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Type PRL1a by Cutler-Hammer.
 - 2) Type AL or AQ by General Electric.
 - 3) Type P1 by Siemens.
 - 4) Type NQOD by Square D.
8. Load Centers:
- a. Surface-mounted, outdoor NEMA Type 3R enclosure with padlocking provisions. 12-1/2 inches (318 mm) wide by 4-1/2 inch (115 mm) deep minimum.
 - b. HACR type circuit breakers.
 - c. Use equipment from same manufacturer as main panelboard.
 - d. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Type CH by Eaton.
 - 2) Type PowerMark Plus by General Electric.
 - 3) Type PL by Siemens.
 - 4) Type QO by Square D.
9. Labels:
- a. All Switchboards shall be labeled with Arc-Flash Hazard Information per NFPA 70E 130.5 including:
 - 1) Nominal system voltage.
 - 2) Arc flash boundary.
 - 3) Available incident energy.
 - 4) Working distance.
 - 5) Minimum arc rating of clothing.
 - 6) Level of PPE.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification Of Conditions:
 - 1. Examine wall framing and verify framing for proper spacing for installation of panelboard(s).
 - a. Notify Architect of improper spacing in writing.

- B. Contractor shall be responsible for performing required calculations to determine ARC Flash Hazards and providing all appropriate labeling per NFPA 70E.

3.2 INSTALLATION

- A. Label panelboards, load centers, and each breaker in main panelboard with **1/16 inch (1.6 mm)** thick laminated plastic composition material with contrasting color core. Engraved letters shall be **1/4 inch (6 mm)** high.
- B. Provide typewritten circuit schedules in lighting and distribution panelboards and load centers to identify panelboard and load served by each branch breaker.
- C. Arrange conductors neatly within panelboards and load centers.
- D. Secure to structure in accordance with requirements of Project seismic design category.

3.3 PROTECTION

- A. Protect panelboards, load centers, and interior components from paint, gypsum board compound, dirt, dust, and other foreign matter during construction.

END OF SECTION

SECTION 26 2726**WIRING DEVICES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 1. Furnish and install wiring devices complete with plates as described in Contract Documents.
- B. Related Requirements:
 1. Section 26 0501: 'Common Electrical Requirements'.
 2. Section 27 1116: 'Communications Cabinets, Racks, Frames, and Enclosures'.
 3. Section 27 1501: 'Communications Horizontal Cabling' for cables for telephone and data systems.

PART 2 - PRODUCTS**2.1 COMPONENTS**

- A. Manufacturers:
 1. Manufacturer Contact List:
 - a. Cooper Wiring Devices, Peachtree City, GA www.cooperwiringdevices.com.
 - b. General Electric Industrial Systems, Charlotte, NC www.geindustrial.com.
 - c. Hubbell Building Automation, Austin, TX www.hubbell-automation.com.
 - d. Hubbell Inc, Milford, CT www.hubbell-wiring.com or Hubbell Canada Inc, Pickering, ON (800) 263-4622 or (905) 839-4332.
 - e. Hunt Control Systems Inc, Fort Collins, CO www.huntdimming.com.
 - f. Intermatic Inc, Spring Grove, IL www.intermatic.com.
 - g. IR-TEC America, Inc., Brea, CA www.irtec.com/en-ira/.
 - h. Leviton Manufacturing Co, Little Neck, NY www.leviton.com or Leviton Manufacturing of Canada Ltd, Pointe-Claire, QB (800) 461-2002 or (514) 954-1840.
 - i. Legrand, West Hartford, CT www.legrand.us.com or Vaughan, ON www.legrand.ca.com.
 - j. Lutron Electronics Co Inc, Coopersburg, PA www.lutron.com.
 - k. Ortronics, New London, CT www.ortronics.com.
 - l. Paragon Electric Co Inc, Carol Stream, IL www.icca.invensys.com/paragon or Paragon Electric, Mississauga, ON (800) 951-5526 or (905) 890-5956.
 - m. Pass & Seymour, Syracuse, NY www.passandseymour.com or Pass & Seymour Canada Inc, Concord, ON (905) 738-9195.
 - n. Philips Lighting Co, Somerset, NJ www.lighting.philips.com/nam or Philips Lighting Canada, Scarborough, ON (416) 292-3000.
 - o. Red Dot div of Thomas & Betts, Memphis, TN www.tnbcom.
 - p. Schneider Electric North America, Palatine, IL www.schneider-electric.com (847) 397-2600.
 - q. Sensorswitch, Wallingford, CT www.sensorswitch.com.
 - r. Siemon Company, Watertown, CT www.siemon.com.
 - s. Square D Co, Palatine, IL www.squared.com.
 - t. Suttle, Hector, MN www.suttleonline.com.
 - u. Tork Inc, Mount Vernon, NY www.tork.com.
 - v. Watt Stopper Inc, Santa Clara, CA www.wattstopper.com.
 2. Product Options:
 - a. Faces shall be nylon where available.
 - b. Devices of single type shall be from same Manufacturer.

- c. Devices are listed as white. Use white devices on light colored walls, brown on dark colored walls, and black on black walls.

B. Switches:

1. Furnace Disconnect:

- a. Category Four Approved Products. See Section 01 6200 for definitions of Categories:

- 1) 20 AMP, single pole:
 - a) Cooper: 2221V.
 - b) Hubbell: HBL1221-I.
 - c) Pass & Seymour: 20AC1-I.
 - d) Leviton: 1221-2I.

2. Standard Style:

- a. Category Four Approved Products. See Section 01 6200 for definitions of Categories:

- 1) 20 AMP, single pole:
 - a) Cooper: 2221V.
 - b) Hubbell: HBL1221-I.
 - c) Pass & Seymour: 20AC1-I.
 - d) Leviton: 1221-2I.
- 2) Two Pole:
 - a) Cooper: 2222V.
 - b) Hubbell: HBL1222-I.
 - c) Pass & Seymour: 20AC2-I.
 - d) Leviton: 1222-2I.
- 3) Three Way:
 - a) Cooper: 2223V.
 - b) Hubbell: HBL1223-I.
 - c) Pass & Seymour: 20AC3-I.
 - d) Leviton: 1223-2I.
- 4) Four Way:
 - a) Cooper: 2224V.
 - b) Hubbell: HBL1224-I.
 - c) Pass & Seymour: 20AC4-I.
 - d) Leviton: 1224-2I.
- 5) Pilot Switch:
 - a) Hubbell: HBL1221-PL.
 - b) Pass & Seymour: 20AC1-RPL.
 - c) Leviton: 1221-PLR.
- 6) Lighted Toggle Switch:
 - a) Single Pole:
 - (1) Cooper: 2221-LTV.
 - (2) Hubbell: HBL1221-IL.
 - (3) Pass & Seymour: 20AC1-ISL.
 - (4) Leviton: 1221-LHI.
 - b) Three Way:
 - (1) Cooper: 2223-LTV.
 - (2) Hubbell: HBL1223-IL.
 - (3) Pass & Seymour: 20AC3-ISL.
 - (4) Leviton: 1223-7LC.

3. Exhaust Fan Timer Switches:

- a. Serving Area:

- 1) 0-60 minute, no hold position.
- 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) Intermatic: FD60MWC.
 - b) Paragon: SWPD60M-W.
 - c) Tork: A560MW.

4. Digital Time/Timer Switch:

- a. As shown in small Storage, Mechanical and Electrical Rooms.
- b. Automatic countdown type:

- 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) Leviton: LTT60-1L.
 - b) Hubbell: TD200.
 - c) Pass & Seymour: RT1W.
 - d) Tork: SSA100.
 - e) Watt Stopper: TS-400-W.
 5. Dimmer Switches:
 - a. Vertical slide control with faceplate.
 - b. Preset, ON-OFF switch, 1000VA.
 - c. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Hubbell: AS101/AS11.
 - 2) Hunt: DAP-10-IV.
 - 3) Leviton: IPI10-I.
 - 4) Lutron: N-1003P-IV.
 - 5) Pass & Seymour: 91180-I.
 - 6) Phillips: MP1000-I.
 - 7) Watt Stopper: AD-1103-I.
 6. Momentary Switches:
 - a. 15 AMP, specification grade.
 - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Cooper: 1895W.
 - 2) Hubbell: HBL1556W.
 - 3) Legrand: 1250W.
- C. Receptacles:
1. Rectangular Face Designer Style:
 - a. 15 AMP, specification grade, back and side wired, self grounding.
 - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Cooper: 6262W.
 - 2) Hubbell: HBL2152WA.
 - 3) Leviton: 16252-W.
 - 4) Pass & Seymour: 26252-W.
 2. Range Receptacle:
 - a. Three pole, four wire grounding, 125 / 250 V, NEMA 14-50R, 50 AMP complete with plate.
 - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Cooper: 1258.
 - 2) Hubbell: HBL9450A.
 - 3) Leviton: 279.
 - 4) Pass & Seymour: 3894.
 3. Ground Fault Circuit Interrupter (GFCI):
 - a. 15 AMP, specification grade.
 - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Cooper: GF15W.
 - 2) Hubbell: GF5252WA.
 - 3) Leviton: 8599-W.
 - 4) Pass & Seymour: 1594-W.
 4. Basketball Standard Receptacle:
 - a. Three pole, four wire grounding, 125 / 250V, locking type, NEMA L14-20R, 20 AMP, complete with plate.
 - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Cooper: CWL1420R.
 - 2) Hubbell: HBL2410.
 - 3) Leviton: 2410.
 - 4) Pass & Seymour: L1420-R.
- D. Plates:
1. Standard Cover Plates:
 - a. Office / Occupied Areas:

- 1) Nylon or high impact resistant thermoplastic.
 - 2) Color shall match wiring device.
 - b. All Other: Steel.
 - c. Ganged switches shall have gang plates.
 - d. Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories:
 - 1) Cooper.
 - 2) Hubbell.
 - 3) Leviton.
 - 4) Pass & Seymour.
 - 2. Weatherproof In-Use Receptacle Covers:
 - a. NEMA 3R rated.
 - b. Cast aluminum.
 - c. Compatible with GFCI receptacles.
 - d. Complete with weather resistant gaskets and stainless steel screws.
 - e. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Hubbell: WP26MH, horizontal; WP26M, vertical.
 - 2) Intermatic: WP1010HMC, horizontal; WP1010MC, vertical.
 - 3) Red Dot: CKMG, horizontal; CKMGV, vertical.
- E. Occupancy Sensors:
- 1. Ceiling, ultrasonic type.
 - a. Complete with sensor and combined relay / control transformer.
 - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Cooper Controls:
 - a) Sensor: OAC-U-0501-R.
 - b) Relay / Transformer: SP20-MV.
 - 2) IR-TEC America:
 - a) Sensor: OS-361DT.
 - b) Relay / Transformer: PPU-300.
 - 3) Leviton:
 - a) Sensor: OSC05-RUW.
 - b) Relay / Transformer: OPP20-D2.
 - 4) Sensorswitch:
 - a) Sensor: CMPDT9.
 - b) Relay / Transformer: MP-20-SP0DM.
 - 5) Watt Stopper:
 - a) Sensor: W-500A.
 - b) Relay / Transformer: BZ-150.
 - c. Provide manual ON and OFF momentary override switches. Refer to Contract Drawings for number of switches.
 - 2. Ceiling, dual technology type.
 - a. Complete with sensor and relay / transformer.
 - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Cooper Controls:
 - a) Sensor: OAC-DT-0501-R.
 - b) Relay / Transformer: SP20-MV.
 - 2) IR-TEC America:
 - a) Sensor: OS-361DT.
 - b) Relay / Transformer: PPU-300.
 - 3) Leviton:
 - a) Sensor: OSC05-RMW.
 - b) Relay / Transformer: OPP20-D2.
 - 4) Sensorswitch:
 - a) Sensor: CMPDT9.
 - b) Relay / Transformer: MP-20-SP0DM.
 - 5) Watt Stopper:
 - a) Sensor: DT-305.
 - b) Relay / Transformer: BZ-150.

- c. Provide manual ON and OFF momentary override switches. Refer to Contract Drawings for number of switches.
 3. Wall switch, passive infrared type.
 - a. Features include sensitivity and time delay adjustments.
 - b. Manual ON / auto OFF capability.
 - c. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Cooper Controls: OSW-P-1001-MV-W.
 - 2) IR-TEC America: LbS-700NW.
 - 3) Leviton: ODS10-IDW.
 - 4) Sensorswitch: WSD-V-WH.
 - 5) Watt Stopper: PW-100-W.
- F. Surge Protective Device (for landscape irrigation controller):
 1. Type 3 as defined in UL 1449 and approved for exterior application.
 2. Parallel metal oxide varistors, MOV, from each line to ground: 120 / 240 VAC. UV resistant construction with epoxy encapsulation of electrical connections.
 3. Include **1/2 inch (12.7 mm)** mounting nipple and locknut.
 4. Category Four approved Products. See Section 01 6200 for definitions of Categories:
 - a. ASZ175B1 by Cooper Power Systems.
 - b. AG2401C by Intermatic.
 - c. 54175-SSA by Leviton.
 - d. TDS120XR50S by Square D.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install devices flush with walls, straight, and solid to box.
- B. Label dimmer switch groupings with **1/16 inch (1.6 mm)** thick laminated plastic composition material with contrasting color core. Engraved letter shall be **1/4 inch (6 mm)** high.
- C. Install surge protective device in knock-out of junction box installed on bottom of automatic sprinkler controller.

END OF SECTION

SECTION 26 2816

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To:
 - 1. Furnish and install disconnects as described in Contract Documents, except those provided integral with equipment.
- B. Related Requirements:
 - 1. Section 26 0501: Common Electrical Requirements.

PART 2 - PRODUCTS

2.1 ASSEMBLIES

- A. Manufacturers:
 - 1. Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories.
 - a. Disconnects: Same as Manufacturer of Project's main panelboard.
 - b. Fuses.
 - 1) Cooper Bussmann, Ellisville, IL www.cooperbussmann.com.
 - 2) Edison Fuse, Ellisville, IL (314) 391-3443.
 - 3) Ferraz Shawmut, Newburyport, MA www.ferrazshawmut.com.
 - 4) Littelfuse Inc, Des Plaines, IL www.littelfuse.com.
- B. Disconnects:
 - 1. Heavy-duty quick-make, quick-break type, non-fused unless indicated otherwise.
 - 2. Provide interlock to prevent opening of door when switch is in ON position.
 - 3. Provide means to lock switch in OFF position with padlock.
 - 4. Disconnects for motor circuits shall be horsepower rated.
 - 5. Disconnects For Furnace Units And Unit Heaters: Provide manual starter with thermal overload relay. Provide overload relay to match motor full load amps.
 - 6. Enclosures:
 - a. Interior: NEMA / CEMA Type 1.
 - b. Exterior: NEMA / CEMA Type 3R.
 - 7. Fuses:
 - a. Fuse fused disconnects with dual-element time delay fuses and equip with rejection type fuse holders.
 - b. Fuses on Project shall be from single manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Label disconnects to indicate equipment served, such as Condensing Unit CU-1. Use **1/16 inch (1.6 mm)** thick laminated plastic composition material with contrasting color core. Engraved letters shall be **1/4 inch (6 mm)** high. Attach labels with screws.

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- B. Install furnace disconnects on furnace at location where it is accessible from front of unit and it does not interfere with unit's operation.

END OF SECTION

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SECTION 26 5100**INTERIOR LIGHTING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install lighting system as described in Contract Documents, complete with lamps.
- B. Related Requirements:
 - 1. Section 26 0501: 'Common Electrical Requirements'.
 - 2. Section 26 5121: 'Interior Lighting: LED Dimming Drivers'.
 - 3. Section 09 5116: 'Acoustical Tile Ceilings'.

1.2 REFERENCES

- A. Reference Standards:
 - 1. American National Standards Institute (ANSI):
 - a. ANSI C78.377-2017, 'American National Standard for Electric Lamps: Specification for the Chromaticity of Solid State Lighting Products'.
 - 2. Federal Communications Commission (FCC):
 - a. Code of Federal Regulations (CFR):
 - 1) FCC 47 CFR Part 18, 'Industrial, Scientific, and Medical Equipment'.
 - 3. Institute of Electrical and Electronics Engineers (IEEE):
 - a. IEEE C62.41.1-2002, 'Guide on the Surge Environment in Low-Voltage (1000 V and Less) AC Power Circuits'.

PART 2 - PRODUCTS**2.1 ASSEMBLIES**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Advance Transformer Co, Rosemont, IL www.advancetransformer.com.
 - b. Cooper Wiring Devices by Eaton, Peachtree City, GA www.cooperindustries.com.
 - c. General Electric Lighting, Hendersonville, NC or General Electric Lighting Canada Inc, Mississauga, ON www.gelighting.com/na.
 - d. Howard Lighting Products, Laurel, MS www.howard-ind.com.
 - e. Osram Sylvania, Danvers, MA www.sylvania.com or Osram Sylvania Ltd, Mississauga, ON (905) 673-6171.
 - f. Philips Lighting Co, Somerset, NJ www.lighting.philips.com/nam or Philips Lighting Canada, Scarborough, ON (416) 292-3000.
 - g. Universal Lighting Technologies, Nashville, TN www.universalballast.com.
 - h. Venture Lighting International, Solon, OH www.venturelighting.com.
 - i. Watt Stopper Inc, Santa Clara, CA www.wattstopper.com.
 - j. Westinghouse Lighting Corp, Philadelphia, PA www.westinghouselightbulbs.com.
 - 2. Product Options: When several lighting fixtures are specified by name for one use on Drawings, select any one of those specified. Do not mix fixtures from different manufacturers specified for one use.

B. Materials**1. Lighting Fixtures:****a. Type One Acceptable Products:**

- 1) See Fixture Schedule on Drawings for acceptable manufacturers and models.
- 2) Equals as approved by Architect before bidding. See Section 01 6200.

b. See 'Light Fixture Schedule' provided by Owner's Representative.

a)

2. Lamps:**a. Other Lamps:**

- 1) Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories:
 - a) General Electric.
 - b) North American Philips.
 - c) Osram / Sylvania.
 - d) Westinghouse.

b. LED Lamps and Fixtures:

- 1) Replacement Lamps shall have minimum efficiency of 70 lm / W per LM 79.
- 2) Integral LED Lamps shall have minimum efficiency of 90 lm / W per LM 79.
- 3) Provide minimum rated life of 50,000 per LM 80 and LM 70 standards.
- 4) Color Temperature: 3000k.
- 5) Provide full spectrum color index of 65.

C. Factory Assembly:

1. Fixtures shall be fully assembled complete with necessary wiring, sockets, lamps, reflectors, ballasts, auxiliaries, plaster frames, recessing boxes, hangers, supports, lenses, diffusers, and other accessories essential for complete working installation.

PART 3 - EXECUTION**3.1 INSTALLATION****A. Interface With Other Work:**

1. Coordinate with Sections under 09 5000 heading to obtain symmetrical arrangement of fixtures in acoustic tile ceiling as shown on Reflected Ceiling Plan in Contract.
2. In mechanical equipment rooms, coordinate locations of light fixtures with equipment locations to provide proper room illumination without obstruction. Suspend fixtures that must be mounted below pipes, ducts, etc, with chains or other Architect approved method.

B. Securely mount fixtures. Support fixtures weighing 50 lbs (23 kg) or more from building framing or structural members.**C. Fasten lay-in fixtures to ceiling suspension system on each side with bolts, screws, rivets, or clips. In addition, connect lay-in fixtures with two (2) No. 12 gauge diagonal wires with three (3) turns each end; two (2) per fixture minimum to building framing or structural members. Connect to opposing corners of fixture. Wires may be slightly slack. Make final conduit connections to lay-in fluorescent fixtures with specified flexible conduit or flexible fixture whips.****D. Where fixtures are shown installed end to end, provide suitable connectors or collars to connect adjoining units to appear as a continuous unit.****E. Where recessed fixtures are to be installed, provide openings, plaster rings, etc, of exact dimensions for such fixtures to be properly installed. Coordinate fixture installation with ceiling type and thickness. Terminate circuits for recessed fixtures in an extension outlet box near fixture and connect with specified flexible conduit.**

3.2 ADJUSTMENT

- A. Repair scratches or nicks on exposed surfaces of fixtures to match original undamaged conditions.

END OF SECTION

SECTION 26 5121**INTERIOR LIGHTING: LED Dimming Drivers****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
1. Furnish and install Interior Lighting LED Dimming Drivers as described in Contract Documents, complete with lamps.
- B. Related Requirements:
1. Section 26 0501: 'Common Electrical Requirements'.
 2. Section 26 0924, 'Lighting Control System'.
 3. Section 26 2726: 'Wiring Devices'.
 4. Section 26 5100: 'Interior Lighting'.
- C. Reference Standards:
1. American National Standards Institute (ANSI) / American National Standard Lighting Group (ANSLG):
 - a. ANSI/ANSLG C78.377-2017, 'American National Standard for Electric Lamps: Specification for the Chromaticity of Solid State Lighting Products'.
 - b. ANSI/ANSLG C82.11-2017, 'High-Frequency Fluorescent Lamp Ballasts'.
 2. American National Standards Institute (ANSI) / Illuminating Engineering Society (IES):
 - a. ANSI/IES RP-16-10, 'Nomenclature and Definitions for Illuminating Engineering'.
 3. Federal Communications Commission (FCC):
 - a. Code of Federal Regulations (CFR):
 - 1) FCC 47 CFR Part 15, 'Class B: Radio Frequency Devices'.
 4. Institute of Electrical and Electronics Engineers (IEEE) / American National Standards Institute (ANSI):
 - a. IEEE/ANSI C62.41.1-2002, 'Guide on the Surge Environment in Low-Voltage (1000 V and Less) AC Power Circuits'.
 5. International Electrotechnical Commission (IEC):
 - a. IEC 60929 ED. 4.0 B:2011, 'AC and/or DC Supplied Electronic Control Gear for Tubular Fluorescent Lamps - Performance Requirements'.
 - b. IEC 61000-3-2 ED. 5.0 B:2018, 'Electromagnetic Compatibility (EMC) - Part 3-2: Limits for Harmonic Current Emissions (Equipment Input Current \leq 16 A per phase)'.
 - c. IEC 61347-1 ED. 3.1 B:2017, 'Lamp Controlgear - Part 1: General and Safety Requirements'.
 - d. IEC 61347-2-13 ED. 2.1 B:2016, 'Lamp Controlgear - Part 2-13: Particular Requirements for d.c. or a.c. Supplied Electronic Controlgear for LED modules'.
 - e. IEC 61547 ED. 2.0 B:2009, 'Equipment for General Lighting Purposes - EMC Immunity Requirements'.
 - f. IEC 62384 ED. 1.0 B:2006, 'D.C. or A.C. Supplied Electronic Control Gear for LED Modules - Performance Requirements'.
 - g. IEC 62386-101 ED. 2.1 B:2018, 'Digital Addressable Lighting Interface - Part 101: General Requirements - System'.
 6. National Electrical Manufacturers Association (NEMA):
 - a. NEMA 410-2015, 'Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts'.
 7. Underwriters Laboratories (UL):
 - a. UL 1310: 'Class 2 Power Units' (2018).
 8. Underwriters Laboratories (UL) / Underwriters Laboratories of Canada (ULC):
 - a. UL 8750: 'Standard for Light Emitting Diode (LED) Equipment for Use in Lighting Products' (2015).

1.2 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Manufacturer's published product data on dimensions, ratings, catalog numbers and identification of products and accessories for products included for project. Include performance data.
 - 2. Shop Drawings:
 - a. Provide fixture type(s) list for each specific driver.
 - b. Provide wiring diagrams as needed for special operation or interaction with other system(s).
- B. Informational Submittals:
 - 1. Qualification Statements:
 - a. Manufacturer: Provide experience compliance documentation.
 - b. Products: Provide compliance documentation with UL / ULC requirements.
- C. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Warranty Documentation:
 - 1) Final, executed copy of Warranty on drivers.

1.3 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Meet UL / ULC requirements.
- B. Qualifications. Requirements of Section 01 4301 applies but not limited to following:
 - 1. Manufacturer:
 - a. Manufacture with five (5) years experience in manufacture of dimmable electronic lighting drivers.
 - b. Provide experience documentation.

1.4 FIELD CONDITIONS

- A. Ambient Conditions:
 - 1. General:
 - a. Proceed with installation only when following ambient conditions can be maintained:
 - 1) Install when the temperature is between **minus 4 deg F (minus 20 deg C)** minimum and **122 deg. F (50 deg. C)** maximum and relative humidity is ninety (90) percent, non-condensing.
 - 2) Protect from dust and excess moisture during installation.

1.5 WARRANTY

- A. Manufacturer Warranty:
 - 1. Provide five (5) year warranty on drivers to operate driver at or below required driver warranty temperature.

PART 2 - PRODUCTS

2.1 ASSEMBLIES

- A. Manufacturers:

1. Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories:
 - a. eldoLED America, San Jose, CA www.eldoled.com.
 - b. General Electric Lighting, Hendersonville, NC or General Electric Lighting Canada Inc, Mississauga, ON www.gelighting.com/na.
 - c. Howard Lighting Products, Laurel, MS www.howard-ind.com.
 - d. OSRAM Sylvania, Danvers, MA or OSRAM Sylvania LTD, Mississauga, Ontario Canada www.Sylvania.com.
 - e. Philips Lighting Co, Somerset, NJ www.lighting.philips.com/nam or Philips Lighting Canada, Scarborough, ON (416) 292-3000.

- B. LED Dimming Driver:
 1. Description:
 - a. LED Dimming Driver:
 - 1) 4 wire (010V DC Voltage Controlled) Dimming Drivers.
 - 2) Integral Diming Driver for replacement lamp.
 2. Design Criteria:
 - a. Driver:
 - 1) Driver must be able to operate for (+/- 10 percent) supply voltage of 120V through 277VAC at 60Hz.
 - 2) Driver to be UL / ULC recognized under component program and shall be modular for simple field replacement. Drivers that are not UL / ULC recognized or not suited for field replacement will not be used.
 - 3) Driver shall have ability to provide no light output when analog control signal drops below 0.5 V, and shall consume 0.5 watts or less in this standby. Control deadband between 0.5V and 0.65V shall be included to allow for voltage variation of incoming signal without causing noticeable variation in fixture to fixture output.
 - b. Range and Quality:
 - 1) LED dimming to be equal in range and quality to commercial grade incandescent dimmer:
 - a) Quality of dimming to be defined by dimming range, freedom from perceived flicker or visible stroboscopic flicker, smooth and continuous change in level (no visible steps in transitions), natural square law response to control input, and stable when input voltage conditions fluctuate over what is typically experience in commercial environment.
 - 2) Ten-year expected life while operating at maximum case temperature and 90 percent non-condensing relative humidity.
 - c. Inrush Current:
 - 1) Driver must limit inrush current as followings:
 - a) Minimum Requirement: Meet or exceed NEMA 410 driver inrush standard of 430 amps per 10 amps load with maximum of 370 amps² per second.
 - b) Preferred Requirement: Meet or exceed 30mA²s at 277VAC for up to 50 watts of load and 75A at 240us at 277VAC for 100 watts of load.
 - d. Withstand up to 1,000 volt surge without impairment of performance as defined by IEEE/ANSI C62.41.1 Category A.
 - e. Light Output:
 - 1) No visible change in light output with variation of plus/minus 10 percent line voltage input.
 - f. Harmonic Distortion:
 - 1) Total Harmonic Distortion less than 20 percent and meet ANSI/ANSLG C82.11 maximum allowable THD requirements at full output.
 - 2) THD shall at no point in dimming curve allow imbalance current to exceed full output THD.
 - g. Automatic Adaptation:
 - 1) Driver must support automatic adaptation, allowing for future luminaire upgrades and enhancements and deliver improved performance.
 - a) Adjustment of forward LED voltage, supporting 3V through 55V.
 - b) Adjustment of LED current from 200mA to 1.05A at the 100 percent control input point in increments of 1 mA.

- c) Adjustment for operating hours to maintain constant lumens (within 5 percent) over 50,000 hour design life of system, and deliver up to 20 percent energy savings early in life cycle.
- h. Light Quality:
 - 1) Over entire range of available drive currents, driver shall provide step-free, continuous dimming to black from 100 - 1 percent light output and step to 0 percent where indicated. Driver shall respond similarly when raising from 0 percent to 100 percent.
 - 2) Drivers to track evenly across multiple fixtures at all light levels, and shall have input signal to output light level that allows smooth adjustment over entire dimming range.
 - 3) Driver and luminaire electronics shall deliver illumination that is free from objectionable flicker as measured by flicker index (ANSI/IES RP-16-10). At all points within dimming range from 100-0.1 percent luminaire shall have:
 - a) LED dimming driver shall provide continuous step-free, flicker free dimming similar to incandescent source.
 - b) Minimum Requirement: Flicker index shall less that 5 percent at all frequencies below 1000 Hz.
 - c) Preferred specification: Flicker index shall be equal to incandescent, less that 1 percent at all frequencies below 1000 Hz.
- i. Control Input:
 - 1) 4-Wire (0-10V DC Voltage Controlled) Dimming Drivers:
 - a) Must meet IEC 60929 ED. 4.0 B Annex E for General White Lighting LED drivers.
 - b) Connect to devices compatible with 0 to 1 OV Analog Control Protocol, Class 2, capable of sinking 0.6 ma per driver at low end of 0.3V. Limit number of drivers on each 0-1 OV control output based on voltage drop and control capacity.
 - c) Control relays or contactors and transformers for up to six circuits
 - d) Sensor controller with HIGH, LOW, and DEADBAND adjustments.
 - 2) Integral Dimmer Driver for replacement lamps:
 - a) LED Driver shall not cause shadows.
 - b) LED Driver shall be line voltage controlled and shall be compatible with any universal dimmer.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation of driver to meet Manufacturer's prescribed methods and instructions.
- B. Meet Ambient Conditions requirements for installation.
- C. Driver may be remote mounted up to **300 ft (90 m)** depending on power level and wire gauge.
- D. 0-10V input shall be protected from line voltage miswire, and immune and output unresponsive to induced AC voltage on control leads.

END OF SECTION

SECTION 26 5200**EMERGENCY LIGHTING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install emergency battery units as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 26 0501: 'Common Electrical Requirements'.

PART 2 - PRODUCTS**2.1 SYSTEMS**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Beghelli, Miramar, FL www.beghelliusa.com.
 - b. Bodine Emergency Lighting, Collierville, TN www.bodine.com
 - c. Dual-Lite, Cheshire, CT www.dual-lite.com.
 - d. Iota Engineering Co, Tucson, AZ www.iotaengineering.com
 - e. Lightolier, Fall River, MA www.lightolier.com.
 - f. Lithonia Lighting, Conyers, GA www.lithonia.com.
 - g. McPhilben / Day-Brite Lighting, Tupelo, MS www.mcphilben.com.
 - h. Sure-Lites / Cooper Lighting, Elk Grove, IL www.cooperlighting.com.
- B. Materials:
 - 1. Fluorescent Battery Packs:
 - a. Design Criteria:
 - 1) Batteries shall be long life nickel cadmium type.
 - 2) Complete with charging indicator light and test switch.
 - 3) Components shall be fully concealed and easily accessible for maintenance or replacement.
 - 4) Factory installed in lighting fixture, or field installed to same standards.
 - b. Linear Fluorescent Lighting Fixtures:
 - 1) Battery pack shall operate one (1) lamp at approximately 600 lumens initially and 60 percent minimum of initial lumens after ninety (90) minutes.
 - 2) Charger shall be capable of full recharge in twenty four (24) hours.
 - c. Class Two Quality Products: See Section 01 4301 for Manufacturer Qualifications and Section 01 6200:
 - 1) Any Manufacturer that conforms to Contract Documents requirements.
 - 2. Emergency Lighting Units And Fixtures:
 - a. Design Criteria:
 - 1) Shall operate indicated number of lamps for ninety (90) minutes of emergency operation.
 - 2) Sealed, maintenance free, lead calcium type battery.
 - 3) Painted steel housing and complete with power indicator light and test switch.
 - 4) Lamps to be designed for wet locations and with full vertical and horizontal adjustment of lamps.
 - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:

- 1) See Contract Drawings for approved fixtures. Coordinate emergency lighting unit and fixture so that systems function as required.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Battery Packs:
 1. General:
 - a. Wire so unit can be tested with lights on.
 - b. Wire so lamps in normal mode are switched off with other lighting in area. Connect unit to unswitched conductor of normal lighting circuit.
 2. Linear Fluorescent Lighting Fixtures:
 - a. Install in ballast channel of fixture with charging indicator light and test switch mounted on fixture end, or visible and accessible through lens.
- B. Emergency Lighting Units:
 1. Aim lamps to maximize lighting of first **50 feet (15 meters)** of egress path.
 2. Wire so lamps are normally off and operate upon loss of normal building power.
 3. Connect units to un-switched conductor of normal lighting circuit.

END OF SECTION

SECTION 26 5600**EXTERIOR LIGHTING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install exterior lighting system as described in Contract Documents.
- B. Products Furnished But Not Installed Under This Section:
 - 1. Anchor bolts.
- C. Related Requirements:
 - 1. Section 03 3111: 'Cast-In-Place Structural Concrete' for bases for light poles and installation of anchor bolts.
 - 2. Section 26 0501: 'Common Electrical Requirements'.

PART 2 - PRODUCTS**2.1 SYSTEM**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Cutler-Hammer Inc, Milwaukee, WI www.cutler-hammer.eaton.com or Cutler-Hammer/Eaton Yale Ltd, Burlington, ON (905) 333-6442.
 - b. General Electric Industrial Systems, Charlotte, NC or G E Lighting Canada Inc, Mississauga, ON www.geindustrial.com.
 - c. Intermatic Inc, Spring Grove, IL www.intermatic.com.
 - d. Paragon Electric Co Inc, Carol Stream, IL www.icca.invensys.com/paragon or Paragon Electric / Maple Chase, Mississauga, ON (800) 951-5526 or (905) 890-5956.
 - e. Siemens Energy & Automation, Alphrata, GA www.sea.siemens.com or Siemens Canada, Mississauga, ON (905) 819-8000.
 - f. Square D Co, Palatine, IL or Square D / Schneider Electric, Toronto, ON www.squared.com.
 - g. Tork Inc, Mount Vernon, NY www.tork.com.
- B. Materials:
 - 1. Exterior Fixtures:
 - a. Finish shall be high quality polyester powder coating:
 - 1) Finish process shall consist of cleaning, electrostatically applying power coat, and thermal curing.
 - 2) Weather, scratch, UV, and fade resistant.
 - b. Color shall be Manufacturer's standard white, natural aluminum, or medium bronze as selected by Architect before bidding.
 - c. Type One Acceptable Products:
 - 1) As indicated on Fixture Schedule. Do not mix fixtures from different manufacturers for one use.
 - 2) Equals as approved by Architect before bidding. See Section 01 6200.
 - 2. Parking Area Poles:
 - a. Designed for wind loading required for Project location as determined by Architect.
 - b. Aluminum hinged base type with matching aluminum anchor bolt cover secured to base.
 - c. Include hand hole with cover at pole base.
 - d. Finish And Color: Match parking area fixtures.
 - 3. Exterior Lighting Control:

- a. Photo Cell:
 - 1) 120 volts.
 - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a) Paragon: CW201-00.
 - b) Tork: 2101.
- b. Lighting Contactor:
 - 1) 120 volt coil, 20 amps, 2 pole, NEMA 1 enclosure.
 - 2) By same manufacturer as main panelboard.
 - 3) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a) Cutler Hammer: CN35.
 - b) General Electric: CR260L-21CA22.
 - c) Siemens: LEN01B200120A.
 - d) Square D: Class 8903, Type LG-20.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Interface With Other Work:
 1. Coordinate location of anchor bolts and conduit in concrete bases so pole will be properly mounted and centered on base.
 2. Install hinged light pole bases so poles can be completely lowered to ground without obstruction out into parking area.
 3. Install time switches, manual bypass switches, and contactor inside building to control parking area and building exterior lighting. Label each component to identify lighting controlled, I.E. 'PARKING LIGHTING' or 'BUILDING LIGHTING.' Label with **1/16 inch (1.5 mm)** thick laminated plastic composition material with contrasting color core. Engraved letters shall be **1/4 inch (6 mm)** high.
 4. Locate photocell(s) outside building under soffit and away from any light source and direct sunlight.
 5. Wire photocell and time switch in series for photo cell ON, time switch OFF operation.

END OF SECTION

SECTION 27 1116**COMMUNICATIONS CABINETS, RACKS, FRAMES, AND ENCLOSURES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Selection Includes But Is Not Limited To:
 - 1. Furnish and install communications cabinets, racks, frames, and enclosures as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 26 0526: 'Grounding And Bonding For Electrical Systems'.
 - 2. Section 27 1501: 'Communications Horizontal Cabling'.
 - 3. Section 27 4117: 'Video Systems'.
 - 4. Section 27 5117: 'Audio Systems'.
- C. Products Installed But Not Furnished Under This Section:
 - 1. Cable Management, Vertical Cable Management, and Horizontal Cable Management.

1.2 REFERENCES

- A. Association Publications:
 - 1. British Standards Institution (BSI):
 - a. BS EN 50310:2006, 'Application of Equipotential Bonding and Earthing in Buildings with Information Technology Equipment.
 - 2. Building Industry Consulting Service International (BISCI):
 - a. Information Transport Systems Installation Methods Manual (ITSIMM) (5th Edition).
 - b. Telecommunications Distribution Methods Manual (TDMM) (12th Edition).
 - 3. Institute of Electrical and Electronics Engineers:
 - a. IEEE 802.3-2018, '*Standard for Ethernet*'.
 - b. IEEE 1100-2005, 'Recommended Practice for Powering and Grounding Electric Equipment'.
 - 4. Telecommunications Industry Association:
 - a. TIA TSB-162, 'Telecommunication Cabling Guidelines for Wireless Access Points' (November 2013).
- B. Reference Standards:
 - 1. International Electrotechnical Commission:
 - a. IEC 60603-7:2011, 'Connectors for electronic equipment – Part 7 'Detail specification for 8-way, unshielded, free and fixed connectors'.
 - 2. International Organization for Standardization / International Electrotechnical Commission:
 - a. ISO/IEC 11801 ED.2.0 EN CORR3:2008, 'Information Technology-Generic Cabling for Customer Premises'.
 - 3. National Fire Protection Association:
 - a. NFPA 70, 'National Electrical Code (NEC)' (2017 or most recent edition adopted by AHJ).
 - 4. Telecommunications Industry Association:
 - a. TIA-568.2, 'Balanced Twisted-Pair Telecommunications Cabling and Components Standards' (Revision D, 2018).
 - b. TIA-569, 'Telecommunications Pathways And Spaces' (Revision D, 2015).
 - c. TIA-606, 'Administration Standard for Telecommunications Infrastructure' (Revision C, 2017).
 - d. TIA-607, 'Telecommunications Bonding and Grounding (Earthing) for Customer Premises' (Revision C, 2015).

- e. TIA-758, 'Customer-Owned Outside Plant Telecommunication Infrastructure Standard' (Revision B, 2012).
- f. TIA-942, 'Telecommunications Infrastructure Standard for Data Centers' (Revision B, 2017).
- g. TIA-1152, 'Requirements for Field Test Instruments and Measurements for Balanced Twisted-Pair Cabling' (Revision A 2016).

1.3 SUBMITTALS

- A. Action Submittals:
 1. Product Data:
 - a. Provide Manufacturer's documentation and descriptive information on each piece of equipment to be used.

PART 2 - PRODUCTS

2.1 SYSTEMS

- A. Manufacturers:
 1. Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories:
 - a. Atlas Sound, Phoenix, AZ www.atlassound.com.
 - b. Lowell Manufacturing Co., Pacific, MO www.lowellmfg.com
 - c. Middle Atlantic Products, Fairfield, NJ www.middleatlantic.com.

PART 3 - EXECUTION

3.1 INSTALLERS

- A. Approved Installers:
 1. Approved installers in Section 27 5117 are to both furnish and install components of this section. See Section 01 4301. Installer requirements of Section 01 4301 applies.

3.2 INSTALLATION

- A. Equipment Cabinet:
 1. See Section 27 5117 'Sound System' for installation of Sound Equipment.
- B. Equipment Cabinet:
 1. Install vent panels at top and bottom of equipment cabinets and between components where possible for maximum ventilation when equipment locations is not specified in Contract Drawings. Locate amplifiers at top of cabinet. Locate equalizers below amplifiers, separated by several vent panels.
 2. Securely fasten equipment plumb and square in place. Utilize all fastening holes in front of cabinet.
 3. Securely fasten in place equipment that is not rack mounted, including relays and other small components. Do not use sticky-back tape.
 4. Install balancing / isolation transformer when balanced and unbalanced components are connected.
 5. Wire XLR-type connections with pin 2 hot, pin 1 shield.
 6. Connect powered components to 120 VAC outlets on voltage suppressor power bars. Do not connect to outlets on other components.
 7. Identification:
 - a. Legibly identify user-operated system controls and system input / output jacks using engraved, permanently attached laminated plastic plates or imprinted Lexan labels. Label

- equipment and controls within equipment cabinets using similar labels or printed labels from a label maker or laser printer.
- b. Affix label to rack panel inside cabinet listing name and telephone number of installer. Appropriate warranty instructions may be included.
- C. Communications Racks, Frames and Enclosures:
1. Racks shall be installed as per Manufacturer's recommendations.
 2. Racks shall be securely attached to concrete floor with **3/8 inch (9.5 mm)** minimum hardware or as required by local codes.
 3. Place racks with **36 inches (900 mm)** minimum clearance front and back from walls and **28 inches (710 mm)** clear on one side of rack. When mounted in row, maintain **36 inches (900 mm)** minimum from wall behind and in front of row of racks and from wall at each end of row.
 4. Grounding:
 - a. Racks shall be grounded to telecommunications ground bus bar as per Section 26 0526 'Grounding And Bonding For Electrical Systems'.
 - b. Racks shall be grounded in accordance with TIA-607.
 5. Seismic Bracing:
 - a. Comply with IBC and local seismic requirements for all equipment and conduit pathways.
 6. Rack mount screws not used for installing patch panels and other hardware shall be bagged and left with rack upon completion of installation.
 7. Mounted termination block fields shall be mounted on Terminal Board in Technology Room provided by Electrical as shown in Contract Documents.
 - a. Wall mounted termination block fields shall be installed with lowest edge of Terminal Board.

3.3 FIELD QUALITY CONTROL

- A. Non-Conforming Work: Non-conforming work as covered in the General Conditions applies, but is not limited to the following:
1. Correct any work found defective or not complying with Contract Document requirements at no additional cost to Owner.

END OF SECTION

SECTION 27 1501**COMMUNICATIONS HORIZONTAL CABLING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
1. Furnish, install, and test communications horizontal cabling as described in Contract Documents including following:
 - a. Cables and related terminations.
 - b. Patch cords and modular connectors.
 - c. Surface raceway and outlet poles.
 - d. Support and grounding hardware.
 - e. UTP Cable.
 - f. UTP Patch cords.
 - g. UTP Connector Modules.
 - h. Installation and testing of Owner Furnished Network Equipment.
- B. Related Requirements:
1. Division 26: Raceways and surface boxes.
 2. Section 07 8400: 'Firestopping' for furnishing and installation of firestopping.
 3. Section 26 0526: 'Grounding And Bonding For Electrical Systems' for installation and termination.
 4. Section 27 1116: 'Communications Cabinet, Racks, Frames, and Enclosures'.
 5. Section 27 5117: 'Audio Systems'.
- C. Products Installed But Not Furnished Under This Section:
1. Owner Furnished Network Equipment as specified on TT (Technology Telecommunication) and TA (Technology Audiovisual) Drawings as shown in Contract Documents including:
 - a. Internet Firewall.
 - b. ISP Modem.
 - c. Network Switch.
 - d. Wireless Access Port.
- D. Related Requirements:
1. Section 01 6400: Owner will provide Network Equipment as specified on TT (Technology Telecommunication) and TA (Technology Audiovisual) Drawings as shown in Contract Documents. Contract Documents establishes quality of materials and installation for information of Contractor, Architect, and Owner's Representatives. Design Criteria in PART 2 of this Section identifies Contractor's responsibility for Owner Network Equipment.

1.2 REFERENCES

- A. Association Publications:
1. Building Industry Consulting Service International (BISCI):
 - a. *Information Technology Systems Installation Methods Manual* (ITSIMM) (7th Edition).
 - b. *Telecommunications Distribution Methods Manual* (TDMM) (14th Edition).
 2. Institute of Electrical and Electronics Engineers:
 - a. IEEE 802.3-2018, '*Standard for Ethernet*'.
 - b. IEEE 1100-2005, '*Recommended Practice for Powering and Grounding Electric Equipment*'.
 3. Telecommunications Industry Association:
 - a. TIA TSB-162, '*Telecommunication Cabling Guidelines for Wireless Access Points*' (Revision A, 2013).

- B. Reference Standards:
1. National Fire Protection Association:
 - a. NFPA 70, 'National Electrical Code (NEC)' (2020 or most recent edition adopted by AHJ).
 2. Telecommunications Industry Association:
 - a. TIA-568.1 'Commercial Building Telecommunications Infrastructure Standard' (Revision D, 2019)
 - b. TIA-568.2, 'Balanced Twisted-Pair Telecommunications Cabling and Components Standards' (Revision D, 2018).
 - c. TIA-568.4 'Broadband Coaxial Cabling and Components Standard (Revision D, 2017)
 - d. TIA-606, 'Administration Standard for Telecommunications Infrastructure' (Revision C, 2017).
 - e. TIA-607, 'Telecommunications Bonding and Grounding (Earthing) for Customer Premises' (Revision D, 2019).
 - f. TIA-758, 'Customer-Owned Outside Plant Telecommunication Infrastructure Standard' (Revision B, 2012).
 - g. TIA-1152, 'Requirements for Field Test Instruments and Measurements for Balanced Twisted-Pair Cabling' (Revision A 2016).
 3. Underwriters Laboratories:
 - a. UL 94: Standard for Test for Flammability of Plastic Materials for Parts in Devices and Appliances (March 2013 6th Edition).
 - 1) 94HB, 'Horizontal Burn Test'.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
1. Coordinate with Project Manager and/or Facility Manager well in advance of Substantial Completion for installation of all Owner Furnished Network Equipment.

1.4 SUBMITTALS

- A. Action Submittals:
1. Product Data:
 - a. Provide Manufacturer's documentation, installation instructions, and descriptive information on each piece of equipment to be used.
 2. Shop Drawings:
 - a. Provide three (3) copies of labeling system reflecting approved label scheme for cable installation for racks, cables, panels, and outlets.
- B. Informational Submittals:
1. Certificates:
 - a. Provide Installer certificates of qualifications required.
 2. Design Data:
 - a. Identification and labeling:
 - 1) Provide labeling system for cable installation to be approved by Owner.
 - a) Clearly identify all components of system: racks, cables, panels and outlets.
 - b) Designate cables origin and destination and unique identifier for cable within facility by room number and port count.
 - c) Racks and patch panels shall be labeled to identify location within cable system infrastructure.
 - b. After system installation, provide three (3) full documentation sets to Consulting Engineer/Architect for approval.
 3. Tests And Evaluation Reports:
 - a. Submit documentation within ten (10) working days of completion of each testing phase. This is inclusive of all test results and record drawings.
 - b. Draft drawings may include annotations done by hand. Final copies of all drawings shall be submitted within thirty (30) working days of completion of each testing phase.
 - c. At request of Consulting Engineer, provide copies of original test results.
 4. Field Quality Control Submittals:

- a. Architect will provide floor plans in paper and electronic formats on which record documentation information can be recorded.
- 5. Qualification Statements:
 - a. Letter from Manufacturer certifying level of training and experience of Installer.
- C. Closeout Submittals:
 - 1. Include following information in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Operations and Maintenance Data:
 - 1) Provide operating and maintenance instructions for each item of equipment submitted under Product Data.
 - b. Warranty Documentation:
 - 1) Final, executed copy of Warranty.
 - c. Record Documentation:
 - 1) Manufacturers documentation:
 - a) Manufacturer's literature or cut sheet.
 - 2) Tests and evaluation reports.
 - 3) As-built Documentation:
 - a) Provide record document to include cable routes and outlet locations.
 - (1) Sequential number shall identify outlet locations.
 - (2) Numbering, icons, and drawing conventions used shall be consistent throughout all documentation.
 - (3) Provide labeling system information.

1.5 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. System shall meet approval of authority having jurisdiction (AHJ). NEC and State and/or local ordinances and regulations shall govern unless more stringent requirements are specified.
 - 2. Meet all TIA/EIA commercial building wiring standards.
 - 3. Meet Telecommunications Distribution Methods Manual (TDMM) (12th Edition) requirements for installation and testing.
 - 4. All Networks shall be installed per applicable standards and manufacturer's guidelines.
 - 5. Cable assemblies shall be UL / CE Listed and CSA Certified. Cables shall be a distinctive green or green/yellow in color, and all jackets shall be UL, VW-1 flame rated.
 - 6. Grounding shall conform to all required Commercial Building Grounding and Bonding Requirements for Telecommunications, Electrical Codes, and Manufacturer's grounding requirements.
- B. Qualifications: Requirements of Section 01 4301 applies, but is not limited to following:
 - 1. Manufacturer Qualifications:
 - a. Provide single source for all products of system:
 - 1) KeyConnect by Belden.
 - 2) Netkey by Panduit.
 - 3) System 6 by Siemon.
 - 4) Uniprise Media 6 by CommScope.
 - 2. Installers Qualifications:
 - a. Approved and Certified by Manufacturer (installation and maintenance trained):
 - 1) Belden Certified System Vendor (CSV).
 - a) Belden Certified LDS Partner.
 - 2) CommScope Certified Business Partner.
 - a) CommScope Certified LDS Partner.
 - 3) Panduit Certified Installer (PCI).
 - 4) Siemon Certified Installers (CI).
 - b. Three (3) year experience with similar projects. Provide documentation.

1.6 WARRANTY

- A. Special Warranty:
1. Cabling System:
 - a. Provide warranty for permanent link cabling system to meet Category 6 standard requirements for structured cabling system for twenty (20) years.
 2. Installer Warranty:
 - a. Installer guarantees that all work is in accordance with all express and implied requirements of Contract Documents, that all work is of good quality, and further warrants work and material for period of (1) year from date of substantial completion of project, unless longer period of time is specified in Contract. All work not conforming to these requirements, may be considered defective:
 - 1) If, within one (1) year after substantial completion of work, or within such longer period of time as may be prescribed by law or by terms of any warranty in Contract, any of work is found to be defective or not in accordance with Contract, Installer shall at Installer cost correct it promptly after receipt of written notice from Owner.
 - 2) Installer's obligation shall survive termination of Contract.
 - 3) Owner shall give such notice within reasonable time after discovery of condition.
 - b. Installer warrants to Owner that all materials and equipment furnished under this Contract shall be new unless otherwise specified, free from faults and defects and in conformance with Contract Documents:
 - 1) Contractor shall secure manufacturer's warranties and deliver copies thereof to Owner upon completion of work.
 - 2) All such warranties shall commence from date of substantial completion and will not in any way reduce Installer's responsibilities under this Contract.
 - 3) Whenever guarantees or warranties are required by specifications for longer period than one year, such longer period shall govern.
 - c. Installer will provide twenty (20) year minimum end to end manufacturer warranty.

PART 2 - PRODUCTS

2.1 OWNER-FURNISHED PRODUCTS

- A. Category Four Products. See Section 01 6200 for definitions of Categories:
1. Owner Furnished Network Equipment as specified on TT (Technology Telecommunication) and TA (Technology Audiovisual) Drawings as shown in Contract Documents including:
 - a. Internet Firewall.
 - b. ISP Modem.
 - c. Network Switch(es).
 - d. Wireless Access Points.
 2. Coordination:
 - a. Coordinate installation of all Owner Furnished Network Equipment including but limited to:
 - 1) Installation and configure devices in accordance with Owner requirements.
 - 2) Proper set-up of network equipment.
 - 3) Owner Furnished internet service to building prior to final installation of AV and Voice Data Equipment.
 - 4) Testing of network equipment.

2.2 SYSTEMS

- A. Manufacturers:
1. Category Four Approved Manufacturers and Products. See Section 01 6200 for definitions of Categories:
 - a. Belden, St. Louis, MO www.belden.com.
 - b. Panduit Corporation, Tinley Park IL www.panduit.com.
 - c. Systemax Solutions, a CommScope Company, Hickory, NC www.systemax.com.

- d. The Siemon Company, Watertown, CT www.siemon.com.

B. Design Criteria:

1. Must install single manufacture as complete permanent link.
 - a. Category 6 minimum compliance margin on all parameters beyond category 6 and Power Sum ACR out to 250 MHz.
2. Entire Category 6 system to be provided by single approved Manufacturer throughout.
3. Install structured cabling system that will be able to support interconnections to active telecommunications equipment for voice and data applications in multi vendor, multi product environment. Structured cabling system should adhere to TIA-568, TIA-606; TIA-607, and TIA-942 standards with respect to pathways, distribution, administration, and grounding of the system.
4. Each room drop will consist of two drops each consisting of two terminations can be interoperable to accommodate either voice or data applications. Provide convenience phone drops that will consist of single termination that will be installed in proper faceplate for each location's phone.
5. Install, terminate, test, and guarantee each drop according to customer all applicable standards and customer preferences.
6. Horizontal cables will be rated Category 6 (250 MHz) in performance and rated to comply with TIA-568 to connector outlets at Work Area. Horizontal cables will home run back to Technology Room (Entrance Facility / Main Cross Connect) and will terminate on individual Category 6 rated jacks to populate modular 48 port angled patch panel on open or flat patch panel inside enclosures. All cables will be patched at cutover as interconnection into floor serving active equipment using RJ45 modular equipment cables rated to Category 6.
7. Match additions to horizontal raceway to complete system according to TIA-568 where suspension and protection gaps exist.

C. Components – Work Area Subsystem:

1. Provide connectivity equipment used to connect horizontal cabling subsystem and equipment in work area. Both copper and fiber media shall be supported. Connectivity equipment shall include following options:
 - a. Patch (equipment) cords and modular connectors.
 - b. Outlets and surface mount boxes.
 - c. Surface raceway and outlet poles.
 - d. Consolidation point / MUIO.
2. Patch Cords and Modular Connectors:
 - a. Match horizontal cabling medium and rating. Same Manufacturer shall provide modular connectors and patch cords. Total patch cord length at work area is not to exceed **10 feet (3.0 m)**.
 - b. Copper Connectivity:
 - 1) Network Cabling System:
 - a) Provide for Work Area subsystem, including all modular connectors.
 - b) Modular connectors shall support of high-speed networks and applications designed for implementation on copper cabling.
 - c) Outlets shall utilize fully interchangeable and individual connector modules that mount side-by-side to facilitate quick and easy moves, adds and changes.
 - 2) Modular Connections:
 - a) Data Modules shall be Category 6:
 - (1) Eight position modules required in all work areas and shall exceed connector requirements of TIA Category 6 standard.
 - (2) Prove termination cap with strain relief on cable jacket, ensure cable twists are maintained to within **1/8 inch (3 mm)** and include wiring scheme label. Wiring scheme label shall be available with TIA-568 wiring schemes.
 - b) Terminations shall use for TIA-568 wiring scheme.
 - c) Modules shall terminate 4 pair 23 100-ohm solid unshielded twisted pair cable.
 - d) Modules shall meet ISO 11801 standard including complying with intermateability standard IEC 60603-7 for backward compatibility.
 - e) Category 6 modules shall have UL and CSA approval.
 - f) Modules shall have ETL verified Category 6 performance and ISO 11801 Class E performance in both basic and channel links.
 - g) Modules shall be universal in design, accepting 2, 3, or 4 pair modular plugs without damage to outer jack contacts.

- h) Modules shall be able to be re-terminated minimum of 10 times and be available in 11 standard colors for color-coding purposes.
 - i) Jack shall snap into all outlets and patch panels.
 - j) Module shall include black base to signify Category 6 400 MHz performance.
- 3) Patch Cords:
- a) Category 6 patch cords shall be factory terminated with modular plugs featuring one-piece, tangle-free latch design and strain-relief boots to support easy moves, adds, and changes.
 - b) Constructed with Category 6 23-AWG stranded UTP cable.
 - c) Each patch cord shall be one hundred (100) percent performance tested at factory in channel test to TIA Category 6 standard.
 - d) Patch cords shall come in standard lengths of **3, 5, 7, 9, 14 and 20 feet (0.90, 1.50, 2.15, 2.75, 4.20 and 6.1 meters)** and 6 standard colors of Blue or White.
 - e) Provide one (1) each **8 feet (2.45 m)** patch cord for 50 percent of terminated work station ports.
3. Outlets and Surface Mount Boxes:
- a. Outlets and surface mount boxes shall support network system by providing high-density in-wall, surface mount cabling applications.
 - b. Provide faceplates for flush mount:
 - 1) Outlets faceplates shall be manufactured from high-impact thermoplastic material with UL 94 flammability rating of 94 HB or better.
4. Copper Cable:
- a. Design Criteria:
 - 1) Performance exceeds all TIA-568 Category 6 and ISO 11801 for Class E cable requirements.
 - 2) ETL tested and verified for Category 6 component performance.
 - 3) Conductors are twisted in pairs with four pairs contained in flame retardant PVC jacket separated by a spline.
 - 4) Performance tested to 650 MHz.
 - 5) Plenum (CMP) and non-plenum/riser (CMR) flame rated.
 - 6) Maximum installation tension of 25 lbs (110 N).
 - 7) Installation temperature range: **32 deg F (0 deg C) to 140 deg F (60 deg C)**.
 - 8) Operating temperature range: **14 deg F (minus 10 deg C) to 140 deg F (60 deg C)**.
 - 9) Cable diameter: Riser – **0.26 inch (6.604 mm)** 0.260"; Plenum – **0.25 inch (6.35 mm)**.
 - 10) Easy payout, reel-in-a-box and descending length markings on cable speed installation.
 - 11) Supports following applications: Ethernet 10BASE-T, 100BASE-T (Fast Ethernet) and 1000BASE-T (Gigabit Ethernet); 1.2Gb/s ATM; Token Ring 4/16; digital video; and broadband/baseband analog video.
 - 12) Color shall be blue.
- D. Horizontal Distribution Cabling:
- 1. General:
 - a. Horizontal distribution cabling system is portion of telecommunications cabling system that extends from work area telecommunications outlet/connector to horizontal cross-connect in Technology Room (Entrance Facility / Main Cross Connect).
 - 1) Horizontal cabling in office should terminate in Technology Room (Entrance Facility / Main Cross Connect) located on same floor as Work Area being served.
 - 2) Horizontal cabling is installed in star topology (home run).
 - 3) Bridged taps and splices are not permitted as part of copper horizontal cabling.
- E. Components – Technology Room (Entrance Facility / Main Cross Connect):
- 1. General:
 - a. Connect networking equipment to horizontal and backbone cabling subsystems:
 - 1) Termination hardware (connectors and patch cords), racks, cable management products and cable routing products.
 - 2) Cable termination hardware.
 - b. Terminate each horizontal or backbone cabling run using appropriate connectors or connecting blocks depending upon cable type:
 - 1) Matching patch cords will be used to perform cross-connect activities or to connect into the networking/voice hardware:

- a) Category 6 Enhanced Unshielded Twisted Pair (UTP).
- c. Four-pair Category 6 UTP cabling shall be terminated onto four-pair Category 6 module:
 - 1) All modules shall be terminated using 568-B wiring scheme.
 - 2) Eight position module shall exceed connector requirements of TIA Category 6 standard.
 - 3) Jack termination to 4-pair, 100 ohm solid unshielded twisted pair cable shall be by use of forward motion termination cap and shall not require use of punchdown or insertion tool.
2. Rack, Cabinet, and Cabling Management Enclosure:
 - a. Cable Management:
 - 1) Cable Management System shall be used to provide neat and efficient means for routing and protecting fiber and copper cables and patch cords on telecommunication racks and enclosures.
 - 2) Provide complete cable management system comprised of vertical and horizontal cable managers to manage cables on both front and rear of rack.
 - 3) System shall protect network investment by maintaining system performance, controlling cable bend radius and providing cable strain relief.
 - b. Vertical Cable Management:
 - 1) General:
 - a) Vertical cable managers include components that aid in routing, managing and organizing cable to and from equipment.
 - b) Panels shall protect network equipment by controlling cable bend radius and providing cable strain relief.
 - 2) Provide panels with universal design mounting to **19 inches (480 mm)** rack and constructed of steel bases with PVC duct attached.
 - 3) Covers shall be able to hinge from either side yet still be easily removed to allow for quick moves, adds, and changes.
 - c. Horizontal Cable Management:
 - 1) General:
 - a) Horizontal cable managers include components that aid in routing managing and organizing cable to and from equipment.
 - b) Panels shall protect network equipment by controlling cable bend radius and providing cable strain relief.
 - 2) Provide panels with universal design mounting to **19 inches (480 mm)** rack and constructed of steel bases with PVC duct attached.
 - 3) Duct fingers shall include retaining tabs to retain cables in place during cover removal.
 - 4) Covers shall be able to hinge from either side yet still be easily removed to allow for quick moves, adds, and changes.
3. Patch Cords:
 - a. Provide patch cords between modular patch panels configured as cross-connect or between patch panel and networking hardware when patch is used as interconnect. Provide one (1) each **3 feet (0.90 m)** patch cord for each terminated patch panel port.
 - b. Provide patch cords as indicated on Drawings and Specifications as shown in Contract Documents. Ensure all devices are fully connected to network equipment.
 - c. Provide additional patch cords with appropriate length to connect all Owner provided internet enabled appliances (IEA) as specified on TT (Technology Telecommunication) and TA (Technology Audiovisual) Drawings as shown in Contract Documents.
 - d. Patch cords shall be factory terminated with modular plugs featuring one-piece, tangle-free latch design and black strain-relief boots to support easy moves, adds and changes.
 - e. Construct patch cords with Category 6 24-AWG stranded UTP cable.
 - f. Patch cords shall be one hundred (100) percent performance tested at factory in channel test to Category 6 standard.
4. Patch Panels:
 - a. Four-pair Category 6 UTP cabling shall be terminated onto four-pair-punch-down style connecting hardware mounted to rear of integral patch panels and routed to Category 6 modules on front face of patch panel.
 - b. Patch panels shall be universal for TIA-568 wiring configurations.
 - c. Patch panels shall have removable 6-port design that allows 6-port module to be removed without disrupting other ports.
 - d. Integral cable tie mounts shall be included in panel for cable management on back of panel.

- e. Port and panels shall be easy to identify with write-on areas and optional label holder for color-coded labels.
 - f. Rack mountable patch panels shall mount to standard **19 inches (480 mm)** rack.
5. Grounding and Bonding:
- a. Provide Telecommunications Bonding Backbone:
 - 1) Ground all telecommunications cable shields, equipment, racks, cabinets, raceways, and other associated hardware that has potential to act as current carrying conductor.
 - 2) Install telecommunication Bonding Backbone independent of building's electrical and building ground.
 - 3) Designed in accordance with recommendations contained in TIA-607 Telecommunications Bonding and Grounding Standard.
 - b. All wires used for telecommunications grounding purposes shall be identified with green insulation:
 - 1) Non-insulated wires shall be identified at each termination point with wrap of green tape.
 - 2) All cables and bus bars shall be identified and labeled as required.
6. Firestopping: Furnish and install firestopping as per Section 07 8400.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General:
1. Install communications system in accordance with Manufacturer's written instructions, and complying with applicable portions of NEC 'Standard of Installation'.
- B. Work Area Outlets:
1. Cables shall be coiled in in-wall or surface-mount boxes if adequate space is present to house cable coil without exceeding Manufacturers bend radius.
 - a. No more than **12 inches (300 mm)** of UTP slack shall be stored in in-wall box, modular furniture raceway, or insulated walls.
 - b. Excess slack shall be loosely configured and stored in ceiling above each drop location when there is not enough space present in outlet box to store slack cable.
 2. Cables shall be dressed and terminated in accordance with TIA-568, Manufacturer's recommendations, and best industry practices.
 3. Cables shall be bundled using Velcro straps at least **0.25 inch (6.35 mm)** wide. Use of plastic wire ties or zip ties is not allowed on project.
 4. Pair untwist at termination shall not exceed **0.125 inch (3.175 mm)**.
 5. Bend radius of cable in termination area shall not be less than 4 times outside diameter of cable.
 6. Cable jacket shall be maintained to within **one inch (25 mm)** of termination point.
 7. Data / voice jacks, unless otherwise noted in Contract Documents, shall be located on each faceplate.
 8. Horizontal Cabling:
 - a. Data jacks in horizontally oriented faceplates shall occupy rightmost position(s).
 - b. Voice jacks shall occupy the top position(s) on the faceplate. Voice jacks in horizontally oriented faceplates shall occupy the left-most position(s).
- C. Horizontal Cross Connect:
1. Cables shall be dressed and terminated in accordance with TIA-568, Manufacturer's recommendations, and best industry practices.
 2. Pair untwist at termination shall not exceed **0.125 inch (3.175 mm)**.
 - a. Bend radius of cable in termination area shall not be less than 4 times outside diameter of cable.
 3. Cables shall be neatly bundled and dressed to their respective panels or blocks.
 - a. Each panel or block shall be fed by individual bundle separated and dressed back to point of cable entrance into rack or frame.

- b. Cables shall be bundled using Velcro straps at least **0.25 inch (6.35 mm)** wide. Use of plastic wire ties or zip ties is not allowed on project.
 4. Cable jacket shall be maintained as close as possible to termination point.
 5. Each cable shall be clearly labeled on cable jacket behind patch panel at location that can be viewed without removing bundle support ties.
 - a. Cables labeled within bundle, where label is obscured from view shall not be acceptable.
 6. Horizontal Cabling:
 - a. A pull cord (nylon; **1/8 inch (3 mm)** minimum) shall be co-installed with all cable installed in any conduit.
 - b. Cable raceways shall not be filled greater than required by TIA-569 maximum fill for particular raceway type.
 - c. Cables shall be installed in continuous lengths from origin to destination (no splices) except for transition points, or consolidation points.
 - d. Where transition points or consolidation points are allowed, they shall be located in accessible locations and housed in enclosure intended and suitable for purpose.
 - e. Cable's minimum bend radius and maximum pulling tension shall not be exceeded.
 - f. If J-hook or trapeze system is used to support cable bundles, all horizontal cables shall be supported at **48 inch (1 200 mm)** to **60 inches (1 500 mm)** maximum intervals. At no point shall cable(s) rest on acoustic ceiling grids or panels.
 - g. Horizontal distribution cables shall be bundled in groups of no more than 25 cables. Cable bundle quantities in excess of 25 cables may cause deformation of bottom cables within bundle and degrade cable performance.
 - h. Cables shall be bundled using Velcro straps at least **0.25 inch (6.35 mm)** wide. Use of plastic wire ties or zip ties is not allowed on project.
 - i. Cable shall be installed above fire-sprinkler systems and shall not be attached to system or any ancillary equipment or hardware. Cable system and support hardware shall be installed so that it does not obscure any valves, fire alarm conduit, boxes, or other control devices.
 - j. Cables shall not be attached to ceiling grid or lighting fixture wires. Where support for horizontal cable is required, install appropriate carriers to support cabling.
 - k. Cables shall be identified by self-adhesive label and meet requirements of TIA-606. Cable label shall be applied to cable behind faceplate on section of cable that can be accessed by removing cover plate.
 - l. Unshielded twisted pair cable shall be installed so that there are no bends smaller than four times the cable outside diameter at any point in run and at termination field.
 - m. Pulling tension on 4-pair UTP cables shall not exceed **25 lbf (111 N)** for a four-pair UTP cable.
- D. Vertical Outlet Pole And Surface Raceway:
 1. Horizontal Cabling:
 - a. General:
 - 1) Vertical outlet poles and Surface Raceway refers to surface raceway system used for branch circuit wiring and/or data network, voice, and other low-voltage cabling. Surface raceway shall be used in solid wall applications or for applications where moves, additions and changes are very typical to workflow.
 - b. Raceway system shall consist of raceway, appropriate fittings and accessories to complete installation per electrical Contract Documents. Non-metallic surface raceway is to be utilized in dry interior locations only as covered in Article 352, part B of the NEC, as adopted by the NFPA and as approved by the ANSI.
- E. Copper Termination Hardware:
 1. Cables shall be dressed and terminated in accordance with TIA-568, Manufacturer's recommendations, and best industry practices.
 2. Pair untwist at termination shall not exceed **0.125 inch (3.175 mm)**.
 - a. Bend radius of cable in termination area shall not be less than 4 times outside diameter of cable.
 3. Cables shall be neatly bundled and dressed to their respective panels or blocks.
 - a. Each panel or block shall be fed by individual bundle separated and dressed back to point of cable entrance into rack or frame.
 - b. Cables shall be bundled using Velcro straps at least **0.25 inch (6.35 mm)** wide. Use of plastic wire ties or zip ties is not allowed on project.

4. Cable jacket shall be maintained as close as possible to termination point.
 5. Each cable shall be clearly labeled on cable jacket behind patch panel at location that can be viewed without removing bundle Velcro support straps.
 - a. Cables labeled within bundle, where label is obscured from view shall not be acceptable.
- F. Grounding System:
1. Where required, Telecommunications Bonding Backbone shall be designed and/or approved by qualified Installer.
 2. Follow requirements of TIA-607.
- G. Seismic Bracing:
1. Comply with IBC and local seismic requirements for all equipment and conduit pathways.
- H. Identification and Labeling:
1. Apply machine generated approved labeling for racks, cables, panels and outlets:
 - a. Designate cables origin and destination and unique identifier for cable by room name and/or number and port count.
 - b. Racks and patch panels shall be labeled to identify location within cable system infrastructure.
 2. Place labeling within view at termination point on each end.
 3. Outlet, patch panel and wiring block labels shall be installed on, or in, space provided on device.
 4. See Contract Drawings for labeling scheme.
 5. Conform to IP addressing assignments as listed in Attachment 'FACILITIES ZONE IP ADDRESS ASSIGNMENT TABLE'.
 - a. See Attachment 'FACILITIES ZONE IP ADDRESS ASSIGNMENT TABLE' for 'IP Address Assignments.

3.2 FIELD QUALITY CONTROL

- A. Field Tests:
1. Provide testing upon completion of installation.
 - a. General:
 - 1) Testing to be in accordance with TIA standards and Manufacturer's system warranty guidelines and best industry practice.
 - a) If any of these are in conflict, discrepancies shall be brought to attention of Architect/Consulting Engineer for clarification and resolution.
 - b. Cables and termination hardware:
 - 1) Test complete system for defects in installation.
 - 2) Verify cabling system performance under installed conditions according to requirements of TIA-568:
 - a) All pairs of each installed cable shall be verified prior to system acceptance.
 - b) Any defect in cabling system installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks shall be repaired or replaced in order to ensure one hundred (100) percent useable conductors in all cables installed.
 - c. Copper channel testing:
 - 1) All twisted-pair copper cable links shall be tested for compliance to requirements of TIA-568 for appropriate Category of cabling installed.
 - 2) Backbone multimode fiber cabling shall be tested at both 850 nm and 1300 nm.
 - d. UTP Cables and Links testing:
 - 1) UTP cabling channel must be tested at swept frequencies up to 250 MHz for internal channel performance parameters as defined in IEEE 802.3 and TIA-568. Certifications shall include following parameters for each pair of each cable installed:
 - a) Wire map (pin to pin connectivity).
 - b) Length (in feet or millimeters).
 - c) Near End Crosstalk (NEXT).
 - d) Far End Crosstalk (FEXT).

- e) ELFEXT.
- f) Attenuation/Crosstalk Ration (ACR).
- g) Return Loss.
- h) Propagation Delay.
- i) Delay Skew.
- j) Test equipment shall provide electronic and printed record of these tests.
- 2) Test each pair of cable for opens, shorts, grounds, and pair reversal.
 - a) Correct short or grounded and reversed pairs.
 - b) Examine open and shorted pairs to determine if problem is caused by improper termination.
 - c) If termination is proper, tag bad pairs at both ends and note on termination sheets.
 - d) If horizontal cable contains bad conductors, remove and replace cable.
- e. Testing Equipment:
 - 1) Comply with requirements of TIA-568.
 - a) Appropriate level III tester shall be used to verify Category 6 cabling systems.
 - 2) UTP Cables and Links test equipment:
 - a) Category Four Approved Testing Equipment. See Section 01 6200 for definitions of Categories:
 - (1) Fluke Networks DTX-1800 with firmware version 2.04 or later.
 - (a) Test lead to be P/N DTX-PLA001 or PLA002 universal permanent link interface adapter.
 - (2) Agilent Wirescope Pro N2640A with firmware version 2.1.9 or later.
 - (a) Test lead to be P/N N2644A-101 universal CAT6A link smart probes.
- f. Re-Testing:
 - 1) Consulting Engineer may request ten (10) percent random field re-test to be conducted on cable system, at no additional cost to Owner, to verify documented findings.
 - a) Tests shall be repeat of those defined above.
 - b) If findings contradict documentation submitted, additional testing can be requested to extent determined necessary by Consulting Engineer, including one hundred (100) percent re-test at no additional cost to Owner.
- g. Tests And Evaluation Reports:
 - 1) Printouts generated for each cable by wire test instrument shall be submitted as part of documentation package. Installer may furnish this information in electronic form.
 - a) Media shall contain electronic equivalent of test results as defined by the Section along with software necessary to view and evaluate test reports.
 - 2) Submit documentation within ten (10) working days of completion of each testing phase. This is inclusive of all test results and record drawings.
 - 3) Draft drawings may include annotations done by hand. Final copies of all drawings shall be submitted within thirty (30) working days of completion of each testing phase.
 - 4) If requested by Consulting Engineer, provide copies of original test results.
- h. Test Documentation:
 - 1) Provide electronic format documentation within three (3) weeks after completion of project.
 - 2) Documentation shall be clearly marked on outside front cover with following:
 - a) "Project Test Documentation".
 - b) Project name.
 - c) Date of completion (month and year).
 - 3) Test results shall include following:
 - a) Record of test frequencies.
 - b) Cable type.
 - c) Conductor pair and cable (or outlet) I.D.
 - d) Measurement direction.
 - e) Reference setup.
 - f) Crew member name(s).
 - g) Test equipment name, manufacturer, model number, serial number, software version.
 - h) Last calibration date:
 - (1) Unless Manufacturer specifies more frequent calibration cycle, annual calibration cycle is required on all test equipment used on project.

- (2) Document shall detail test method used and specific settings of equipment during test as well as software version being used in field test equipment.

- B. Non-Conforming Work: Non-conforming work as covered in General Conditions applies, but is not limited to following:
 - 1. Any cable damaged or exceeding recommended installation parameters during installation shall be replaced at no additional cost to Owner.
 - 2. Any defect in cabling system installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks shall be repaired or replaced in order to ensure one hundred (100) percent useable conductors in all cables installed at no additional cost to Owner.
 - 3. Correct deviation and repeat applicable testing at no additional cost to Owner.
 - 4. Correct any work found defective or not complying with Association Publications and TDMM requirements at no additional cost to Owner.
 - a. Document all problems found and corrective action taken.
 - b. Include both failed and passed test data.

END OF SECTION

ATTACHMENTS

Facilities Zone IP Address Assignments

Installers connecting any equipment to the Facilities Zone shall conform to the IP addressing assignments listed in the Table below.

- For each device listed, the Device must be statically assigned the IP Address that is given by adding the specified offset in the table to the Facility Zone Gateway address.
- IP addresses should follow standard IPv4 Octet form.
- The respective Device installer is responsible for setup of the device.
- Structured Cabling Installer shall post a copy of this list near the Firewall, with the Gateway address filled in.

SECTION 27 5117**AUDIO SYSTEMS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install complete and operational sound system as described in Contract Documents including:
 - a. Complete systems for amplifying sound signals from microphones and media source equipment and distributing them to loudspeakers at various locations.
 - 2. Assist Audiovisual Consultant with final inspection and equalization of system and provide necessary test equipment for audio system and partition noise isolation tests if applicable. Correct problems found at time of final inspection of system.
- B. Related Requirements:
 - 1. Division 26 'Electrical':
 - a. Raceway, boxes, and installation of speaker enclosures and mounting rings furnished by Division 27.
 - b. Power to equipment location and power relay wiring if applicable.
 - 2. Section 27 1116: 'Communications Cabinet, Racks, Frames, and Enclosures'.
 - 3. Section 27 1501: 'Communications Horizontal Cabling'.
 - 4. Audiovisual Consultant will perform final inspection, system balance, and instruct CES personnel in operation of system.
- C. Products Installed But Not Furnished Under This Section:
 - 1. Webcast Communicator or Webcast Capable Device.
- D. Related Requirements:
 - 1. Section 01 6400: Owner will furnish Webcast Communicator or Webcast Capable Device such as personal computer or laptop. This Section establishes quality of materials and installation for information of Contractor, Architect, and Owner's Representatives.

1.2 REFERENCES

- A. Association Publications:
 - 1. Building Industry Consulting Service International (BISCI):
 - a. *Information Transport Systems Installation Methods Manual (ITSIMM)* (5th Edition).
 - b. *Telecommunications Distribution Methods Manual (TDMM)* (12th Edition).
 - 2. InfoComm International Association:
 - a. *Audiovisual Best Practices: The Design & Integration Process for the AV and Construction Industries*.
 - b. *AV Design Reference Manual* (1st Edition, 2006).
 - c. *Basics of Audio and Visual Systems Design* (2003).
 - 3. Institute of Electrical and Electronics Engineers:
 - a. IEEE 1100-2005, '*Recommended Practice for Powering and Grounding Electric Equipment*'.
- B. Reference Standards:
 - 1. American National Standards Institute/InfoComm International Association:
 - a. ANSI/INFOCOMM 1M:2009, 'Audio Coverage Uniformity in Enclosed Listener Areas'.
 - b. ANSI/INFOCOMM 2M:2010, 'Standard Guide for Audiovisual Systems Design and Coordination Processes'.
 - c. ANSI/INFOCOMM 4:2012, 'Audiovisual Systems Energy Management'.
 - 2. National Fire Protection Association:

- a. NFPA 70, 'National Electrical Code (NEC)' (2017 or most recent edition adopted by AHJ).
- b. NFPA 72, 'National Fire Alarm and Signaling Code' (2019 or most recent edition adopted by AHJ).
3. Telecommunications Industry Association:
 - a. TIA-568.2, 'Balanced Twisted-Pair Telecommunications Cabling and Components Standards' (Revision D, 2018).
 - b. TIA-569, 'Telecommunications Pathways And Spaces' (Revision D, 2015).
 - c. TIA-606, 'Administration Standard for Telecommunications Infrastructure' (Revision C, 2017).
 - d. TIA-607, 'Telecommunications Bonding and Grounding (Earthling) for Customer Premises' (Revision C, 2015).
 - e. TIA-758, 'Customer-Owned Outside Plant Telecommunication Infrastructure Standard' (Revision B, 2012).
4. Underwriters Laboratories (UL):
 - a. UL 486A-486B, 'Wire Connectors' (3rd Edition April 2018).

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 1. Coordinate final inspection schedule of audio systems before Audiovisual Consultant's final inspection.
- B. Schedule:
 1. After completion of audio system installation of this section, Installer to perform Field Testing before Audiovisual Consultant Final Inspection of audio system.
 2. Notify Audiovisual Consultant two (2) weeks minimum before Audiovisual Consultant's final inspection as specified in Field Quality Control in Part 3 of this specification.

1.4 SUBMITTALS

- A. Informational Submittals:
 1. Special Procedure Submittals:
 - a. Provide itemized list of equipment to be supplied.
 - b. Provide proposed labeling for system components.
 2. Qualification Statement:
 - a. Installer:
 - 1) Provide Qualification documentation as requested by Engineer/Architect including:
 - a) List of Projects requested.
 - b) List of certified technician(s) with dates of training courses completed.
- B. Closeout Submittals:
 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Operations and Maintenance Data:
 - 1) Equipment Manufacturer's manual:
 - a) Audio system operation and maintenance instructions.
 - b) List of equipment provided, including portable equipment, showing make, model, and serial number.
 - b. Warranty Documentation:
 - 1) Include copy of final, executed warranty.
 - c. Record Documentation:
 - 1) Software and Programming: Copies of all manufacturers' software used for programming various components and functions of the system shall be furnished to the Owner:
 - a) Original audio processor program files, source codes and compiled codes used for system control, audio setup and any other computerized functions of system including screen layout generation, configuration and layouts and any other related computer files shall also be furnished to Owner.

- b) In each and every case, all programming, code generation, configuration files, layout files and any other software and/or code written and generated of setup and operation of this system are property of Owner of system and not of Audiovisual Consultant, Contractor or Integrator.

1.5 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 1. System shall be installed in accordance with applicable standards, requirements, and recommendations of International Building Code, National Electrical Code and all local authorities having jurisdiction.
- B. Qualifications:
 1. Installer. Requirements of Section 01 4301 applies, but not limited to following:
 - a. Approved Installers:
 - 1) Installers are to furnish and install components of audio system and meet qualification requirements.
 - 2) Approval subject to agreement process for Pre-Approval Installers.
 - b. Alternate Installer(s):
 - 1) Firm specializing in performing work of this section:
 - a) Minimum three (3) years of successful installation experience of AV system projects of comparable size, and complexity required for this project. Audio systems must have included complete installation and setup work and must have been completed by factory trained and certified technician.
 - b) Firm successfully completed minimum of three (3) projects in past two (2) years before bidding.
 - c) Firms must have certified technician that has successfully completed all relevant training courses recommended by manufacturers and proficient of all specified equipment of this section.
 - d) Comply with specifications and Contract Documents.
 - 2) Submit documentation of compliance of qualifications before bid to Architect or Owner's Representative.
 - c. Same Approved Installer shall furnish and install components of Section 27 1116 'Communications Cabinets, Racks, Frames and Enclosures'.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
 1. Materials shall be delivered in original, unopened packages with labels intact.
- B. Storage And Handling Requirements:
 1. Provide secure location protected from weather in cool, dry location, out of direct sunlight in compliance with Manufacturer's instructions and recommendations.
 2. Keep materials free from dirt and foreign matter.

1.7 WARRANTY

- A. Special Warranty:
 1. Provide complete warranty repair or replacement for one (1) year at no cost to Owner, except in case of obvious abuse.
 2. If failure causes audio system to be inoperative or unusable for its intended purpose, Installer, when notified of problem shall repair system within five (5) days so it will be operational and usable. If defective components cannot be repaired in time, furnish and install temporary loaner equipment as required.
 3. Honor component warranties for term established by Manufacturer, if greater than one (1) year.

PART 2 - PRODUCTS

2.1 OWNER-FURNISHED PRODUCTS

- A. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
1. Webcast Communicator or Webcast Capable Device.

2.2 SYSTEM

- A. Manufacturers Contact List:
1. Category Four components as shown on Drawings from following Manufacturers. See Section 01 6200 for definition of Categories.
 - a. Atlas Sound, Phoenix, AZ www.atlassound.com.
 - b. Audio-Technica US Inc, Stow, OH www.audio-technica.com.
 - c. Belden Wire & Cable Co, Richmond, IN www.belden.com.
 - d. BSS Audio, Sandy, UT www.bssaudio.com.
 - e. Chatsworth, Westlake Village, CA www.chatsworth.com.
 - f. Community Professional Loudspeakers, Chester, PA www.communitypro.com.
 - g. COMTEK Inc, Salt Lake City, UT www.comtek.com.
 - h. Conquest Sound Co, Tinley Park, IL www.conquestsound.com.
 - i. Crown Audio Inc, Elkhart, IN www.crownaudio.com.
 - j. Countryman, Menlo Park, CA www.countryman.com.
 - k. EIKI International, Laguna Niguel, CA www.eiki.com.
 - l. Electro-Voice Inc, Burnsville, MN www.electro-voice.com.
 - m. Emtech Electronics Inc, Orem, UT www.emtechelectronics.com.
 - n. Extron, Anaheim, CA www.extron.com.
 - o. HellermannTyton, Milwaukee, WI www.hellermann.tyton.com.
 - p. Hubbell Inc, Orange, CT www.hubbell-wiring.com.
 - q. IVIE Technologies Inc, Lehi, UT www.ivie.com.
 - r. JBL Professional, Northridge, CA www.jblpro.com.
 - s. König & Meyer, Wertheim, Germany www.k-m.de/en.
 - t. Leviton Manufacturing Co, Little Neck, NY www.leviton.com.
 - u. Liberty AV Solutions, Colorado Springs, CO www.libertycable.com.
 - v. Lowell Manufacturing Co, Pacific, MO www.lowellmfg.com.
 - w. Middle Atlantic Products, Fairfield, NJ www.middleatlantic.com.
 - x. Neutrik USA Inc, Lakewood, NJ (732) 901-9488. www.neutrikusa.com.
 - y. Newark Electronics, Sola and Triad, Chicago, IL www.newark.com.
 - z. QSC Audio Products, Costa Mesa, CA www.qscaudio.com.
 - aa. Radio Design Labs, Carpinteria, CA www.rdlnet.com.
 - bb. Rane Corp, Mukilteo, WA www.rane.com.
 - cc. Shure Brothers, Evanston, IL www.shure.com.
 - dd. SoundTech, Mundelein, IL www.soundtech.com.
 - ee. Soundtube Entertainment, Park City, UT www.soundtube.com.
 - ff. Surgex, Knightdale, NC www.surgex.com.
 - gg. Switchcraft, Chicago, IL www.switchcraft.com.
 - hh. TOA Electronics, South San Francisco, CA www.toaelectronics.com.
 - ii. TV One, Erlanger, KY www.tvone.com.
 - jj. Whirlwind Music Distributors, Inc., Rochester, NY www.whirlwindusa.com.
 - kk. Wireworks Corp, Hillside, NJ www.wireworks.com.
- B. Performance:
1. Capabilities:
 - a. Installations with audio DSP shall meet following performance parameters:
 - 1) From 100 Hz to 2 kHz, flat within plus or minus 2 dB.
 - 2) Above 2 kHz, slope down along an approximate 3 dB per octave slope to 8 kHz.
 - b. No noise, hum, RFI pickup or distortion shall be audible under normal operating conditions.
 - c. Audio systems shall reproduce program material at level of 80 to 85 dBA without audible distortion.

- d. All input levels shall be pre-set so system may be operated without going into feedback under normal conditions.
- C. System Requirements:
1. General:
 - a. Provide complete and fully functional audio systems using materials and equipment of types, sizes, ratings, and performances as indicated in equipment list in accompanying drawings:
 - 1) Use materials and equipment that comply with referenced standards and manufacturers' standard design and construction in accordance with published product information.
 - 2) Coordinate features of materials and equipment so they form integrated system with components and interconnections matched for optimum performance of specified functions.
 2. Provide all wire, cable, and connectors as required to complete installation of all systems as designed and specified.
- D. Equipment And Materials:
1. General:
 - a. Provide equipment selected from equipment list on drawings, or as substituted following proscribed substitution process, using all solid state components fully rated for continuous duty at ratings indicated or specified.
 - b. Select equipment for normal operation on input power supplied at 105 130 V, 60 Hz.

PART 3 - EXECUTION

3.1 INSTALLERS

- A. Approved Installers:
1. Category Four Approved Installers. See Section 01 6200 for definitions of Categories:
 - a. Qualifications:
 - 1) Meet qualification requirements as specified in Quality Assurance in Part 1 of this specification.
 - b. General Communications: (801) 266-5731.
 - c. Marshall Industries: (801) 266-2428.
 - d. Poll Sound: (801) 261-2500.
 - e. Professional Systems Technology: (801) 649-6696.

3.2 EXAMINATION

- A. Verification Of Conditions:
1. Verify compliance with following items before beginning work of this Section:
 - a. No cables spliced.
 - b. Isolated ground run back to electrical panel from all equipment cabinets.
 - c. Specified conduit, cables, speaker enclosures and equipment cabinets are properly installed.
 - d. Location and angle of speaker cabinets.
 2. Ensure that no solid structural or decorative member impedes sound propagation from speakers and that no member with cross section greater than **3/4 inch (19 mm)** is placed in front of speakers.
 3. Verify installation of fiberglass insulation in field-fabricated speaker enclosures.

3.3 INSTALLATION

- A. General:
1. Install system in accordance with NFPA 70 'National Electrical Code', NFPA 72 'National Fire Alarm and Signaling', and other applicable codes. Install equipment in accordance with manufacturer's written instructions.

- B. Mounting And Securing Equipment:
1. Equipment shall be firmly secured in place unless requirements of portability dictate otherwise.
 2. Fastenings and supports shall be adequate to support their loads with safety factor of at least three (3) times weight of equipment being installed.
 3. Any structural mounting that is not able to meet this requirement due to specific nature of equipment, manufacturer's requirements or limitations of facility, shall not be installed without prior approval of Engineer.
 4. Install all boxes, equipment, hardware, and other materials plumb, level, and square.
- C. Millwork:
1. Install technology equipment and support equipment in podium and other millwork in neat and cosmetically dressed out manner.
 2. Saw cuts, holes and recesses into laminates and woodwork shall be straight.
 3. Radius and circular cuts shall be consistent, and all uneven surfaces shall be corrected. This shall include use of moldings, grommets, bushings, laminates, and wood products as required to dress out installation of equipment.
 4. Install equipment and panels in technology racks and podiums using matching screws, hardware and grommets.
- D. Speakers:
1. Maintain uniform polarity in speakers and wiring.
 2. Employ no positive stop in rotation of speaker volume controls. Controls shall be capable of continuous rotations in either direction.
 3. Mount transformers with screws securely to speaker brackets or enclosures. Adjust torsion springs as necessary to securely support speaker assembly.
 4. Neatly mount speaker grilles, panels, connector plates, control panels, etc., tight, plumb, and square unless indicated otherwise on drawings.
 5. Provide brackets, screws, adapters, springs, rack mounting kits, etc, recommended by manufacturer for correct assembly and installation of speaker assemblies and electronic components.
 6. Line factory-fabricated speaker back boxes with **one inch (25 mm)** minimum fiberglass if not done by Back box Manufacturer.
 7. Speaker Back Boxes shall be secured to structure using **12 ga (2.7 mm)** minimum seismic safety cables.
- E. Technology:
1. Provide sufficient ventilation for adequate cooling of equipment.
 2. Install vent rack panels in unused spaces. Install vent panels at top and bottom and above each power amplifier.
 3. Securely fasten equipment plumb and square in place. Where equipment is installed in rack cabinets, utilize all fastening holes and cove open spaces with perforated panels.
 4. Securely fasten relays and small components. Do not use sticky-back tape for fasteners.
 5. Install balancing transformer on each unbalanced input or output that connects to devices outside equipment cabinet, or that connects to balanced input or output within equipment cabinet.
 6. Connect powered components to 120 VAC outlets on transient voltage surge suppressors. Do not connect to outlets on other components.
 7. Leave sufficient service loops to uniform length on cables to allow operation of system with chassis outside cabinet.
 8. Equipment shall be held firmly in place with proper types of mounting hardware as recommended and/or supplied by manufacturer:
 - a. Mounting hardware provided with equipment shall be used when practical. This shall include, but not be limited to, front and rear rack rails, angle brackets and rack mount kits.
 - b. Equipment shall be installed so as to provide reasonable safety to operator.
- F. Cables, Wires, And Connectors:
1. Cables:
 - a. Cable and wire shall be new and unspliced.
 - b. Splicing:
 - 1) Splicing of cables and conductors is expressly prohibited in any location other than equipment racks.

- 2) Splicing of control and speaker level conductors shall be accomplished via punch block or terminal strip connections only.
 - c. Additional cable length shall be provided at all connector locations. Duplex box, junction box, and floor box locations shall be installed with sufficient cable length behind cover plates to permit wiring maintenance and connector replacement in the future.
 - d. When cable runs utilize vertical cable raceways located within walls, acoustic integrity of walls shall be maintained:
 - 1) Cables that pass-through cover plates of junction boxes and raceways, through slab-to-slab walls, and through conduit lines shall be properly gasketed and sealed. Acoustic material shall be restored or replaced.
 - e. Separation between system cables and other services shall be maximized to prevent and/or minimize potential for electro-magnetic interference (EMI):
 - 1) Provide at least **12 inches (305 mm)** separation from electrical lines whenever feasible.
 - 2) Where separation is unavoidable, distribution cables shall cross other services at right angles whenever practical to minimize EMI.
 - f. Do not install signal cables on top of light fixtures, ceiling speakers, projection screens, HVAC controls or sensing devices, fire safety and sprinkler system detection technology, or any other technology or mechanical equipment.
 - g. Do not lay cables directly on top of T-bar grid ceiling tiles:
 - 1) Support cables installed outside of conduit at **4 feet (1.20 m)** maximum intervals from building structure.
 - 2) Do not utilize support wires from other trades or systems.
 - h. Install system cables shall not block access to other equipment or services, across removable service panels and/or in any other manner to prohibit routine maintenance of HVAC systems, fire safety equipment and building mechanical control systems.
 - i. Inter-rack cabling:
 - 1) Inter-rack cabling shall be neatly laced, dressed, strain relieved and adequately supported.
 - 2) Inter-rack cables shall be grouped according to signals being carried to reduce signal contamination. Separate groups shall be formed for following:
 - a) Power.
 - b) Control.
 - c) Audio cables carrying signals less than -20 dBm.
 - d) Audio cables carrying signals between -20 dBm and +20 dBm.
 - e) Audio cables carrying signals over +20 dBm.
 - j. Power cables, control cables, and high-level cables shall be run on left side of equipment racks as viewed from rear. All other cables shall be run on right side of all equipment racks as viewed from rear.
 - k. Cables, shall be cut to length dictated by cable run.
 - l. Terminal blocks, boards, strips or connectors, shall be furnished by installer for all cables which interface with racks, cabinets, consoles, or equipment modules. Affix terminal blocks, boards, strips or connectors to equipment racks using screws only. Double sided tape will not be accepted.
 - m. Shields for audio cables shall be grounded at input end only of various equipment items on system to prevent potential for ground loops.
 - n. Shields for microphone cables shall be grounded at both ends to allow Phantom Power to pass.
 - o. Where AV cable is installed in areas that are exposed to view of end users, install AV cable and associated power cables inside nylon braided sleeving (wire loom):
 - 1) Examples of such areas include, but are not limited to cables installed to projectors and monitors, and cables installed to devices in/on lecterns such as touch panels and document cameras.
 - 2) Where security cables are specified for physical security to such devices, install the specified security cables inside nylon braided sleeving along with AV cables.
2. Wiring and Cabling:
 - a. Comply with industry standard circuit polarity and loudspeaker wiring polarity. No cables shall be terminated with polarity reversal between connectors at either end.
 - b. System wire, after being cut and stripped, shall have wire strands twisted back to their original lay and be terminated by approved soldered or mechanical means. No bare wire ends shall be accepted.

- c. Do not place any wires and cables for this system in any conduit, raceway, wire way or cable tray that is used for mechanical systems of building.
 - d. Route all cable and wiring within equipment racks, cabinets and millwork according to function, separating wires of different signal levels (microphone, line level, amplifier output, AV, control, etc.) by as much distance as possible. Neatly arrange, harness and bundle all cable with velcro straps.
 - e. After completion of wiring and cable installation, all trough and box covers shall be notched out and grommetted for clearance of various cable bundles, (i.e., separate audio, and control). Panel covers shall be screwed back in place and all gaskets shall be restored or replaced.
3. Connectors:
- a. Provide connectors of type and quality as detailed in Contract Drawings and/or as required to meet minimum bandwidth requirements of equipment to which connectors are terminated. Overall quantity of connectors shall not be limited by quantities indicated in Contract Drawings and shall be provided as required.
 - b. No connectors shall be installed in non-accessible locations or used for splicing cables. Connectors shall be new.
 - c. Connectors shall incorporate strain relief mechanisms which firmly grip the jacket of connected cables.
 - d. Connectors shall be properly polarized to prevent improper seating.
 - e. Connectors shall provide appropriate electrical characteristics for circuitry to which they are attached.
 - f. Exposed conductors inside of equipment racks shall be dressed with heavy duty neoprene heat-shrink tubing.
 - g. Heat-shrink type tubing shall be used to insulate and dress ends of all wire and cables including separate tube for ground or drain wire.
 - h. Solder connections shall be made with rosin-core solder. Temperature controlled soldering irons rated at least 60 watts shall be used for all soldering work. No soldering guns, gas or butane, or temperature unregulated irons shall be used on job site.
 - i. Mechanical connections shall be made with approved crimp lugs of correct size and type for connection. Wire nuts shall not be permitted except inside speaker enclosures. Each connector shall be attached with proper size controlled-duty-cycle ratcheting crimp tool approved by manufacturer.
 - j. Conventional non-ratcheting type crimping tools are unacceptable, and shall not be used on job site. Presence of such tools on job site shall constitute evidence of mechanical connections made with unauthorized tools and shall provide sufficient grounds for rejection of all mechanical connections in system, and will be considered non-conforming work.
- G. Equipment Cabinet:
- 1. Install vent panels at top and bottom of equipment cabinets and between components where possible for maximum ventilation. Locate amplifiers at top of cabinet. Locate equalizers below amplifiers, separated by several vent panels.
 - 2. Securely fasten equipment plumb and square in place. Utilize all fastening holes in front of cabinet.
 - 3. Securely fasten in place equipment that is not rack mounted, including relays and other small components. Do not use sticky-back tape.
 - 4. Install balancing / isolation transformer when balanced and unbalanced components are connected.
 - 5. Wire XLR-type connections with pin 2 hot, pin 1 shield.
 - 6. Connect powered components to 120 VAC outlets on voltage suppressor power bars. Do not connect to outlets on other components.
 - 7. Identification:
 - a. Legibly identify user-operated system controls and system input / output jacks using engraved, permanently attached laminated plastic plates or imprinted Lexan labels. Label equipment and controls within equipment cabinets using similar labels or printed labels from a label maker or laser printer.
 - b. Affix label to rack panel inside cabinet listing name and telephone number of installer. Appropriate warranty instructions may be included.

H. Identification And Labeling:

1. Cables, regardless of length, shall be identified with machine-printed wrap-around labeling system at both ends:
 - a. These labels shall be self-laminating to ensure durability.
 - b. Label format used shall be equal, or better than, system detailed.
 2. There shall be no unmarked cables any place in system.
 3. Marking codes used on cables shall correspond to codes provided with submittals, and/or written documentation of 'Record Drawings'.
 4. Connectors, controls, equipment components, terminal blocks and equipment racks are to be permanently labeled in format approved during submittal process.
 5. Equipment labels are to be permanently engraved in metal. Alternative method shall be approved during submittal process only.
 6. Clearly and permanently label all jacks, controls, connections, and so forth. Embossed or printed label tape shall not be used and is considered unacceptable for this system. Attach labels with double stick tape as required.
 7. Labeling shall be completed prior to acceptance of final system.
- I. Grounding:
1. Provide equipment grounding connections for audio system as indicated. Tighten connections to comply with tightening torques specified in UL Standard 486A-486B to assure permanent and effective grounds.
 2. Ground equipment, conductor, and cable shields to eliminate shock hazard and to eliminate ground loops, common mode returns, noise pickup, cross talk, and other impairments. Provide 5 ohm ground at main equipment location. Measure, record, and report ground resistance.
 3. Provide grounding conductor with green insulation between as indicated on Contract Drawings. Comply with IEEE and TIA standards.
- J. Seismic Bracing:
1. Comply with IBC and local seismic requirements for all equipment and conduit pathways.

3.4 FIELD QUALITY CONTROL

- A. Field Tests:
1. Installer Testing:
 - a. After completion of installation but before inspection by Audiovisual Consultant, perform following:
 - 1) Conduct system tests and make necessary corrections for proper system operation including, but not limited to, following:
 - a) Output level uniformity.
 - b) Polarity.
 - c) Shock, strain excited hum, and oscillation.
 - d) Clipping, hum, noise, and RFI in all system configurations.
 - e) Speaker line impedances.
 - f) Loose parts and poor workmanship or soldering.
 - 2) Sweep speaker systems with high-level sine wave or 1/3 octave pink noise source. Correct causes of buzzes or rattles related to speakers or enclosures. Notify Contractor and Audiovisual Consultant of external causes of buzzes or rattles.
 - 3) Rough Balance: Balance system well enough that it can be used for meetings before final inspection.
 - b. Complete documentation required by Audiovisual Consultant and submit to consultant within five (5) days of Substantial Completion.
- B. Field Inspections:
1. Audiovisual Consultant Inspection And Equalization:
 - a. Coordinate final inspection schedule with Audiovisual Consultant two (2) weeks minimum before Consultant's final inspection.
 - b. Have copy of Installer redlined documents sent to Audiovisual Consultant two (2) weeks minimum to before field inspection.
 - c. Have loose equipment (microphones, cables, etc.) available at time of inspection.
 - d. Assist Audiovisual Consultant in final inspection of completed system.

- e. Assist Audiovisual Consultant in noise isolation testing of folding partitions and office doors.
- f. Provide following test equipment in good working order:
 - 1) Laptop computer:
 - a) Operating System: Microsoft Window 7.
 - b) Processor: 2 GHz Dual-Core Intel Processor or faster (or compatible).
 - c) RAM: 2 GB or greater.
 - d) Video: Graphics processor with 128 M dedicated video RAM, minimum 1024x768 display or better.
 - e) Sound Hardware: Audio Hardware with OS compatible ASIO, Wav/WDB drivers, sample rate of up to 192kHz and bit-resolutions of up to 32. Bit, or better.
 - 2) 1/3 octave real-time audio spectrum analyzer with SPL meter, and precision microphone.
 - 3) Digitally generated random pink noise generator, 20Hz-20KHz, minimum two (2) hour repetition rate or ten (10) minutes minimum of equivalent signal recorded on compact disc.
 - 4) Direct reading audio impedance meter, minimum three (3) frequencies, and ten (10) percent accuracy.
 - 5) Digital Volt-Ohmmeter.
 - 6) Audio oscillator, variable frequency, 20Hz-20KHz.
 - 7) MP3 player with pre-recorded speech and music program material.
 - 8) Necessary chargers, cables, test leads, adapters, and other accessories for test equipment.
 - 9) Tools and spare parts for making adjustments and corrections to system.
 - 10) CAT-5 / RJ-45 continuity tester similar to Ideal 62-200 or Amprobe DCT-300.
- g. Correct minor items so Audiovisual Consultant may certify satisfactory completion during his visit.

C. Non-Conforming Work:

- 1. Correct any work found defective or not complying with contract document requirements at no additional cost to the Owner.

D. Manufacturer Services:

- 1. Provide services of factory authorized service representative to supervise field assembly and connection of components and pretesting, testing, and adjustment of system.

3.5 CLEANING

A. Waste Management:

- 1. All work areas are to be kept clean, clear and free of debris at all times.
- 2. Disposal of rubbish, debris, and packaging materials to Contractor provided Dumpster.

END OF SECTION

SECTION 28 1316
ACCESS CONTROL SYSTEMS

PART 1 GENERAL**1.01 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install electronic door access control system as described in Contract Documents including the following:
 - a. Access control devices.
 - b. Application software.
 - 2. Furnish and install electronic emergency lockdown system as described in Contract Documents including the following:
 - a. Latching button.
- B. Products Installed But Not Furnished Under this Section"
 - 1. Pull string in conduit from storefront to location accessible by master controller.
 - 2. Electrical duplex located for master controller.
- C. Related Requirements:
 - 1. Section 08 4113: 'Aluminum-Framed Entrances And Storefronts' for installation of storefront.
 - 2. Division 26: 'Electrical' for conduit, pull string and duplex for access control system.

1.02 REFERENCES

- A. Referenced Standards:
 - 1. National Fire Protection Association:
 - a. NFPA 70, 'National Electrical Code' (2017 or most recent edition adopted by AHJ).
 - b. NFPA 101, 'Life Safety Code' (2018 or most recent edition adopted by AHJ).
 - 2. Underwriters Laboratories, Inc.
 - a. UL 294, 'Access Control System Units' (7th Edition).

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate location of pull string inside storefront door mullion where electric strike and proximity reader will be mounted to location that can be accessed by master controller by Division 26.
 - 2. Coordinate electric strike requirements.
 - 3. Coordinate location of latching button control for electronic emergency lockdown system.
- B. Sequencing:
 - 1. Install access control system after the following has been completed:
 - a. Storefront has been installed.
 - b. Adjacent walls and ceilings are finished and painted.
- C. Preinstallation Meetings:
 - 1. Conduct meeting with facility representative to review reader and equipment locations.
 - 2. Conduct meeting with facility representative and other related equipment manufacturers to discuss access control system interface requirements.

1.04 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Manufacturer's original catalog data and descriptive information on each piece of equipment to be used.
 - b. Manufacturer's written installation instructions.
 - c. Manufacturer's written maintenance and operation instructions.
 - 2. Shop Drawings:

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- a. Prepared by authorized factory representative and including:
 - 1) Single line diagram of actual system. Typical riser diagrams are not acceptable.
 - 2) Complete wiring diagrams.
- B. Informational Submittals:
 - 1. Certificates:
 - a. Authorized Dealer Certificate and Certified Training Certificates of Installer(s).
 - 2. Manufacturer Instruction:
 - a. Instruction manual that explains operation of system.
- C. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Operations and Maintenance Data:
 - 1) Operation Manual
 - 2) Master Control Manual.
 - 3) Maintenance and operational instructions.
 - (a) Battery replacement schedule.
 - (b) Recommended backup procedures and schedule.
 - 4) Contact Information:
 - (a) Provide name, address, and phone numbers including 24/7 contact if available.
 - b. Warranty Documentation:
 - 1) Final, executed copies of Warranties on Master Control, Proximity Readers, and Electronic Locking Hardware.
 - c. Record Documentation:
 - 1) Manufacturers documentation:
 - (a) Manufacturer's literature or cut sheet for each item of the system.
 - (b) Manufacturer's operating system backup.
 - (c) Two (2) keys to control box.

1.05 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. System shall be recognized for intended use by applicable building codes.
- B. Qualifications:
 - 1. Installer: Requirements of Section 01 4301 applies, but not limited to following:
 - a. Factory-trained and certified.
 - b. Installer shall have performed at least three installations of similar size, scope, and complexity in each of the past two years and be approved by Access Control Manufacturer.
 - c. Bonded and Licensed.
 - d. Comply with specifications and contract documents.
- C. Certifications:
 - 1. Access Control system shall be certified by Manufacturer to meet performance design criteria according to following test standards.
 - a. NFPA 101.
 - b. Underwriter's Laboratories 294 (UL) listed.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.
- B. Store products in manufacturer's unopened packaging, keep dry and protect from damage until ready for installation.

1.07 WARRANTY

- A. Manufacturer Warranty and Extended Warranties:
 - 1. Master Controller:

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- a. Manufacturer's 5-year Warranty against faulty workmanship and materials.
- 2. Electronic Locking Hardware:
 - a. Manufacturer's Warranty on each component.
- B. Provide minimum one-year manufacturer warranty covering repair or replacement due to defective materials or workmanship.
- C. Special Warranty:
 - 1. Distributor's ninety (90) day no questions asked return of product guarantee.
 - 2. Distributor's one (1) year guarantee covering installation.

PART 2 PRODUCTS

2.01 SYSTEMS

- A. Distributors:
 - 1. Category Three Approved Distributors. See Section 01 6200 for definitions of Categories:
 - a. Troy Muir
Everest Contracting
(801) 550-9933
trm.everest@gmail.com
 - b. Equal as approved by manufacturer and architect prior to bidding.
- B. Description:
 - 1. Electronic door access system.
 - 2. Electronic emergency lockdown system.
- C. Design Criteria:
 - 1. Furnish and install complete electronic door access control system as described in contract documents.
 - a. System shall include all necessary readers, controller, cables, connectors, power supplies, software, and accessories for a complete operational door access system.
 - 2. Furnish and install complete emergency lockdown system as described in contract documents.
 - a. System Description
 - 1) System is deactivated by default.
 - 2) System is activated and deactivated by latching switch.
 - 3) System is bypassed exit devices at each door or pair of doors for emergency egress.
 - b. System shall include:
 - 1) Latching button at Support Specialist.
 - 2) Electric strikes at each door specified in the Door Schedule.
 - 3) All required relays, components, etc., to complete the system.
- D. Materials:
 - 1. Access Control System:
 - a. Category Three Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Kindoo by Locktronics.
 - 2) Kin-drel receiver.
 - 3) Electric strike by the same manufacturer supplying the balance of the aluminum storefront door hardware.
 - 2. Emergency Lockdown System:
 - a. TS-32B Latching Panic Station by Hanchett Entry Systems, Inc.
 - 1) Button color: Black.

2.02 ACCESSORIES

- A. Cable:
 - 1. Reader-22/6 Cable-Stranded / Shielded as required by Manufacturer.

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2. Strikes-18/4 Cable-Stranded / Shielded as required by Manufacturer

PART 3 EXECUTION

3.01 INSTALLERS

- A. Category Three Approved Installers. See Section 01 6200 for definitions of Categories:
 - a. Troy Muir
Everest Contracting
(801) 550-9933
trm.everest@gmail.com
 - b. Equal as approved by the manufacturer and architect prior to bidding.

3.02 EXAMINATION

- A. Verification Of Conditions:
 1. Examine substrate and verify it suitable for installation of system:
 - a. Notify Architect of unsuitable conditions in writing.
 - b. Commencement of Work by installer is considered acceptance of substrate.

3.03 INSTALLATION

- A. Interface With Other Work:
 1. Coordinate with Division 26 for location of duplex for master controller and pull string inside storefront door mullion where electric strike and pull string to proximity reader.
 2. Coordinate with Division 08 storefront entrances.
- B. General:
 1. Install Access Door System as per Manufacturer's written instructions.
 2. Install electronic emergency lockdown system as described in Contract Documents.

3.04 FIELD QUALITY CONTROL

- A. Field Tests:
 1. Conduct test (at Closeout) of system in presence of Owner and show system to be free of defective workmanship and materials.
- B. Non-Conforming Work:
 1. Replace system components that fail to perform as designed.
 2. Correct all work not in compliance to Contract Documents at no additional cost to Owner.

3.05 CLEANING

- A. Waste Management:
 1. Perform daily clean-up to collect wrappings, empty containers, paper, and other debris from project site.
 2. Upon completion, debris must be disposed of in legally acceptable manner.

3.06 CLOSEOUT ACTIVITY

- A. Instruction Of Owner:
 1. Perform up to three (3) hour maximum training session for Owner's Representative(s) demonstrating operation and maintenance of completed systems.
 - a. System operational instructions.
 - b. System maintenance procedures.
 - 1) Backup procedures and schedule.
 - 2) Battery replacement schedule.

3.07 PROTECTION

- A. Protect cable from cuts, abrasion, and other damage during construction.

END OF SECTION

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SECTION 28 3101

FIRE DETECTION AND ALARM SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To:
 1. Furnish and install fire alarm and detection system as described in Contract Documents.
 2. Furnish and install raceway, cable and conductors, boxes, and miscellaneous items necessary for complete system.

- B. Products Furnished But Not Installed Under This Section:
 1. Door Plates for door hold / release devices.

- C. Related Requirements:
 1. Division 21: Furnishing and installing of water flow switches, post indicating valves, valve tamper switches, and low air pressure switch.
 2. Section 23 0933: Furnishing and installing of duct smoke detectors in main return air ducts.
 3. Division 26: Quality of and installation standards for wiring, raceway, conduit, and boxes.

1.2 REFERENCES

- A. Reference Standards:
 1. National Fire Protection Association:
 - a. NFPA 72, 'National Fire Alarm and Signaling Code' (2019 or most recent edition adopted by AHJ).
 2. Underwriters Laboratories:
 - a. UL 268, 'Smoke Detectors for Fire Alarm Systems'.
 - b. UL 464, 'Audible Signal Appliances'.
 - c. UL 521, 'Heat Detectors for Fire Protective Signaling Systems'.
 - d. UL 864, 'Control Units and Accessories for Fire Alarm Systems'.
 - e. UL 1480, 'Speakers for Fire Alarm, Emergency, and Commercial and Professional'.
 - f. UL 1481, 'Power Supplies for Fire-Protective Signaling Systems'.
 - g. UL 1971, 'Standard for Signaling Devices for the Hearing Impaired'.

1.3 SUBMITTALS

- A. Action Submittals:
 1. Shop Drawings:
 - a. Prepared by authorized factory representative and including:
 - 1) Single line diagram of actual system. Typical riser diagrams are not acceptable.
 - 2) Complete wiring diagrams.
 - 3) Manufacturer's original catalog data and descriptive information on each piece of equipment to be used.

- B. Informational Submittals:
 1. Certificates:
 - a. Certificate of completion, from Manufacturer's Representative, in accordance with NFPA 72 requirements.
 2. Qualification Statement:
 - a. Installer:

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- 1) Provide NICET Certification documentation.

C. Closeout Submittals:

- 1. Include following information in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Operations and Maintenance Data:
 - 1) Provide operating and maintenance instructions for each item of equipment submitted under Product Data.
 - 2) Provide instruction manual from Manufacturer that explains what is to be done in event of various indications.
 - b. Record Documentation:
 - 1) Include copy of approved shop drawings.

1.4 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:

- 1. System shall meet approval of authority having jurisdiction (AHJ). NEC and local ordinances and regulations shall govern unless more stringent requirements are specified.
- 2. Equipment, devices, and cable shall be UL or Factory Mutual listed for use in fire alarm systems.

B. Qualifications:

- 1. Installer:
 - a. Project Forman or Person in Charge at all times to be NICET Level III Certified for work performed by this Section.
 - b. Provide Certificate documentation before installation.

PART 2 - PRODUCTS

2.1 SYSTEMS

A. Manufacturers:

- 1. Type One Acceptable Manufacturers:
 - a. Fire-Lite Alarms, Northford, CT www.firelite.com.
 - b. Mircom / Summit Systems Technologies, Cheektowaga (Buffalo), NY, Vaughan (Toronto), Ontario www.mircom.com / www.summit-st.net.
 - c. Potter Electric Signal Company, St. Louis, MO www.pottersignal.com.
 - d. Silent Knight Security Systems, Northford CT www.silentknight.com.
 - e. Equal as approved by Architect before bidding. See Section 01 6200.

B. Performance:

- 1. Design Criteria:
 - a. Automatic fire alarm system consisting of control panel, power supplies, alarm initiating devices, notification appliances, and off-site communicating devices. System shall be non-coded and addressable, and monitored for integrity of conductors.
 - b. Class A loop type initiating device circuits and Class A loop type notification appliance circuits.
 - c. Class B initiating device circuits and Class B notification appliance circuits including end-of-line devices.
 - d. Equipment and accessories furnished under this Specification shall be standard products of single manufacturer, or include written statement by Control Panel Manufacturer confirming compatibility of components and inclusion of these components under system warranty.

C. Operation:

- 1. Operation Sequences:

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- a. Operation of manual station or automatic activation of any smoke detector, heat detector, or sprinkler flow device shall:
 - 1) Cause system notification appliances to operate.
 - 2) Indicate zone in alarm on control panel.
 - 3) Initiate off-site alarm notification system.
 - 4) Indicate zone or device in alarm on remote annunciator.
- b. System shall return to normal when operated device is returned to normal and control panel is manually reset, except alarms may be silenced as specified below.
- c. Alarm may be silenced by switch in control panel.
 - 1) Ring Back Feature: When silenced, this shall not prevent the resounding of subsequent alarms if another zone should alarm.
- d. When alarms are silenced, zone indicating red LEDs on control panel and remote annunciator shall remain indicated until operated device is returned to normal and control panel is manually reset.
- e. Green pilot LED, or other visual annunciation, shall normally be on indicating that system is receiving normal power. In addition, failure of normal power shall be annunciated.
- f. Trouble alarm and annunciation, operating together, shall signal trouble condition. Following conditions shall signal trouble condition:
 - 1) Failure of normal power.
 - 2) Opens or short circuits on indicating circuits.
 - 3) Disarrangements in system wiring.
 - 4) Control panel circuit board removal.
 - 5) Ground faults.
 - 6) Trouble silencing switch shall silence trouble alarm, but visual annunciation shall remain on until system is restored to normal. As ring-back feature, trouble alarm shall resound as reminder to return silencing switch to normal position.
- g. Supervisory LED, separate from trouble LED, and alarm, operating together, shall signal operation of supervisory device, such as control valve tamper, low air pressure, and low temperature switches. Alarm silence switch shall operate in same manner as trouble alarm.

D. Components:

1. Control Panel:
 - a. Listed under UL Standard 864.
 - b. Solid-state design with flush or semi-flush mounting.
 - c. Control functions shall be behind locked door with annunciating devices visible through door. Single key shall operate all keyed functions in system. Provide three keys.
 - d. Each zone shall be electrically supervised in accordance with wiring style specified.
 - e. Provide integral surge protection.
 - f. Make provisions for connection to off-site alarm notification system including all required programming. Provide separate dry contacts for alarm and supervisory/trouble alarms.
 - g. Power Supply:
 - 1) Provide indication of normal power supply.
 - 2) Loss of normal power shall activate trouble alarm.
 - 3) Meet requirements of and size in accordance with UL Standard 1481 and NFPA 72.
 - 4) Include standby batteries, charger, and automatic transfer equipment.
 - h. Visual Annunciation:
 - 1) Separate indication on each zone for alarm, trouble, or supervisory conditions.
 - 2) Visual indication shall be by LED lights or other easily identifiable method.
 - 3) On zoned system, permanently custom label zones by zone name, not number.
 - 4) Fault or trouble condition on any zone shall not affect any other zone.
 - i. Audible Voice Alarm Annunciation:
 - 1) Alarm signal shall be annunciated by audible voice evacuation message. Message shall be digitally recorded with message content meeting requirements of local code authority. Message shall be field programmable and retained in memory if power is interrupted.
 - 2) Output level shall be adjustable at control panel.
 - 3) Alarm signal shall also operate strobe lights, if specified.
 - 4) Provide alarm silence switches at control panel.

- 5) Trouble alarm shall be horn integral to control panel.
 - 6) Supervisory alarm may be same audible alarm as trouble alarm, but with separate visual annunciation.
2. Off-Site Alarm Notification System:
 - a. Provide one (1) analog telephone lines to fire alarm control panel.
 - b. Install, program and connect cellular communication device furnished by Owner. Coordinate with Owner at least four (4) weeks in advance for equipment delivery.
 - c. Provide dialer system equipment and programming compatible with Owner selected monitoring service (refer to alarm.ldschurch.org for details).
 - d. Owner will arrange for monitoring connection contract.
 - e. Communicator device shall transmit all zone identification, device identification alarm identification, and all other signals available at panel to Owner's Central Station using standard contact ID codes.
 - f. Phone Dialer device shall be of same manufacturer as Fire Alarm Panel or shall be supplied, approved and tested by Fire Alarm Panel Manufacturer.
 3. Alarm Initiating Devices:
 - a. Smoke Detectors:
 - 1) Photoelectric type.
 - 2) Listed under UL Standard 268.
 - 3) Provide visual indication of alarm on unit.
 - b. Duct Smoke Detectors:
 - 1) Furnished and Installed by Division 23.
 - 2) Power provided by Division 26.
 - 3) Connect to Fire Detection And Alarm System by this Section.
 - c. Heat Detectors:
 - 1) Non-settable 135 deg F (57 deg C) fixed temperature.
 - 2) Provide visible indication that device has operated.
 - 3) Listed under UL Standard 521.
 - d. Low Building Temperature Device:
 - 1) Set for contact closure at 35 deg F (2 deg C).
 - 2) Type Two Acceptable Products;
 - a) Honeywell T631A1006.
 - b) Equal as approved by Architect before installation. See Section 01 6200.
 - e. Manual Fire Alarm Boxes:
 - 1) Non-coded and double-action requiring two actions to initiate alarm. Breakable glass type is not approved.
 - 2) Box shall mechanically latch when actuated and require key to reset. Key shall match control panel door lock.
 4. Notification Appliances:
 - a. Color: White.
 - b. Combination Speaker / Strobe:
 - 1) Wall mounted flush or semi-flush.
 - 2) Audible voice output of 90 dB minimum at 10 feet (3 meters).
 - 3) Integrally mounted flashing light unit with block letters 'FIRE.' Adjustable light intensity of 15-110 candela and flash rate between one and three Hertz, except where higher rated output devices are indicated on Drawings.
 - 4) Listed under UL Standard 1480 and UL Standard 1971.
 - c. Strobe Only:
 - 1) Wall mounted flush or semi-flush.
 - 2) Integrally mounted flashing light unit with block letters 'FIRE.' Adjustable light intensity of 15-110 candela and flash rate between one and three Hertz.
 - 3) Listed under UL Standard 1971.
 5. Accessory Devices:
 - a. Notification Appliance Protective Devices: Provide wire guard covers for appliances installed in Cultural Center.
 6. Cables And Wiring:
 - a. Comply with NEC Article 760.
 - b. Jacket and insulation color shall be red.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install fire alarm and detection systems as indicated, in accordance with Equipment Manufacturer's written instructions, and complying with applicable portions of NEC, NFPA, and NECA's 'Standard of Installation'.
1. Mounting Heights:
 - a. Unless otherwise indicated, mount center of outlets or boxes at following heights above finish floor:
 - 1) Control Panel: **72 inches (1 800 mm)** to top.
 - 2) Wall-Mounted Horn / Strobe: **80 inches (2 1032 mm)**. **6 inches (150 mm)** below ceiling, whenever ceiling is below **80 inches (2 1032 mm)**.
 - 3) Wall-Mounted Strobe: **80 inches (2 1032 mm)**. **6 inches (150 mm)** below ceiling, whenever ceiling is below **80 inches (2 1032 mm)**.
 - 4) Manual pull stations: **48 inches (1 200 mm)**.
 - 5) Remote annunciator panel: **60 inches (1 500 mm)**.
 2. Locate fire alarm manual stations **24 inches (600 mm)** minimum away from any light switch.
 - B. Identification:
 1. Label zone indicators on control unit indicating location and type of initiating device, i.e., CORRIDOR SMOKE, VALVE TAMPER, AIR SYSTEM SMOKE, etc. Labels shall be engraved plastic laminate, or other permanent labeling system as supplied by Control Unit Manufacturer.
 2. Post copy of wire identification list inside fire alarm panel door or other area accessible to fire alarm service personnel.
 3. Print location of circuit disconnecting means inside panel.
 - C. Conductors:
 1. Install conductors and make connections to water flow switches, valve tamper switches, low air pressure switches, and duct smoke detectors.
 2. Loop wires through each device on zone for proper supervision. Tee-taps not permitted.
 3. Minimum conductor size shall be 14 AWG unless otherwise specified.
 - D. Do not install ceiling mounted detectors within **36 inches (900 mm)** of air discharge grilles. Do not install manual fire alarm boxes within **24 inches (610 mm)** of light switches. Coordinate with other trades as required.

3.2 FIELD QUALITY CONTROL

- A. Field Tests:
1. Provide factory-trained representative to perform complete system testing in presence of Owner's representative and local fire department personnel upon completion of installation.
 - a. Test each initiating and annunciating device for proper operation, except fixed temperature heat detectors.
 - b. Test operation of trouble annunciation on each circuit.
 - c. Perform complete testing of control panel functions including off-site monitoring.

3.3 CLOSEOUT ACTIVITIES

- A. Instruction Of Owner:
1. Instruct Owner's Representative in proper operation and maintenance procedures.

3.4 PROTECTION

- A. Provide dust protection for installed smoke detectors until finish work is completed and building is ready for occupancy.
- B. Protect conductors from cuts, abrasion and other damage during construction.

END OF SECTION

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**SECTION 31 0500
COMMON EARTHWORK REQUIREMENTS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General procedures and requirements for earthwork.
- B. Verification of conditions.
- C. Preparation.
- D. Repair and restoration.
- E. Field quality control.

1.02 RELATED REQUIREMENTS

- A. Section 01 4000 - Quality Requirements: Procedures for testing, inspection, mock-ups, reports, certificates; use of reference standards.
- B. Section 32 9001 - Common Planting Requirements:
 - 1. Pre-installation conference held jointly with other landscape related sections.

1.03 REFERENCES

- A. Definitions:
 - 1. Aggregate Base: Layer of granular material immediately below concrete and asphalt paving or miscellaneous site concrete (sidewalks, curbs, etc) and below interior concrete slabs on grade.
 - 2. Base: See Aggregate Base.
 - 3. Building Grading: Sloping of grounds immediately adjacent to building. Proper grading causes water to flow away from a structure. Grading can be accomplished either with machinery or by hand.
 - 4. Compacted Fill: Placement of soils on building site placed and compacted per Contract Documents.
 - 5. Excavation: Removal of soil from project site or cavity formed by cutting, digging or scooping on project site.
 - 6. Fine Grading (FG): Preparation of subgrade preceding placement of surfacing materials (any aggregate base and topsoil) for contour of building site required. Fine Grading is conducted to ensure that earth forms and surfaces have been properly shaped and subgrade has been brought to correct elevations. It is performed after rough grading and placement of any complicated fill but before placement of aggregate base or topsoil.
 - 7. Finish Grading: Completed surface elevation of landscaping areas for seeding, sodding and planting on building site.
 - 8. Natural Grade: Undisturbed natural surface of ground.
 - 9. Rough Grading (RG): Grading, leveling, moving, removal, and placement of existing or imported soil to its generally required location and elevation. Cut and fill is part of rough grading.
 - 10. Subgrade (definition varies depending upon stage of construction and context of work being performed):
 - a. Prepared natural soils on which fill, aggregate base, or topsoil is placed OR
 - b. Prepared soils immediately beneath paving, sidewalks or topsoil.
 - 11. Topsoil Placement and Grading: Topsoil placement and finish grading work required to prepare site for installation of landscaping.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Consulting Engineers (Civil, Structural, Geotechnical) are to incorporate the requirements of the Geotechnical Evaluation Report for site specific requirements into all specification sections found in Division 31 and 32 as part of the design process.

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- B. Preinstallation Meeting: Schedule meeting after completion of site clearing but no less than one week before beginning grading work for all affected installers.
1. Include a review of:
 - a. Geotechnical Evaluation Report
 - b. Earthwork schedule.
 - 1) Site clearing.
 - 2) Earth moving
 - c. Field tests and inspection requirements.
 - d. Review Landscape Grading requirements.
 - e. Termite control application requirements.
 2. Include a review of items that occur before pre-installation conference for landscape sections:
 - a. Clearing and grubbing requirements.
 - b. Topsoil stripping and stockpiling requirements.
 - c. Landscape grading requirements.
 - d. Landscape finish grade tolerance requirements.
 - e. Landscape and plant tolerances.
 - f. Surface preparation of landscape and planting areas.
- C. Pre-installation meeting for landscape sections as specification in Section 32 9001:
1. Schedule meeting after completion of Fine Grading, but one week minimum before beginning landscape work and held jointly with following sections:
 - a. Section 32 8423 - Underground Sprinklers.
 - b. Section 32 9120 - Topsoil and Placement.
 - c. Section 32 9122 - Topsoil Grading.
 - d. Section 32 9219 - Seeding
 - e. Section 32 9223 - Sodding.
 - f. Section 32 9300 - Plants.
 2. Post-installation meeting: Review that following landscape items have been installed correctly:
 - a. Topsoil placement.
 - b. Topsoil surface preparation.
 - c. Topsoil depth.
 - d. Landscape finish grade tolerances.
 - e. Surface preparation of landscape and planting areas.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions:
1. Contact Underground Service Alert to arrange for utility location services forty-eight (48) hours, minimum, before performing any work on site.
 2. Perform minor, investigative excavations to verify location of various existing underground facilities at sufficient locations to assure that no conflict with the proposed work exists and sufficient clearance is available to avoid damage to existing facilities.
 3. Perform investigative excavating ten (10) days, minimum, in advance of performing any excavation or underground work.
 4. Notify Architect by phone or fax within twenty-four (24) hours upon discovery of conflicts or problems with existing facilities. Follow telephone or fax notification with letter and diagrams indicating conflict or problem with sufficient measurements and details to evaluate problem.

3.02 PREPARATION

- A. Protection:

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1. Spillage:
 - a. Avoid spillage by covering and securing loads when hauling on or adjacent to public streets or highways.
 - b. Remove spillage and sweep, wash, or otherwise clean project, streets, and highways.
2. Dust Control:
 - a. Take precautions necessary to prevent dust nuisance, both on-site and adjacent to public and private properties.
 - b. Correct or repair damage caused by dust.
3. Existing Plants And Features:
 - a. Do not damage tops, trunks, and roots of existing trees and shrubs on site that are intended to remain.
 - b. Do not use heavy equipment within branch spread.
 - c. Interfering branches may be removed only with permission of Architect.
 - d. Do not damage other plants and features that are to remain.

3.03 REPAIR / RESTORATION

- A. Adjust existing covers, boxes, and vaults to grade.
- B. Replace broken or damaged covers, boxes, and vaults.
- C. Independently confirm size, location, and number of covers, boxes, and vaults that require adjustment.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Owner is responsible for Quality Assurance: Quality Assurance performed by Owner will be used to validate Quality Control by Contractor. Refer to Section 31 2323 Part 3 for subgrade, fill and aggregate base testing and inspection requirements.
 1. Quality Control is sole responsibility of Contractor.
 2. Testing and inspection of earthwork operations is required.
 3. Notify Architect if weather, scheduling, or any other circumstance has interrupted work, twenty-four (24) hours minimum, before intended resumption of work.
- C. Non-Conforming Work:
 1. If specified protection precautions are not taken or corrections and repairs not made promptly, Owner may take such steps as may be deemed necessary and deduct costs of such from monies due to Contractor. Such action or lack of action on Owner's part does not relieve Contractor from responsibility for proper protection of The Work.

END OF SECTION

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**SECTION 31 1000
SITE CLEARING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Clearing and protection of vegetation.
- B. Removal of existing debris.

1.02 RELATED REQUIREMENTS

- A. Section 01 1000 - Summary: Limitations on Contractor's use of site and premises.
- B. Section 01 5000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.
- C. Section 01 7000 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products.
- D. Section 31 0500 - Common Earthwork Requirements
- E. Section 31 1123 - Aggregate Base, Topsoil Stripping and Stockpiling
- F. Section 31 2200 - Grading.
- G. Section 31 2200 - Grading: Fill material for filling holes, pits, and excavations generated as a result of removal operations.
- H. Section 31 2316 - Excavation
- I. Section 31 2316.13 - Trenching
- J. Section 31 2323 - Fill and Aggregate Base: Fill material for filling holes, pits, and excavations generated as a result of removal operations.
- K. Section 31 2323 - Fill and Aggregate Base: Filling holes, pits, and excavations generated as a result of removal operations.
- L. Section 32 9300 - Plants: Relocation of existing trees, shrubs, and other plants.
- M. Section 32 9300 - Plants: Pruning of existing trees to remain.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Participate in pre-installation meeting as specified in Section 31 0500.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.01 SITE CLEARING

- A. Comply with other requirements specified in Section 01 7000.
- B. Minimize production of dust due to clearing operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

3.02 VEGETATION

- A. Do not remove or damage vegetation beyond the limits indicated on drawings.
- B. Install substantial, highly visible fences at least 3 feet high to prevent inadvertent damage to vegetation to remain:
 - 1. At vegetation removal limits.
 - 2. Around trees to remain within vegetation removal limits; locate no closer to tree than at the drip line.
 - 3. Around other vegetation to remain within vegetation removal limits.
- C. Vegetation Removed: Do not burn, bury, landfill, or leave on site, except as indicated.

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- 1. Chip, grind, crush, or shred vegetation for mulching, composting, or other purposes; preference should be given to on-site uses.
 - 2. Trees: Sell if marketable; if not, treat as specified for other vegetation removed; remove stumps and roots to depth of 18 inches.
 - 3. Existing Stumps: Treat as specified for other vegetation removed; remove stumps and roots to depth of 18 inches.
 - 4. Fill holes left by removal of stumps and roots, using suitable fill material, with top surface neat in appearance and smooth enough not to constitute a hazard to pedestrians.
- D. Restoration: If vegetation outside removal limits or within specified protective fences is damaged or destroyed due to subsequent construction operations, replace at no cost to Owner.

3.03 DEBRIS

- A. Remove debris, junk, and trash from site.
- B. Leave site in clean condition, ready for subsequent work.
- C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

14922 / 2022 New Construction Master	31 1000 - 2	Site Clearing
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**SECTION 31 2200
GRADING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Removal of topsoil.
- B. Rough grading.
- C. Fine grading

1.02 RELATED REQUIREMENTS

- A. Section 31 0500 - Common Earthwork Requirements.
- B. Section 31 1000 - Site Clearing.
- C. Section 31 2316 - Excavation and Trenching.
- D. Section 31 2323 - Fill and Aggregate Base: Filling and compaction of fill and aggregate base materials.
- E. Section 32 1216 - Asphalt Paving
- F. Section 32 1216 - Concrete Paving
- G. Section 32 9120 - Topsoil and Placement
- H. Section 32 9122 - Topsoil Grading
- I. Section 32 9219 - Seeding.
- J. Section 32 9223 - Sodding.
- K. Section 32 9300 - Plants.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Per Section 31 0500 - Common Earthwork Requirements.
 - 1. Identify benchmark for establishing grades.
 - 2. Examine site to pre-plan procedures for cuts, fill placements, and other necessary work.

1.04 SUBMITTALS

- A. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

1.05 QUALITY ASSURANCE

- A. Owner is responsible for Quality Assurance: Quality Assurance performed by Owner will be used to validate Quality Control performed by Contractor.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Topsoil: See Section 32 9121.
- B. Other Fill and Aggregate Base Materials: See Section 31 2323.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that survey benchmark and intended elevations for the Work are as indicated.
- B. Verify the absence of standing or ponding water.
- C. Do not commence work of this Section until topsoil has been prepared, according to 32 9121.

3.02 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Stake and flag locations of known utilities.

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- C. Locate, identify, and protect from damage above- and below-grade utilities to remain.
- D. Provide temporary means and methods to remove all standing or ponding water from areas prior to grading.
- E. Protect site features to remain, including but not limited to benchmarks, survey control points, existing structures, fences, sidewalks, paving, and curbs, from damage by grading equipment and vehicular traffic.
- F. Protect plants, lawns, rock outcroppings, and other features to remain as a portion of final landscaping.

3.03 SOIL REMOVAL AND STOCKPILING

- A. Stockpile subsoil to be re-used on site if it meets the Project requirements; remove remainder from site.
- B. Stockpiles: Use areas designated on site; pile depth not to exceed 8 feet; protect from erosion.

3.04 ROUGH GRADING

- A. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded.
- B. Do not remove wet subsoil unless it is subsequently processed to obtain optimum moisture content.
- C. When excavating through roots, perform work by hand and cut roots with sharp axe.
- D. See Section 31 2323 for filling procedures.
- E. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.
- F. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of surface water control.

3.05 FINE GRADING

- A. Preparation:
 - 1. Protection Of In-Place Conditions: Protect utilities and site elements from damage.
 - 2. Landscaping and Planting Areas:
 - a. Before grading, dig out weeds from planting areas by their roots and remove from site. Remove rocks larger than 1-1/2 inches in size and foreign matter such as building rubble, wire, cans, sticks, concrete, etc.
 - b. Remove imported paving base material present in planting areas down to natural subgrade or other material acceptable to Architect.
 - 3. Paving:
 - a. Survey and stake parking surfaces to show grading required by Contract Documents.
 - b. Subgrade (material immediately below aggregate base):
 - 1) Compact subgrade as specified in Section 31 2323 (fill).
 - 2) Fine grade parking surface area to grades required by Contract Documents.
 - 3) Subgrade to be constructed smooth and even.

3.06 TOLERANCES

- A. Subgrade beneath compacted fill, aggregate base or topsoil shall be constructed smooth and even.
- B. Rough Grading:
 - 1. Top Surface of Subgrade: Plus or minus 0.10 foot (1-3/16 inches) from required elevation.
 - 2. Top Surface of Finish Grade: Plus or minus 0.04 foot (1/2 inch).
- C. Fine Grading
 - 1. Subgrade (material immediately below aggregate base, natural soils or fill):
 - a. Measure using string line from curb to curb, gutter, flat drainage structure, or grade break.
 - 2. Maximum variation from required grades shall be 1/10 of one foot (28 mm).
 - 3. Landscaping and Planting Tolerances:

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- a. Maximum variation from required grades shall be 1/10 of one foot (28 mm).
- b. To allow for final finish grades as specified in Section 32 9121 of planting areas, fine grade elevations before placing topsoil and mulch are:
 - 1) Sod Areas: Refer to Landscape drawings and specifications.
 - 2) Tree And Shrub Areas: Refer to Landscape drawings and specifications.

D. Slope grade away from building as specified in Section 31 2323.

3.07 REPAIR AND RESTORATION

- A. Existing Facilities, Utilities, and Site Features to Remain: If damaged due to this work, repair or replace to original condition.
- B. Other Existing Vegetation to Remain: If damaged due to this work, replace with vegetation of equivalent species and size.

3.08 FIELD QUALITY CONTROL

- A. See Section 31 2323 for compaction density testing.

3.09 CLEANING

- A. Leave site clean and raked, ready to receive landscaping.

END OF SECTION

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**SECTION 31 2316
EXCAVATION AND TRENCHING**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Excavating for building volume below grade, footings, slabs-on-grade, paving, site structures, and utilities within the building.
- B. Trenching for utilities outside the building to utility main connections.

1.02 RELATED REQUIREMENTS

- A. Section 31 0500 - Common Earthwork Requirements.
- B. Section 31 1000 - Site Clearing: Vegetation and existing debris removal.
- C. Section 31 2200 - Grading: Soil removal from surface of site.
- D. Section 31 2200 - Grading: Grading.
- E. Section 31 2323 - Fill and Aggregate Base: Fill materials, backfilling, and compacting.
- F. Section 33 3113 - Site Sanitary Sewerage Gravity Piping
- G. Performance of excavating inside and outside of building required for electrical and mechanical work is responsibility of respective Section doing work unless arranged differently by Contractor.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Pre-installation Meeting: Per Section 31 0500 - Common Earthwork Requirements and:
 - 1. Review protection of existing utilities requirements.

PART 2 PRODUCTS - NOT USED**PART 3 EXECUTION****3.01 EXAMINATION**

- A. Verification Of Conditions:
 - 1. Carefully examine site and available information to determine type soil to be encountered.
 - 2. Discuss problems with Architect before proceeding with work.

3.02 PREPARATION

- A. Locate, identify, and protect utilities that remain and protect from damage.
- B. Contact Architect immediately upon discovery of undocumented utilities.

3.03 PERFORMANCE

- A. Interface With Other Work:
 - 1. See Section 31 2323 for subgrade preparation at general excavations.
- B. Excavate to accommodate new structures and construction operations.
 - 1. Excavate to the specified elevations.
 - 2. Excavate to the length and width required to safely install, adjust, and remove any forms, bracing, or supports necessary for the installation of the work.
 - 3. Cut utility trenches wide enough to allow inspection of installed utilities.
 - 4. Hand trim excavations. Remove loose matter.
- C. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
- D. Do not interfere with 45 degree bearing splay of foundations.
- E. Provide temporary means and methods, as required, to remove all water from excavations until directed by Architect. Remove and replace soils deemed suitable by classification and which are excessively moist due to lack of dewatering or surface water control.
- F. Utility Trenches:

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1. Unless otherwise indicated, excavation shall be open cut. Short sections of trench may be tunneled if pipe or duct can be safely and properly installed and backfill can be properly tamped in tunnel sections and if approved by Architect.
2. Excavate to proper alignment, depth, and grade. Excavate to sufficient width to allow adequate space for proper installation and inspection of utility piping.
3. If trenches are excavated deeper than required, backfill until trench bottom is proper depth with properly compacted native material.
4. Pipe 4 inches in Diameter or Larger:
 - a. Grade bottom of trenches to provide uniform bearing and support for each section of pipe on undisturbed soil at every point along its length.
 - b. Except where rock is encountered, take care not to excavate below depths indicated.
 - 1) Where rock excavations are required, excavate rock with minimum over-depth of 4 inches below required trench depths.
 - 2) Backfill over-depths in rock excavation and unauthorized over-depths with loose, granular, moist earth, thoroughly compacted.
 - c. Whenever wet or unstable soil incapable of properly supporting pipe, as determined by Architect, occurs in bottom of trench, remove soil to depth required and backfill trench to proper grade with coarse sand, fine gravel, or other suitable material acceptable to Architect.

3.04 REPAIR

- A. Repair damage to other portions of the Work resulting from work of this Section at no additional cost to Owner. Arrange for damage to be repaired by original installer.
- B. Correct areas that are over-excavated and load-bearing surfaces that are disturbed; see Section 31 2323.

3.05 CLEANING

- A. Stockpile excavated material to be re-used in area designated on site in accordance with Section 31 2200.
- B. Remove excavated material that is unsuitable for re-use from site.
- C. Remove excess excavated material from site.

END OF SECTION

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**SECTION 31 2323
FILL AND AGGREGATE BASE**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Filling, backfilling, and compacting for building volume below grade.
- B. Backfilling and compacting for utilities outside the building to utility main connections.
- C. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.
- D. Lightweight (Flowable) concrete fill (option for backfilling of piping systems and other utilities)
- E. Aggregate Base.

1.02 RELATED REQUIREMENTS

- A. Section 31 0500 - Common Earthwork Requirements
- B. Section 31 1000 - Site Clearing
- C. Section 31 2200 - Grading: Removal and handling of soil to be re-used.
- D. Section 31 2200 - Grading: Site grading.
- E. Section 31 2316 - Excavation and Trenching: Removal and handling of soil to be re-used.
- F. Section 31 3116 - Termite Control
- G. Section 32 1216 - Asphalt Paving
- H. Section 32 1213 - Concrete Paving
- I. Division 32 - Exterior Improvements

1.03 REFERENCE STANDARDS

- A. ASTM C150/C150M - Standard Specification for Portland Cement 2020.
- B. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete 2012.
- C. ASTM C796/C796M - Standard Test Method for Foaming Agents for Use in Producing Cellular Concrete Using Preformed Foam 2019.
- D. ASTM D1883 - Standard Test Method for California Bearing Ratio (CBR) of Laboratory-Compacted Soils 2016.
- E. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System) 2017, with Editorial Revision.
- F. ASTM D6817/D6817M - Standard Specification for Rigid Cellular Polystyrene Geof foam 2017.
- G. ASTM D7557/D7557M - Standard Practice for Sampling of Expanded Geof foam Specimens 2009, with Editorial Revision (2013).
- H. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs 2018a.

1.04 DEFINITIONS

- A. Lightweight (Flowable) Concrete Fill::
 1. Self-leveling and self-compacting, cementitious material.
 2. Unconfined compressive strength of less than 150 psi.
 3. Cementitious slurry consisting of mixture of fine aggregate of filler, water and cementitious materials, which is used as fill or backfill in lieu of compacted earth. This material is capable of filling all voids in irregular excavations and hard to reach places (such as under undercuts of existing slabs), is self-leveling, and hardens in a matter of a few hours without need for compacting in layers. Lightweight (Flowable) concrete fill is sometimes referred to as excavatable flowable fill, controlled density fill, controlled low strength material, lean concrete slurry, and unshrinkable fill. Flowable fill is not concrete nor used

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to replace concrete. it is intended to contain low cementitious content for reduced strength development.

- B. Reclaimed Asphalt Pavement (RAP): Existing asphalt mixture that has been pulverized, usually by milling, and is used like an aggregate in recycling of asphalt pavements.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Mix design for Lightweight (Flowable) Concrete Fill.
- C. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used, including manufactured fill.
- D. Compaction Density Test Reports.
- E. Lightweight (Flowable) Concrete Fill Test Reports.
- F. Testing Agency Qualification Statement.

1.06 ADMINISTRATIVE REQUIREMENTS

- A. Participate in pre-installation meeting as specified in Section 31 0500.

1.07 QUALITY ASSURANCE

- A. Testing and Inspection:
 1. Owner will provide Testing and Inspection for fill and aggregate base:
 - a. Owner is responsible for Quality Assurance. Quality assurance performed by Owner will be used to validate Quality Control performed by Contractor.
 2. Owner will employ testing agencies to perform testing and inspection for aggregate base as specified in Field Quality Control in Part 3 of this specification.
 - a. Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform the Work in strict accordance with requirements of Contract Documents and perform contractor testing and inspection.
- B. Designer Qualifications: Perform design of structural fill under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
- C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.
- D. Scheduling:
 1. Allow special inspector to review all subgrades and excavations to determine if site has been prepared in accordance with geotechnical evaluation report prior to placing any fill or aggregate base (or concrete).
 2. Notify Testing Agency and Architect seventy-two (72) hours minimum before installation of fill or aggregate base to perform proctor and plasticity index tests on proposed fill, aggregate base or subgrade.
 3. Notify Testing Agency and Architect twenty-four (24) hours minimum before installation of fill or aggregate base to allow inspection.
 4. Allow Inspection and Testing Agency to inspect and test subgrades and each fill and aggregate base layer. Proceed with subsequent earthwork only after inspections and test results for prior compacted work comply with requirements.
 5. Interior slab-on-grade concrete:
 - a. Notify Architect twenty-four (24) hours minimum before installation of concrete to allow inspection of vapor retarder installation.
 - b. Notify Testing Agency and Architect twenty-four (24) hours minimum before installation of interior concrete slabs to allow inspection of aggregate base.
 - c. Allow special inspector to review all subgrades and excavations to determine if building pad has been prepared in accordance with geotechnical report prior to placing any aggregate base.

6. Notify Testing Agency and Architect twenty-four (24) hours minimum before placing concrete for exterior site work concrete (sidewalks, curbs, gutters), footings, foundation walls, and building slabs to allow inspection of aggregate base.
7. Paving:
 - a. Notify Testing Agency and Architect twenty-four (24) hours minimum before placing aggregate base to allow inspection of aggregate base.

PART 2 PRODUCTS

2.01 FILL MATERIALS

- A. Fill under landscaped areas (on-site fill shall be used only under landscaped areas and only if they meet the following requirements):
 1. Well graded material conforming to ASTM D2487 free from debris, organic material, frozen materials, brick, lime, concrete, and other material which would prevent adequate performance of backfill.
 2. Fill more than 36 inches below finish grade shall comply with soil classification groups GW, CL, GP, GM, SW, SP, or SM. Fill may not contain stones over 6 inches (150 mm) diameter and ninety (90) percent minimum of fill shall be smaller than 1-1/2 inch in any direction.
 3. Fill less than 36 inches below finish grade shall comply with soil classification groups SW, SP, SM, or SC. Fill may not contain stones larger than 1-1/2 inches in any direction and ninety (90) percent minimum of fill shall be smaller than 3/8 inch in any direction.
- B. Imported Structural Fill (under paved areas, site concrete elements, buildings, and plaza except where Aggregate Base is specifically allowed):
 1. All imported structural fill shall be non-expansive granular soil meeting the following requirements:
 - a. Granular (minus 3-inch)
 - b. Passing No. 200 sieve < 35%
 - c. Liquid Limit < 30%
 Structural fill shall be tested and verified to meet these requirements prior to delivery to the site.
 2. If soft subgrade conditions are encountered or where structural fill is required to be placed closer than 2.0 feet above the water table at the time of construction, stabilize soils as follows:
 - a. Option 1: a mixture of coarse angular gravels and cobbles and/or 1.5- to 2.0-inch gravel (stabilizing fill).
 - b. Option 2: stabilization fabric (Mirafi 600X or equivalent) placed on the natural ground if 1.5- to 2.0-inch gravel is used as stabilizing fill.
- C. Lightweight (Flowable) Concrete Fill:
 1. Finished Properties, Class II Engineered Fill:
 - a. Cast Density, Maximum: 30 pounds per cubic foot.
 - b. Compressive Strength, Minimum: 41 pounds per square inch.
 2. Materials:
 - a. Cement: ASTM C150/C150M.
 - b. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.
 - c. Admixtures: As recommended by lightweight (flowable) concrete fill manufacturer.
 - d. Expansion Material: Manufacturer's recommended expansion material.
 - e. Mix Design: By manufacturer.
- D. Aggregate Base:
 1. Under Exterior Concrete Excluding Under Paving and Where Otherwise Noted on the Contract Drawings:
 - a. New Aggregate Base:
 - 1) Road Base to conform to State DOT Specifications.
 2. Under Landscape Mow Strips (except where otherwise noted on the Contract Drawings):

- a. 3/4 inch gravel.
- 3. Under Paving:
 - a. New Aggregate Base:
 - 1) Road Base to conform to 1-1/2 inches minus State DOT Specifications and Gradations.
 - 2) Aggregate base shall be non-plastic.
 - b. Reclaimed Asphalt and Concrete Pavement (RAP):
 - 1) Pulverized Portland or asphalt concrete paving mixed uniformly with existing aggregate base.
 - 2) Conform to following gradation:
 - (a) Sieve Percent of Weight Passing

(1) 2 inch (50.0 mm)	100
(2) 1 1/2 inch (38.0 mm)	85 - 100
(3) 3/4 inch (19.0 mm)	60 - 80
(4) No. 4 (4.750 mm)	30 - 50
(5) No. 200 (0.075 mm)	5 - 12
 - 3) Quality Requirements as established by testing:
 - (a) R-value (CBR value as per ASTM D1883): 70 percent minimum.
 - 4) Sand Equivalent (ASTM D2419): 25 percent minimum.
 - 5) ASTM C131/C131M (Los Angeles Abrasion): 50 percent maximum.
 - (a) ASTM D4318 (Atterberg Limits): Non-Plastic.
- 4. Under Interior Concrete Slab-On-Grade:
 - a. New Aggregate Base:
 - 1) Gravel: 3/4 inch minimum to one inch maximum well-graded, clean gravel or crushed rock.
 - 2) Base type gravel or crushed rock, graded by weight (three-quarter to one-inch clean gap-graded gravel); road Base type gravel or crushed stone (slag not allowed). Conform to the following gradation:
 - (a) Sieve Percent of Weight Passing

(1) 2 inch (50.0 mm)	100
(2) 1 1/2 inch (38.0 mm)	85 - 100
(3) 1 inch (25.4 mm)	100
(4) 3/4 inch (19.0 mm)	80 - 90
(5) 1/2 inch (12.7 mm)	20 - 40
(6) 3/8 inch (9.5 mm)	5 - 10
(7) No. 4 (4.750 mm)	0 - 12
- E. Crushed Rock Base:
 - 1. Install where shown on the Contract Drawings.
 - 2. 3/4" - 1" crushed rock.
 - 3. Compaction shall be by procedural compaction.
- F. Subbase:
 - 1. Well graded gravel (A-1-a) with maximum particle size of 3.0 inches.

2.02 SOURCE QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for general requirements for testing and analysis of soil material.
- B. Where fill materials are specified by reference to a specific standard, test and analyze samples for compliance before delivery to site.
- C. If tests indicate materials do not meet specified requirements, change material and retest.

PART 3 EXECUTION

3.01 EXAMINATION

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- A. Identify required lines, levels, contours, and datum locations.
- B. Verify areas to be filled are not compromised with surface or ground water.

3.02 PREPARATION

- A. Scarify and proof roll subgrade surface to a depth of 6 inches to identify soft spots.
 - 1. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.
- B. Before placing fill, aggregate base, or finish work, prepare existing subgrade as follows:
 - 1. Under Building Slab and 5 feet out from the building footprint, under Equipment Pad, Under Driveways, Parking, Under Miscellaneous Concrete Site Elements And Outside Face of Foundation Wall Areas:
 - a. Do not place fill or aggregate base over frozen subgrade.
 - b. Moisture condition to uniform moisture content of between optimum and four (4) percent over optimum, and mechanically compact 6 inches deep to ninety-five (95) percent minimum of relative compaction.
 - c. Finish grade to grades required by Contract Documents.
 - 2. Landscape Areas:
 - a. Compact subgrade to eight-five (85) percent relative compaction.
- C. Aggregate Base:
 - 1. Do not perform work during unfavorable conditions as specified below:
 - a. Presence of free surface water.
 - b. Over-saturated subbase materials.
- D. Vapor Retarder under Interior Concrete Slab-on-Grade:
 - 1. Unacceptable conditions for installation include presence of high winds which would tear or damage vapor retarder.
- E. Compact subgrade to density equal to or greater than requirements for subsequent fill material.
- F. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

3.03 PERFORMANCE

- A. Interface With Other Work:
 - 1. Section 31 2200 - Grading for rough grading and preparation of natural soil subgrades below fill and aggregate base materials.
 - 2. Section 31 2200 - Grading for grading of subgrade below aggregate base and topsoil.
 - 3. Do not place fill or aggregate base material when subgrade is frozen or unstable.
 - 4. Remove all standing water before placing fill or aggregate base material.
- B. Fill:
 - 1. General:
 - a. Do not fill against bituminous dampproofing to exterior of font foundation walls for twenty-four (24) hours after application of dampproofing.
 - b. Before backfilling, show utility and service lines being covered on record set of Drawings. Do not backfill until utilities involved have been tested and approved by Architect and until instructed by Architect.
 - c. Around Buildings And Structures: Slope grade away from building as specified unless noted otherwise in Contract Drawings. Hand backfill when close to building or where damage to building might result.
 - d. Site Utilities:
 - 1) In Landscape Areas: Use backfill consisting of on-site soil.
 - 2) Under Pavement and Concrete Site Elements: Extend excavatable flowable fill/backfill to elevation of subgrade. Do not place aggregate base material until excavatable flowable fill/backfill has cured seventy-two hours.
 - e. Do not use puddling or jetting to consolidate fill areas.
- C. Compacting:

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1. Fill And Aggregate Base:
 - a. Under Interior Concrete Slabs on Grade:
 - 1) Fill:
 - (a) Place in 8 inch maximum uncompacted layers, moisture condition to plus or minus two (2) percent of optimum moisture content and mechanically compact to ninety-five (95) percent minimum of maximum laboratory density as established by ASTM D1157.
 - 2) Aggregate Base:
 - (a) Place 4 inches minimum of aggregate base under vapor retarder, level, and mechanically compact to ninety-five (95) percent minimum of maximum laboratory density as established by ASTM D1157.
 - 3) Vapor Retarder:
 - (a) Install vapor retarder in accordance with ASTM E1643 except where Contract Documents indicate otherwise and following instructions:
 - (1) Install vapor retarder over aggregate base over compacted subgrade so entire area under slab is covered.
 - (2) Install vapor retarder in accordance with ASTM E1643 at interior stem walls.
 - (b) Lap joints 6 inches (150 mm) minimum and seal with specified seam tape.
 - (1) Seal vapor retarder around pipes, conduits, and other utility items that penetrate vapor retarder using factory-fabricated boot installed as recommended by Manufacturer.
 - (2) Except for punctures required for reinforcing and anchor bolts at top of stem walls, seal tears and punctures.
 - b. Equipment Pad Areas:
 - 1) Fill:
 - (a) Place in 8 inch maximum uncompacted layers, moisture condition to plus or minus two (2) percent of optimum moisture content and mechanically compact to ninety-five (95) percent minimum of maximum laboratory density as established by ASTM D1157.
 - 2) Aggregate Base:
 - (a) Place aggregate base in minimum thicknesses shown on the Drawings, level, and mechanically compact to ninety-five (95) percent minimum of maximum laboratory density as established by ASTM D1157.
 - c. Under Driveways and Parking Areas:
 - 1) Fill:
 - (a) Place in 8 inch maximum uncompacted layers, dampen but do not soak, and mechanically compact to ninety-five (95) percent minimum of maximum laboratory density as established by ASTM D1557.
 - 2) Aggregate Base:
 - (a) Use 6 inches minimum aggregate base under paving, unless noted otherwise in Contract Drawings, and mechanically compact to ninety-five (95) percent minimum of maximum laboratory density as established by ASTM D1157.
 - (b) Remove or repair improperly prepared areas as directed by Architect.
 - 3) Subbase:
 - (a) Place in 8 inch maximum uncompacted layers, dampen but do not soak, and mechanically compact to ninety-five (95) percent minimum of maximum laboratory density as established by ASTM D1557.
 - (b) Use 8 inches minimum subbase under paving aggregate base.
 - 4) Subgrade:
 - (a) Compact to at least ninety (90) percent minimum of the maximum dry density proctor.

2. Under Miscellaneous Concrete Site Elements (sidewalks, curbs, gutters, not mow strips) And Outside Face of Foundation Walls:
 - a. Fill:
 - 1) Place in 8 inch maximum uncompacted layers, dampen but do not soak, and mechanically compact to ninety-five (95) percent minimum of maximum laboratory density as established by ASTM D1557.
 - b. Aggregate Base:
 - 1) Aggregate base in thicknesses shown on the Drawings. Level, and mechanically compact to ninety-five (95) percent minimum of maximum laboratory density as established by ASTM D1157.
 - c. Subbase:
 - 1) Subbase in thickness shown on the Drawings. Level, and mechanically compact to ninety-five (95) percent minimum of maximum laboratory density as established by ASTM D1157.
3. Under Exterior Mow Strips:
 - a. Aggregate Base:
 - 1) 6 inches of 3/4 inch gravel.
4. Utility Trenches:
 - a. Site:
 - 1) Fill:
 - (a) Place fill in 12 inch maximum uncompacted layers and moisture condition to plus or minus two (2) percent of optimum moisture content.
 - (b) Compact fill to ninety-five (95) percent minimum relative compaction to within 12 inches of finish grade.
 - (c) Compact fill above 12 inches to eight-five (85) percent relative compaction.
 - b. Under Miscellaneous Slabs:
 - 1) Fill:
 - (a) Place in 6 inch maximum uncompacted layers, moisture condition to plus or minus two (2) percent of optimum moisture content, and compact to ninety-five (95) percent minimum relative compaction to within 4 inches of finish grade.
 - 2) Aggregate Base:
 - (a) Place 6 inches minimum of aggregate base, level, and compact.
 - 3) Subbase:
 - (a) Place 6 inches minimum of subbase, level, and compact.
5. Fill Slopes: Compact by rolling or using sheepsfoot roller.
6. Backfill Under Footings as noted on the Contract Documents.
7. Landscape Areas:
 - a. Compact fill to eighty-five (85) percent minimum relative compaction.
8. Other Backfills: Place other fills in 12 inch maximum uncompacted layers and compact to ninety-five (95) percent relative compaction.
9. Loose material from compacted subgrade surface shall be immediately removed before placing compacted fill or aggregate base course.
- D. Fill to contours and elevations indicated using unfrozen materials.
- E. Employ a placement method that does not disturb or damage other work.
- F. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen, or spongy subgrade surfaces.
- G. Maintain optimum moisture content of fill materials to attain required compaction density.
- H. Slope grade away from building minimum 5%, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.
- I. Maintain temporary means and methods, as required, to remove all water while fill is being placed as required, or until directed by the Architect. Remove and replace soils deemed

unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.

3.04 LIGHTWEIGHT (FLOWABLE) CONCRETE FILL

- A. Install lightweight concrete fill according to manufacturer's written instructions.
- B. Use batching, mixing, and placing equipment approved by the manufacturer.
- C. Prevent segregation of material.
- D. Tolerance: Finished surface within 2 inches of elevation indicated on drawings.

3.05 FILL AT SPECIFIC LOCATIONS

- A. Use general fill unless otherwise specified or indicated.

3.06 TOLERANCES

- A. Top Surface of General Filling: Plus or minus 1 inch from required elevations.
- B. Paving Areas:
 - 1. Survey and stake parking surfaces to show grading required by Contract Drawings.
 - 2. Subgrade (soil below aggregate base):
 - a. Prepare natural soil subgrade or fill.
 - 3. Aggregate Base:
 - a. Finish grade parking surfaces to grades as required by Contract Drawings.
 - 1) 0.00 inches high and no more than 1/2 inch low.
 - b. Measure using string line from curb to curb, gutter, flat drainage structure, or grade break.
 - c. Finished aggregate base course shall be true to line and grade within plus or minus 1/4 inch in 10 feet.
 - d. Maximum variation from required grades shall be 1/10 of one foot.

3.07 REPAIR / RESTORATION

- A. Repair damage to other portions of the Work resulting from work of this Section at no additional cost to Owner. On new work, arrange for damage to be repaired by original installer.

3.08 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection and testing.
- B. Field Tests and Inspections:
 - 1. Field tests and inspections and laboratory testing are provided by Owner's independent Testing Agency as specified in Section 01 4523.
 - a. Quality Control is sole responsibility of Contractor:
 - 1) Owner's employment of an independent Testing Agency does no relieve Contractor of Contractor's obligation to perform testing and inspection as part of his Quality Control:
 - (a) Testing and inspections, if performed by Contractor, will be responsibility of Contractor to be performed by an independent entity.
 - 2. Fill/Engineered Fill:
 - a. Testing Agency shall provide testing and inspection for fill.
 - b. Number of tests may vary at discretion of Architect.
 - c. Testing Agency is to provide one (1) moisture-maximum density relationship test for each type of fill material.
 - d. Prior to placement of engineered fill, inspector shall determine that site has been prepared in accordance with geotechnical evaluation report.
 - e. Footing subgrade: At footing subgrades, inspector is to verify that soils conform to geotechnical evaluation report.
 - f. Testing Agency will test compaction of soils according to ASTM D1556/D1556M, ASTM D2167, and ASTM D6938 as applicable. Lift thicknesses shall comply with

geotechnical evaluation report. Inspector shall determine that in-place dry density of engineered fill material complies with geotechnical evaluation report. Tests will be performed at following locations and frequencies:

- 1) Paved Areas: At each compacted fill and backfill layer, at least one (1) test for every 10,000 sq. ft. or less of paved areas but in no case less than three (3) tests.
 - 2) Building Slab Areas: At each compacted fill and backfill layer, at least one (1) test for every 2,500 sq. ft. or less of building slab area but in no case less than three (3) tests.
 - 3) Foundation Wall/Continuous Footing Backfill: At each compacted backfill layer, at least one (1) test for each 40 linear feet or less of wall length, but no fewer than two (2) tests.
 - 4) Trench Backfill: At each 12 inch compacted lift for each 100 linear feet or less of trench length but no fewer than two (2) tests.
 - 5) Sidewalks, Curbs, Gutters, Exterior Pads: Minimum of one (1) test for each lift for each 40 linear feet or one (1) test for every 5,000 sq. ft. or less of pad area but no fewer than three (3) tests.
3. Aggregate Base:
- a. Interior slab-on-grade concrete areas:
 - 1) Testing Agency shall provide testing and inspection for interior aggregate base.
 - 2) Number of tests may vary at discretion of Architect.
 - 3) Testing Agency will test compaction of base in place according to ASTM D1556/D1556M, ASTM D2167, and ASTM D6938, as applicable. Tests will be performed at following frequency:
 - (a) Building Slab Areas: One test for every 2,500 sq. ft. (232 sq. m) or less of building slab area but no fewer than three tests.
 - b. Miscellaneous exterior concrete areas:
 - 1) Testing Agency shall provide testing and inspection for exterior aggregate base.
 - 2) Number of tests may vary at discretion of Architect.
 - 3) Testing Agency will test compaction of base in place according to ASTM D1556/D1556M, ASTM D2167, and ASTM D6938, as applicable. Tests will be performed at following frequency:
 - (a) Sitework Areas: One test for every 10,000 sq. ft. (930 sq. m) or less of exterior pads area but no fewer than three tests.
 - c. Paving area:
 - 1) Testing Agency shall provide testing and inspection for exterior aggregate base.
 - 2) Number of tests may vary at discretion of Architect.
 - 3) Testing Agency will test compaction of base in place according to ASTM D1556/D1556M, ASTM D2167, and ASTM D6938, as applicable. Tests will be performed at following frequency:
 - (a) Sitework Areas: One test for every 10,000 sq. ft. (930 sq. m) or less of exterior pads area but no fewer than three tests.
- C. Lightweight (Flowable) Concrete Fill:
1. Sampling: During initial placement, take four 3 inch by 6 inch³ inch by 6 inch test specimens per 303 cubic yards of material placed or for each four hours of placement work.
 2. Testing: Provide third-party testing of samples in accordance with ASTM C796/C796M except do not oven-dry load-test specimens.

3.09 PROTECTION

- A. Interior Slab-On-Grade Concrete:
1. Vapor Retarder:
 - a. Do not allow water onto vapor retarder or aggregate base before placing concrete.

- b. Protect membrane from possible punctures caused by reinforcing bar supports before placing concrete.

3.10 CLEANING

- A. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.
- B. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

END OF SECTION

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SECTION 31 3116**TERMITE CONTROL****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
1. Furnish and install complete soils treatment with termiticide under and adjacent to building to provide uniform toxic barrier continuous treated zone in all routes of termite entry.
- B. Related Requirements:
1. Section 31: Earthwork.
 - a. Section 31 0501: 'Common Earthwork Requirements'.
 - b. Section 31 1123: 'Aggregate Base':
 - 1) Installation of below-grade vapor retarder.
 - c. Section 31 2216: 'Fine Grading'.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
1. Coordinate soil treatment application with excavation, filling, grading, and concreting operations. Treat soil under footings, grade beams, and ground-supported slabs before construction.
 2. Interior slab-on-grade concrete:
 - a. Coordinate work so vapor retarder can be installed as soon as possible after application of termite protection on top of soil base or aggregate base.
- B. Pre-Installation Conference:
1. Participate in mandatory pre-installation conference.
 2. Schedule pre-installation conference for new Projects after completion of Fine Grading specified in Section 31 2216, but before beginning Aggregate Base as specified in Section 31 1123. This conference may be held jointly with pre-installation conference for Common Planting Requirements specified in Section 32 9001.
 3. In addition to agenda items specified in Section 01 3100, review following:
 - a. Review Applicator Qualification requirements.
 - b. Review Ambient Conditions for acceptability for application of termiticide products.
 - c. Review Delivery, Storage, and Handling requirements.
 - d. Review Examination, Preparation, and Application requirements as called out in Part 3 Execution.
 - e. Review Field Quality Control and Protection requirements as called out in Part 3 Execution.
- C. Sequencing:
1. Application OPTION A:
 - a. Apply termite protection on top of soil base before aggregate base and vapor retarder is installed.
 2. Application OPTION B:
 - a. Install vapor retarder after application of termite protection on top of aggregate base.
 - b. Increase application rate for volume as per Manufacturer's instruction.
 - c. Install below-grade vapor retarder on top of soil base or aggregate base.

1.3 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Submit Chemical Manufacturer's printed literature regarding chemical composition, concentration, and rates and method of application.
 - b. Submit MSDS information.

- B. Informational Submittals:
 - 1. Certificates:
 - a. Provide certificates required by any authorities having jurisdiction (AHJ).
 - 2. Design Data Submittals:
 - a. Certified Applicator's statement indicating total amount of chemical required for Project to provide required amount of mix solution at specified concentration and application rates.
 - b. Certified Applicator to submit take-off showing amounts of square foot and lineal foot application at specified application rate. Also indicate total amount of mix solution required for Project.
 - 3. Manufacturers' Instructions:
 - a. Manufacturer's printed label on product regarding chemical composition, concentration, and rates and method of application.
 - 4. Qualification Submittals:
 - a. Provide BASF Partner Number and evidence of license from authorities having jurisdiction (AHJ).

- C. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Warranty Documentation:
 - 1) Include copy of final, executed warranty.
 - b. Record Documentation:
 - 1) Soil Treatment Application Report: After application of termiticide is complete, submit report including the following:
 - a) Date and time of application.
 - b) Moisture content of soil before application.
 - c) Termiticide brand name and batch number of concentrate.
 - d) Mix rate and quantity of diluted termiticide used.
 - e) Areas of application.
 - f) Weather at time of application.
 - g) Water source for application.

1.4 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Formulate and apply termiticides and termiticide devices according to the EPA-Registered Label.

- B. Qualifications:
 - 1. Applicator: Requirements of Section 01 4301 applies but not limited to the following:
 - a. Applicator shall be licensed pest professional according to regulations of authorities having jurisdiction (AHJ) with Manufacturer's Certification training in correct application methods to apply termite control treatment and products in jurisdiction where Project is located.
 - b. Applicator should be familiar with trenching, rodding, short rodding, subslab injection, low-pressure banded surface applications, and foam delivery techniques.

- C. Source Limitations:
 - 1. Obtain termite control products from single source from single manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Delivery, Storage, and Handling:
 - 1. Certified Applicator responsible for delivery, storage, handling, and dispose of specified products of this section.

- B. Storage And Handling Requirements:
 - 1. Storage:
 - a. Keep containers closed when not in use.
 - b. Store unused product in original container only, out of reach of children and animals.
 - c. Do not store near food or feed.
 - d. Protect from freezing.
 - 2. Spills or leaks:
 - a. General:
 - 1) In case of spill or leak on floor or paved surfaces, soak up with sand, earth, or synthetic absorbent.
 - 2) Avoid skin contact.
 - 3) Remove residue to chemical waste area.
 - 4) Ensure adequate decontamination of tools and equipment following cleanup.
 - b. All leaks resulting in application of this product in locations other than those prescribed must be cleaned up prior to leaving application site.
 - 1) DO NOT allow people or pets to contact contaminated areas until cleanup is completed.

- C. Packaging Waste Management:
 - 1. Disposal:
 - a. Dispose of empty containers in accordance with Manufacturer's and regulatory agency's requirements.
 - b. Do not contaminate water, food, or feed by storage or disposal.

1.6 FIELD CONDITIONS

- A. Ambient Conditions
 - 1. Comply with EPA-Registered Label and requirements of authorities having jurisdiction (AHJ) and Manufacturer's written recommendations regarding environmental conditions under which termiticide shall be applied.

- B. Environmental Limitations:
 - 1. To ensure penetration, do not treat soil that is water saturated or frozen.
 - 2. Do not treat soil (or aggregate base) while precipitation is occurring or movement from treatment area (site) is likely to occur.
 - 3. Do not treat soil (or aggregate base) while large precipitation is expected to occurring within two to four (2-4) hours after application.

1.7 WARRANTY

- A. Manufacturer Warranty:
 - 1. Provide Manufacturer's written warranty:
 - a. Warranty shall guarantee effectiveness of treatment against subterranean termite infestation for five (5) years minimum from acceptance date of Project and be signed by applicator and Contractor as co-guarantors.
 - b. If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.

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PART 2 - PRODUCTS

2.1 MATERIALS

- A. Termiticide:
 - 1. Description:
 - a. Provide EPA-Registered termiticide, complying with requirements of authorities having jurisdiction (AHJ), in aqueous solution formulated to prevent termite infestation.
 - b. Provide quantity required for application at label volume and rate for maximum termiticide concentration allowed for each specific use, according to product’s EPA-Registered Label.
 - 2. Design Criteria:
 - a. Undetectable:
 - 1) Non-repellent or undetectable chemical technology.
 - b. Transfer Effect:
 - 1) Slow-acting treatment allowing individual termite’s ample time to transfer treatment to other termites as they come in contact within the colony.
 - c. Service Life of Treatment:
 - 1) Soil treatment termiticide that is effective for not less than five (5) years against infestation of subterranean termites.
 - 3. Mixes:
 - a. Mix chemicals and water at Manufacturer's recommended printed requirements.
 - 1) To provide maximum control and protection against termite infestation, apply as per Manufacturer printed instructions including but not limited to the following:
 - a) To maximize termiticide potency, product should be applied in manner to provide continuous treated zone to prevent termites from infesting wood to be protected.
 - b) Product is labeled for use at 0.06 percent, 0.09 percent or 0.125 percent finished dilution. The 0.06 percent finished dilution should be used for typical control situations. Where severe termite infestations, problem soils, or difficult construction types are encountered, it may be advisable to use either 0.09 percent or 0.125 percent.
 - 4. Category Four Approved Product. See Section 01 6200 for definitions of Categories. (No substitution of specified product or alteration of Manufacturer’s application requirements is allowed):
 - a. Termidor by BASF Professional Pest Control, Research Triangle Park, NC www.termidorhome.com, or www.pestcontrol.basf.us.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Evaluation And Assessment:
 - 1. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of soil per termiticide label requirements, interfaces with earthwork, slab and foundation work, landscaping, utility installation, and other conditions affecting performance of termite control.
 - 2. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protection Of In-Place Conditions:
 - 1. Allow no disturbance of treated soil (aggregate base) between application of solution and placing of concrete. (Disturbed defined as removing fill and/or replacing fill).
 - 2. Protect neighboring property, water sources, and personnel on site from contamination.
 - a. Use anti-backflow equipment or procedures.

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- b. Do not treat soil beneath structures that contain wells or cisterns.
- c. Take extreme care to avoid runoff. Do not treat soil that is water-saturated or frozen.
- 3. Maintain, on job site, empirical name of chemical, Manufacturer's precautions, and phone numbers of proper authorities to notify in case of spillage or other accident.

B. General Preparation:

- 1. Comply with the most stringent requirements of authorities having jurisdiction (AHJ) and with Manufacturer's written instructions for preparation before beginning application of termite control treatment.
- 2. Remove all extraneous sources of wood cellulose and other edible materials such as wood debris, tree stumps and roots, stakes, formwork, trash, and construction waste wood from soil within and around foundations.
- 3. Do not apply application of termite control until location of air ducts, vents, water, and sewer lines are known and identified. Take extreme caution to avoid contamination of these structural elements and airways.

C. Soil Treatment Preparation:

- 1. Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated.
- 2. Loosen, rake, and level soil to be treated except previously compacted areas under slabs and footings.
- 3. Termiticides may be applied before placing compacted fill under slabs if recommended in writing by termiticide manufacturer.
- 4. Fit filling hose connected to water source at site with backflow preventer, complying with requirements of authorities having jurisdiction (AHJ).

3.3 APPLICATION

A. Interface With Other Work:

- 1. Interior slab-on-grade concrete:
 - a. Installation of vapor retarder, geomembrane if used, and aggregate base.

B. General:

- 1. Comply with the most stringent requirements of authorities having jurisdiction (AHJ) and with Manufacturer's EPA-Registered Label for products.
 - a. Application Restrictions:
 - 1) Do not apply while precipitation is occurring or large precipitation is expected to occurring within two to four (2-4) hours after application'.
 - 2) Do not contaminate water, food or feed. Cover or remove all exposed food, feed and drinking water.
 - 3) Do not apply with 15 feet (4.50 m) of bodies of fresh water lakes, reservoirs, rivers, permanent streams, marshes, and natural ponds.
 - 4) Do not allow residents, children, other persons or pets into immediate area during application.
 - 5) Do not allow residents, children, other persons or pets into treated area until sprays have dried. After application, applicator is required to check for leaks resulting in deposition of treatment dilution in locations other than those prescribed.
- 2. Application OPTION B as specified in Sequencing of this specification in Part 1 General:
 - a. Increase application rate for volume as per Manufacturer's instruction.

C. Applying Soil Treatment:

- 1. Mix treatment termiticide solution to a uniform consistency.
- 2. Provide quantity required for application at the label volume and rate for the maximum specified concentration of termiticide, according to manufacturer's EPA-Registered Label so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction. Distribute treatment evenly.

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3. If impervious soils make reduction in volume of solution necessary, increase percentage of toxicant used in proportion to insure same amount of insecticide be used per linear or square foot (meter).
4. Apply overall treatment to entire surface to be covered by concrete slab.

D. Pre-Construction Treatment:

1. For Slab-on-Grade Construction:
 - a. 4 gallons per 10 linear ft (15 liters per 3 000 linear mm) along outside of exterior foundation.
 - b. 2 gallons per 10 linear ft (7.5 liters per 3 000 linear mm) in voids of unit masonry foundation walls or piers.
 - c. One gallon per 10 sq ft (3.5 liters per one sq m) as overall treatment under slab and attached porches.
 - d. 4 gallons per 10 linear ft (15 liters per 3 000 linear mm) along inside of exterior foundation walls, both sides of interior partition foundation walls, and around utility services and other features that will penetrate slab or where there will be break in concrete (grade changes, zip strips, cold joints, etc.).

3.4 RE-APPLICATION

- A. Reapply treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

3.5 FIELD QUALITY CONTROL

- A. Non-Conforming Work. Non-conforming work as covered in the General Conditions applies, but is not limited to the following:
 1. Applicator:
 - a. Substitution of specified product or alteration of Manufacturer's application requirements is considered defective or not complying with Contract Document requirements. Correct such work at no cost to the Owner.

3.6 PROTECTION

- A. Allow sufficient time (12 hours minimum) for drying after application before resuming construction activities.
- B. Keep off treated areas until completely dry. Do not allow workers or other personnel to enter treatment area until chemical has been absorbed into soil.
- C. Protect application areas from precipitation as recommended by Manufacturer.
- D. Protect temiticide solution, dispersed in treated soils and fill, from being diluted until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.
- E. Post signs in areas of application warning of poison application. Remove signs when areas with application are covered by other construction.

END OF SECTION

SECTION 32 1313**CONCRETE PAVING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
1. Prepare pavement subgrade and aggregate base as described in Contract Documents to receive pavement paving.
 2. Furnish and install pavement aggregate base as described in Contract Documents.
 3. Furnish and install Portland cement concrete paving, control joints and expansion joints as described in Contract Documents.
- B. Related Requirements:
1. Section 01 1200: 'Multiple Contract Summary'.
 2. Section 01 3100: 'Project Management and Coordination' for pre-installation conference.
 3. Section 01 4000: 'Quality Requirements' for administrative and procedural requirements for quality assurance and quality control.
 4. Section 01 4301: 'Quality Assurance – Qualifications' establishes minimum qualification levels required.
 5. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
 6. Section 03 2116: 'Epoxy-Coated Reinforcement Steel Bars'.
 7. Section 03 3111: 'Cast-In-Place Structural Concrete' for:
 - a. Mix Type concrete mixes and admixtures.
 - b. Field Quality Control Testing and Inspection requirements for concrete.
 - c. Membrane Concrete Curing application.
 - d. Pre-installation conference held jointly with other concrete specifications.
 8. Section 03 3517: 'Concrete Sealer Finishing' for application in areas exposed to freeze/thaw cycles and deicing salts.
 9. Section 03 3923: 'Membrane Concrete Curing' for quality of curing materials used.
 10. Section 07 9213: 'Elastomeric Joint Sealants' for quality of joint sealants including other contractual and installation requirements.
 11. Section 31 0501: 'Common Earthwork Requirements' for:
 - a. General procedures and requirements for earthwork.
 - b. Pre-installation conference held jointly with other common earthwork related sections.
 12. Section 31 1123: 'Aggregate Base' for compaction of aggregate base.
 13. Section 31 2213: 'Rough Grading' for grading requirements and preparation of natural soil subgrades below fill and aggregate base materials.
 14. Section 31 2216: 'Fine Grading' for grading of subgrade below aggregate base and topsoil.
 15. Section 31 2323: 'Fill' for compaction procedures and tolerances.

1.2 REFERENCES

- A. Association Publications:
1. American Concrete Institute, Farmington Hills, MI www.concrete.org. Abstracts of ACI Periodicals and Publications.
 - a. ACI 305R-10, 'Guide to Hot Weather Concreting'.
 - b. ACI 306R-10, 'Guide to Cold Weather Concreting'.
 - c. ACI 330R-13, '*Guide for the Design and Construction of Concrete Parking Lots*'.
 - d. Certifications:
 - 1) ACI CP-1(13), '*Technical Workbook for ACI Certification of Concrete Field Testing Technician-Grade 1*'.

- 2) ACI CP-10(10), '*Craftsman Workbook for ACI Certification of Concrete Flatwork Technician/Finisher*'.
 - 3) ACI CP-19(13), '*Technical Workbook for ACI Certification of Concrete Strength Testing Technician*'.
 - 4) ACI CP-43(11), '*Technical Workbook for ACI Certification of Aggregate Base Testing Technician*'.
2. Council of American Structural Engineers:
 - a. CASE Form 101: *Statement of Special Inspections*. Washington, DC: CASE, 2001. (c/o American Council of Engineering Companies, 1015 15th St., NW, Washington, DC 20005; 202-347-7474; www.acec.org).
- B. Definitions (Following are specifically referenced for testing):
1. Accreditation: Process in which certification of competency, authority, or credibility is presented. Verify that laboratories have an appropriate quality management system and can properly perform certain test methods (e.g., ANSI, ASTM, and ISO test methods) and calibration parameters according to their scopes of accreditation.
 2. Approved: To authorize, endorse, validate, confirm, or agree to.
 3. Contract Documents: Engineering and Architectural Drawings and Specifications issued for construction, plus clarification drawings, addenda, approved change orders and contractor designed elements.
 4. Field Quality Control: Testing, Inspections, Special Testing and Special Inspections to assure compliance to Contract Documents.
 5. Inspection/Special Inspection: Inspection of materials, installation, fabrication, erection or placement of components and connections requiring special expertise to ensure compliance with approved construction documents and referenced standards:
 - a. Inspection: Not required by code provisions but may be required by Contract Documents.
 - b. Special Inspection: Required by code provisions and by Contract Documents.
 - c. Inspection-Continuous: Full-time observation of the Work requiring inspection by approved inspector who is present in area where the Work is being performed.
 - d. Inspection-Periodic: Part-time or intermittent observation of the Work requiring inspection by approved inspector who is present in area where the Work has been or is being performed and at completion of the Work.
 6. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform particular construction operation, including installation, erection, application, and similar operations.
 7. Observation: Visual observation of building / site elements or structural system by registered design professional for general conformance to approved construction documents at significant construction stages and at completion. Observation does not include or waive responsibility for performing inspections or special inspections.
 8. Owner's Representative: Owner's Designated Representative (Project Manager or Facilities Manager) who will have express authority to bind Owner with respect to all matters requiring Owner's approval or authorization.
 9. Preconstruction Testing: Tests and inspections that are performed specifically for Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
 10. Product Testing: Tests and inspections that are performed by testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.
 11. Quality Assurance: Testing, Inspections, Special Testing and Special Inspections provided for by Owner.
 12. Quality Control: Testing, Inspections, Special Testing and Special Inspections provided for by Contractor.
 13. Service Provider: Agency or firm qualified to perform required tests and inspections.
 14. Source Quality Control Testing: Tests and inspections that are performed at source, i.e., plant, mill, factory, or shop.
 15. Special Inspection: See Inspection.
 16. Special Inspector: Certified individual or firm that implements special inspection program for project.
 17. Special Test: See Test.

18. Subgrade (definition varies depending upon stage of construction and context of work being performed):
 - a. Prepared natural soils on which fill, aggregate base, or topsoil is placed.
or
 - b. Prepared soils immediately beneath paving or topsoil.
19. Test/Special Test: Field or laboratory tests to determine characteristics and quality of building materials and workmanship.
 - a. Test: Not required by code provisions but may be required by Contract Documents.
 - b. Special Test: Required by code provisions and by Contract Documents.
20. Testing Agency: Entity engaged to perform specific tests, inspections, or both.
21. Testing Agency Laboratory: Agency or firm qualified to perform field and laboratory tests to determine characteristics and quality of materials and workmanship.
22. Verification: Act of reviewing, inspecting, testing, etc. to establish and document that product, service, or system meets regulatory, standard, or specification requirements.

C. Reference Standards:

1. American Association of State and Highway Transportation Officials:
 - a. AASHTO M 153-06 (2011), 'Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction'.
 - b. AASHTO M 213-01 (2010), 'Standard Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)'.
 - c. AASHTO T 318-02 (2011), 'Standard Method of Test for Water Content of Freshly Mixed Concrete Using Microwave Oven Drying'.
 - d. AASHTO M 6: Fine Aggregate for Hydraulic Cement Concrete
 - e. AASHTO M 80: Coarse Aggregate for Hydraulic Cement Concrete
 - f. AASHTO M 85: Portland Cement
 - g. AASHTO M 154: Air-Entraining Admixtures for Concrete
 - h. AASHTO M 194: Chemical Admixtures for Concrete
 - i. AASHTO M 295: Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
 - j. AASHTO T 121: Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
 - k. AASHTO T 160: Length Change of Hardened Hydraulic Cement Mortar and Concrete
 - l. AASHTO T 176: Plastic Fines in Graded Aggregates and Soils by Use of the Sand Equivalent Test
 - m. AASHTO T 325: Estimating the Strength of Concrete in Transportation Construction by Maturity Tests
 - n. AASHTO T 358: Surface Resistivity Indication of Concrete's Ability to Resist Chloride Ion Penetration
 - o. AASHTO TP 137: Box Test in Slip Form Paving of Fresh Portland Cement Concrete
2. American Concrete Institute:
 - a. ACI 117-10: 'Specifications for Tolerances for Concrete Construction and Materials and Commentary'.
 - b. ACI 117M-10: 'Specifications for Tolerances for Concrete Construction and Materials (ACI 117M-10) and Commentary (Metric)'.
 - c. ACI 301-10, 'Specification for Structural Concrete for Buildings'.
 - d. ACI 301M-10, 'Specification for Structural Concrete (Metric)'.
 - e. ACI 305.1-14, 'Specification for Hot Weather Concreting'.
 - f. ACI 306.1-90 (R2002), 'Standard Specification for Cold Weather Concreting'.
3. ASTM International:
 - a. ASTM C33/C33M-13, 'Standard Specification for Concrete Aggregates'.
 - b. ASTM C39/C39M-15a, 'Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens'.
 - c. ASTM C78/C78M-15a, 'Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)'.
 - d. ASTM C94/C94M-15, 'Standard Specification for Ready-Mixed Concrete'.
 - e. ASTM C125-15a, 'Standard Terminology Relating to Concrete and Concrete Aggregates'.
 - f. ASTM C140/C140M-15, 'Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units'.
 - g. ASTM C260: Air-Entraining Admixtures for Concrete
 - h. ASTM C595: Blended Hydraulic Cements

- i. ASTM C1116: Fiber-Reinforced Concrete
- j. ASTM C1157: Hydraulic Cement
- k. ASTM C1567: Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method)
- l. ASTM C1602: Mixing Water Used in the Production of Hydraulic Cement Concrete
- m. ASTM C1609: Flexural Performance of Fiber-Reinforced Concrete (Using Beam With Third-Point Loading)
- n. ASTM C1688/C1688M-14a, 'Standard Test Method for Density and Void Content of Freshly Mixed Pervious Concrete'.
- o. ASTM D1752-04a(2013), 'Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction'.
- p. ASTM D1883-14, 'Standard Test Method for CBR (California Bearing Ratio) of Laboratory-Compacted Soils'.
- q. ASTM D3549/D3549-11, 'Standard Test Method for Thickness or Height of Compacted Bituminous Paving Mixture Specimens'.
- r. ASTM E329-14a: 'Standard Specification for Agencies Engaged in Construction Inspection and/or Testing'.
- 4. Corps of Engineers:
 - a. CRD-C508 - Preformed Expansion Joint Filler for Concrete Paving and Structural Construction.
- 5. International Building Code (IBC):
 - a. Chapter 17, 'Structural Tests and Special Inspections' (2012 or latest edition available).
- 6. Utah Department of Transportation (UDOT):
 - a. UDOT Materials Manual of Instruction
 - b. UDOT Minimum Sampling and Testing Requirements
 - c. UDOT Quality Management Plan
- 7. International Code Council (ICC):
 - a. ICC Evaluation Service (ICC-ES) AC32: Concrete with Synthetic Fibers

1.3 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conferences:

- 1. Participate in pre-installation conference as specified in Section 03 3111:
 - a. In addition to agenda items specified in Section 01 3100 and Section 03 3111, review following:
 - 1) Review placement, finishing, and curing of concrete including cold and hot weather requirements.
 - 2) Review approved mix design and use of admixtures requirements.
 - 3) Review concrete joint layout and joint sealant requirements.
 - 4) Review Section 01 4523 for Testing and Inspection administrative requirements and responsibilities and Field Quality Control tests and inspections required of this section.
 - a) Review frequency of testing and inspections.
- 2. Participate in pre-installation conference as specified in Section 31 0501:
 - a. In addition to agenda items specified in Section 01 3100, Section 03 3111 and Section 31 0501, review following:
 - 1) Review surveying and staking of parking areas and installation of sleeves.
 - 2) Review fill and compaction requirements.
 - 3) Review proposed aggregate base schedule.
 - 4) Review rough grading elevations before placing paving fill.
 - 5) Review fine grading elevations of subgrade before placing aggregate base and paving.
 - 6) Review Section 01 4523 for Testing and Inspection administrative requirements and responsibilities and Field Quality Control tests and inspections required of this section.
 - a) Review frequency of testing and inspections.

B. Scheduling:

- 1. Notify Testing Agency and Architect twenty four (24) hours minimum before aggregate base.
- 2. Notify Testing Agency and Architect twenty four (24) hours minimum before placing concrete paving.

1.4 SUBMITTALS

- A. Action Submittals:
1. Shop Drawings:
 - a. Joint layout plan for written approval before starting work on this Section.
- B. Informational Submittals:
1. Certificates:
 - a. Installers:
 - 1) Certification for National Ready Mixed Concrete Association (NRMCA).
 - 2) Certification for ACI-certified Flatwork Finishers and Technicians.
 2. Design Data:
 - a. Mix Design:
 - 1) Furnish proposed mix design to Architect for review prior to commencement of Work.
 - a) Include density (unit weight) and void content determined per ASTM C1688/C1688M for fresh mixed properties and per ASTM C140/C140M for hardened concrete properties.
 - b) Mix design shall show proposed admixtures, amount, usage instructions, and justification for proposed use.
 - b. Ready-Mix Supplier:
 - 1) Require mix plant to furnish delivery ticket for each batch of concrete. Keep delivery tickets at job-site for use of Owner or his representatives. Tickets shall show following:
 - a) Name of ready-mix batch plant.
 - b) Serial number of ticket.
 - c) Date and truck number.
 - d) Name of Contractor.
 - e) Name and location of Project.
 - f) Specific class or designation of concrete conforming to that used in Contract Documents.
 - g) Amount of concrete.
 - h) Amount and type of cement.
 - i) Total water content allowed by mix design.
 - j) Amount of water added at plant.
 - k) Sizes and weights of sand and aggregate.
 - l) Time loaded.
 - m) Type, name, manufacturer, and amount of admixtures used.
 - n) Design Data.
 - 2) Provide certificates with supporting testing reports verifying compliance with Contract Document requirements and that materials provided are from single source for following:
 - a) Cement.
 - b) Aggregate.
 - c) Fly Ash.
 3. Source Quality Control Submittals:
 - a. Concrete mix design. Testing showing the concrete mix meets the required flexural strength indicated.
 4. Special Procedure Submittals:
 - a. Curing plan.
- C. Closeout Submittals:
1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Record Documentation:
 - 1) Testing and Inspection Reports:
 - a) Testing Agency Testing and Inspecting Reports of concrete paving.

1.5 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:

1. Concrete paving to be installed in strict accordance with original design in accordance with all pertinent codes and regulations and all pertinent portions of Reference Standards.
 2. Obtain all necessary permits and permission to work in public right-of-ways.
 3. All equipment shall conform to all local and state regulations.
- B. Qualifications: Requirements of Section 01 4301 applies, but is not limited to following:
1. Installers And Installation Supervisor:
 - a. ACI-certified Flatwork Finishers and Technicians.
 2. Ready-Mix Supplier:
 - a. Comply with ASTM C94/C94M requirements and be certified according to NRMCA's 'Certification of Ready Mixed Concrete Production Facilities.'
 3. Testing Agencies:
 - a. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technicians, Grade I.
 - b. Personnel performing laboratory tests shall be ACI-certified Laboratory Testing Technicians, Grade I, and laboratory supervisor shall be ACI-certified Laboratory Testing Technician, Grade II.
- C. Testing and Inspection:
1. Owner will provide Testing and Inspection for concrete paving:
 - a. Owner will employ testing agencies to perform testing and inspection for concrete paving as specified in Field Quality Control in Part 3 of this specification.
 - 1) Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform the Work in strict accordance with requirements of Contract Documents and perform contractor testing and inspection.
 - 2) See Section 01 1200: 'Multiple Contract Summary'.
 - b. Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform testing and inspection as part of his Quality Control.
 - 1) Testing and inspections, if performed by Contractor, will be responsibility of Contractor to be performed by an independent entity.

1.6 FIELD CONDITIONS

- A. Ambient Conditions:
1. Cold Weather Limitations:
 - a. Follow requirements of ACI 306 for cold weather concreting.
 2. Hot Weather Limitations:
 - a. Follow requirements of ACI 305 for hot weather concreting.
 3. Do not perform work during unfavorable conditions as specified below:
 - a. Presence of free surface water.
 - b. Over-saturated aggregate base and subgrade materials.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Design Criteria:
1. Design life of concrete paving system shall be forty (40) years minimum.
 2. Aggregate: Conform to UDOT Specification 03055 Class AA(P).
 3. Concrete: Conform to UDOT Specification 03055 Class AA(P).
 4. Fiber reinforcing: Conform to UDOT Specification 03055 Class AA(P).
 5. Concrete curb and gutter shall be of type and size as shown on Contract Drawings.
 6. Provide wet cut control joints at spaces indicated on Contract Drawings.
- B. Aggregate Base: Conform to applicable requirements as specified in Section 03 1123: 'Aggregate Base'.

- C. Control Joint Filler Material:
 - 1. As specified in Section 07 9213 'Elastomeric Joint Sealants'.

- D. Expansion Filler Material:
 - 1. Recycled PVC Joint Filler:
 - a. Design Criteria:
 - 1) Expansion joint filler manufactured from 100 percent recycled vinyl material meeting requirements of ASTM D1752 and AASHTO M-153.
 - 2) **1/2 inch (12.7 mm)** thick.
 - 3) Compressive/Recovery:
 - a) Meet requirements for ASTM D1752 recover minimum of 90 percent of original thickness.
 - 4) Light gray color.
 - b. Type One Approved Products:
 - 1) Proflex by Oscoda Plastics Inc, Oscoda, MI www.oscodaplastics.com.
 - 2) Equal as approved by Architect before bidding. See Section 01 6200.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification Of Conditions:
 - 1. Inspect installed work of all other trades and verify that work is complete where installation of concrete paving may properly commence.
 - 2. Verify elevations of rough grading are correct before paving aggregate base and paving are placed.
 - 3. Verify grades of existing pavements at connection locations.
 - 4. Notify Architect of unsuitable conditions or discrepancies in writing.
 - 5. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.
 - 6. Subgrade preparation may not begin until all utilities have been installed, including underground lighting and sprinkler systems.

3.2 PREPARATION

- A. Barricades:
 - 1. Provide all necessary barricading.

- B. Surface Preparation:
 - 1. Survey and stake parking surfaces to show grading required by Contract Documents.
 - 2. Subgrade (soil below aggregate base):
 - a. Prepare natural soil subgrade as specified in Section 31 2213 'Rough Grading' or prepare fill subgrade as described in Section 31 2216 'Fine Grading'.
 - 3. Aggregate base:
 - a. Finish grade parking surface area to grades required by Contract Documents.
 - b. Compact aggregate base as specified in Section 31 1123.
 - c. Tolerance:
 - 1) Aggregate base:
 - a) Elevation of aggregate base shall be no more than **1/4 inch (6.4 mm)** above or **1/2 inch (12.7 mm)** below the design grade.
 - b) Measure using string line from curb to curb, gutter, flat drainage structure, or grade break.

3.3 INSTALLATION

- A. Interface With Other Work:
1. Section 31 1123: 'Aggregate Base' for compaction of aggregate base.
 2. Section 31 2213: 'Rough Grading' for rough grading and preparation of natural soil subgrades below fill and aggregate base materials.
 3. Section 31 2216: 'Fine Grading' for grading of subgrade below aggregate base and topsoil.
 4. Section 31 2323: 'Fill' for compaction procedures and tolerances.
- B. Paving Forming:
1. Forms shall be cleaned and oiled each time they are used.
 2. Sufficient forms shall be provided so that they may remain in place twelve (12) hours or longer after concrete has been placed.
 3. Forms shall be secured to resist pressure of concrete and any finishing equipment riding on them without springing or settlement.
 4. Joint forms neatly and tightly and securely pinned and staked to line and elevation shown.
 5. Staked form lines shall be inspected and approved in advance of placing concrete.
- C. Manholes And Valves:
1. Adjust manholes and valves in areas of concrete paving after forms have been set.
- D. Paving Placement:
1. Place, strike off, and consolidate concrete with mechanical finishing machine or vibrating screed.
 - a. Hand finishing methods may be used if approved by Architect.
 - b. If screed is used, carry **2 inches (50 mm)** of concrete minimum in front of screed for full width of pavement.
 - c. Concrete may also be placed with slipform paver designed to spread, consolidate, screed, and float-finish concrete in one pass.
 - d. When paving is being laid contiguous to previously finished concrete of the same finish grade elevation or contiguous to previously finished curb, such concrete or curb may be made to serve as side forms and as guide for implements for striking, tamping, and finishing.
 2. Bull float surface with magnesium float immediately after screeding:
 - a. Steel or wood tools are not allowed.
 - b. Surface of concrete must remain open to allow bleed water to pass.
 3. Finish: Skid-resistant finish made with burlap drag or broom:
 - a. Do not finish water into top surface trapping bleed water prior to bleed water evaporating.
 4. Curing:
 - a. Apply product as specified in Section 03 3923 'Membrane Concrete Curing' to concrete paving:
 - b. Apply Concrete Sealer Finishing to exterior concrete placed after about September 1st and located in areas exposed to freeze/thaw cycles and deicing salts.
 - 1) See Section 03 3517 'Concrete Sealer Finishing' for options available.
 5. Joints:
 - a. Control:
 - 1) Depth shall be 1/4 slab thickness except **1 inch (25 mm)** is acceptable when using early entry saws (soft cut):
 - a) Use **1/10 inch (2.54 mm)** to **3/16 inch (4.76 mm)** for unsealed joints.
 - b) Use **1/8 inch (3 mm)** to **1/4 inch (6.4 mm)** for sealed joints.
 - 2) Complete before shrinkage cracking occurs.
 - 3) Make continuous across slab unless interrupted by expansion joint. Extend through adjoining curbs, gutters, and sidewalks.
 - 4) Space not more than 30 times thickness of slab up to maximum of **12-1/2 feet (3.8 meters)** apart in any direction.
 - 5) Control Jointing Methods:
 - a) Sawing: Begin sawing joints as soon as concrete has hardened enough to permit sawing without raveling.
 - b) Hand-Formed: Maximum edge radius shall be **1/4 inch (6 mm)**.
 - c) Pre-molded joint former.
 - 6) Seal control joints.

- b. Expansion:
 - 1) Use to isolate fixed objects abutting or within paved area. Joints shall contain pre-molded joint filler for full depth of slab.
 - 2) Do not use expansion joints along face of curb.
 - 3) Clean and seal before opening parking area to traffic.

E. Tolerances:

1. Paving thickness is shown on Contract Drawings.

3.4 FIELD QUALITY CONTROL

A. Field Tests and Inspections:

1. General:
 - a. Owner is responsible for Quality Assurance. Quality assurance performed by Owner will be used to validate Quality Control performed by Contractor.
 - b. Quality Control is sole responsibility of Contractor as specified in Section 01 4523 'Testing And Inspection Services'.
2. Concrete Paving:
 - a. Testing Agency shall provide testing and inspection for 'Concrete Paving' as specified in Section 03 3000 'Normal Weight Structural Concrete' in Part 3 Field Quality Control for concrete paving.

B. Non-Conforming Work: Non-conforming work as covered in the General Conditions applies, but is not limited to the following:

1. Rejection and Removal of Concrete Paving:
 - a. Reject concrete paving that does not meet the specified requirements.
 - b. Remove concrete paving found defective after installation and install acceptable product at no additional cost to the Owner.
2. Acceptance:
 - a. General:
 - 1) Opening paved surface to traffic does not constitute acceptance.
 - b. Strength:
 - 1) General:
 - a) Lot is acceptable if strength test deviations are within Pay Factor 1.00 limits.
 - b) At Project Manager's discretion, after consulting with design team, a Lot with test deviation greater than Reject may stay in place at 50% cost.
 - 2) Compression: ASTM C39/C39M. Lot size - 5,000 sq. ft. (465 sq. m):
 - a) Pay Factor:
 - (1) 1.00 for 0 psi (0 kPa) below 28 day compressive strength required.
 - (2) 0.90 for 1 psi (6.895 kPa) to 100 psi (690 kPa) below 28 day compressive strength required.
 - (3) 0.80 for 101 psi (0.96 MPa) to 200 psi (1.38 MPa) below 28 day compressive strength required.
 - (4) 0.70 for 201 psi (1.39 MPa) to 300 psi (2.07 MPa) below 28 day compressive strength required.
 - (5) 0.60 for 301 psi (2.08 MPa) to 400 psi (2.75 MPa) below 28 day compressive strength required.
 - (6) Reject for 401 psi (2.76 MPa) or more below 28 day compressive strength required.
 - 3) Flexural: ASTM C78/C78M. Lot size - 5,000 sq. ft. (465 sq. m):
 - a) Pay Factor:
 - (1) 1.00 for 0 psi (0 kPa) less than 28 day flexural strength required.
 - (2) 0.95 for 1 psi (6.895 kPa) to 29 psi (200 kPa) below 28 day flexural strength required.
 - (3) 0.85 for 30 psi (207 kPa) to 60 psi (415 kPa) below 28 day flexural strength required.
 - (4) Reject for 61 psi (420 kPa) or more below 28 day flexural strength required.
 - c. Thickness:

- 1) General:
 - a) At Project Manager's discretion, after consulting with design team, payment may be made for areas deficient in thickness by more than **1 inch (25.4 mm)** at 50 percent. If not, remove and replace at no additional cost to the Owner.
- 2) Paving thickness shall be as indicated in Tolerances above.
- 3) Grade: **1/8 inch (3.175 mm)** in **10 foot (3 meter)** parallel to centerline.
- 4) Cross Slope: **1/4 inch (6.35 mm)** in **10 foot (3 meter)** perpendicular to centerline except at cross section grade breaks.
- 5) Thickness will be determined on ASTM D3549/D3549 cored or sawed specimens. Acceptance will be based on the average of all Lot thickness tests:
 - a) Pay Factor:
 - (1) 1.00 for **0.00 inches (0.00 mm)** to **0.25 inches (6.35 mm)** less than specified thickness.
 - (2) 0.90 for **0.26 inch (6.60 mm)** to **0.50 inches (12.70 mm)** less than specified thickness.
 - (3) 0.70 for **0.51 inches (12.95 mm)** to **0.75 inches (19.05 mm)** less than specified thickness.
 - (4) 0.50 for **0.76 inches (19.30 mm)** to **1.00 inches (25.4 mm)** less than specified thickness.
- 6) When thickness measurement is less than specified by more than **1 inch (25.4 mm)**, actual thickness of pavement will be determined by taking additional cores at intervals less than **10 foot (3 meter)** parallel to centerline in each direction from affected location, until in each direction core is found which is not deficient by more than **1 inch (25.4 mm)**. Exploratory cores for deficient thickness will not be used in averages for price adjustments.

3.5 PROTECTION

A. Traffic:

1. Do not open pavement to traffic for three (3) days or until concrete reaches compressive strength of **1800 psi (12.4 MPa)** minimum, whichever is longer.
2. Restrict traffic to passenger cars and light trucks for seven (7) days.
3. In all cases, obtain approval from Architect before allowing access to parking area by traffic.

END OF SECTION

SECTION 32 1413
PRECAST CONCRETE UNIT PAVING

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Precast concrete unit paving including the following:
 1. Concrete pavers.
 2. Joint sand.
 3. Setting bed sand.
 4. Requirements for crushed rock base.
 5. Geotextile.

1.02 RELATED SECTIONS

- A. Section 03 30 00 - Cast-in-Place Concrete.
- B. Division 31 - Earthwork - for crushed rock base and other grading requirements.

1.03 REFERENCES

- A. ASTM International (ASTM):
 1. ASTM C29 - Bulk Density and Voids in Aggregate Materials.
 2. ASTM C33 - Standard Specification for Concrete Aggregates.
 3. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 4. ASTM C140 - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
 5. ASTM C936 - Standard Specification for Solid Concrete Interlocking Paving Units.
 6. ASTM C979 - Standard Specification for Pigments for Integrally Colored Concrete.
 7. ASTM C1645 - Standard Test Method for Freeze-thaw and De-icing Salt Durability of Solid Concrete Interlocking Paving Units.
 8. ASTM D698 - Test Methods for Moisture Density Relations of Soil and Soil Aggregate Mixtures Using a 5.5 lb (24.4 N) Rammer and 12 in. (305 mm) drop.
 9. ASTM D1557 - Test Methods for Moisture Density Relations of Soil and Soil Aggregate Mixtures Using a 10-lb (44.5 N) Rammer and 18 in. (457 mm) drop.
 10. ASTM D4254 - Standard Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.
 11. ASTM D4354 - Standard Practice for Sampling of Geosynthetics for Testing.
 12. ASTM D4491 - Standard Test Method for Water Permeability of Geotextiles by Permittivity.
 13. ASTM D4533 - Standard Test Method for Index Trapezoidal Tearing Strength of Geotextiles.
 14. ASTM D4632 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
 15. ASTM D4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile.
 16. ASTM D4759 - Standard Practice for Determining the Specifications Conformance of Geosynthetics.
 17. ASTM D4833 - Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes and Related Products.
 18. ASTM D5261 - Standard Test Method for Measuring Mass per Unit Area of Geotextiles.

1.04 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
- B. Product Data:
 1. Manufacturer's data sheets on each product to be used.
 2. Preparation instructions and recommendations.

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3. Storage and handling requirements and recommendations.
 4. Typical installation methods.
- C. Verification Samples: For each finish product specified, two 6 inch square samples of each color in the manufacturer's standard colors for color selection, representing actual product, color, and patterns.
- D. Shop Drawings: Include details of materials, construction and finish. Include relationship with adjacent construction.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum ten years documented experience.
- B. Installer Qualifications: Company specializing in performing Work of this section with minimum two years documented experience with projects of similar scope and complexity.
- C. Source Limitations: Provide each type of product from a single manufacturing source to ensure uniformity.
- D. Mock-Up:
1. Construct a mock-up of 6 feet x 6 feet minimum in size with actual materials in sufficient time for Architect's review and to not delay construction progress. Locate mock-up as acceptable to Architect and provide temporary foundations and support.
 2. Mock-up may be installed and remain as part of the project if the installation is approved by the Architect.
 3. Intent of mock-up is to demonstrate quality of workmanship and visual appearance.
 4. If mock-up is not acceptable, rebuild mock-up until satisfactory results are achieved.
 5. Retain mock-up during construction as a standard for comparison with completed work.
 6. If the mock-up is not installed as part of the project, do not alter or remove mock-up until work is completed or removal is authorized.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store and handle in strict compliance with manufacturer's written instructions and recommendations.
- B. Protect from damage due to weather, excessive temperature, and construction operations.

1.07 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.08 EXTRA MATERIALS

- A. Provide 100 square feet of each product and size used to owner for maintenance and repair. Furnish Pavers from the same production run as installed materials.

PART 2 PRODUCTS

2.01 PAVER SYSTEM

- A. Approved Product
1. Manufacturer: Belgard
 2. Product and installation pattern: Origins 12
 - a. Sizes: mixed installation of the following sizes, as designed in the Manufacturer's standard pattern:
 - 1) 6" x 12" x 2 3/8" thick
 - 2) 12" x 12" x 2 3/8" thick
 - 3) 12" x 18" x 2 3/8" thick
 3. Color and Pattern: Victorian Pattern A.
- B. Equal as approved by the Architect prior to bidding.

C. Paver Performance Requirements

1. Standards Compliance:
 - a. Provide pavers meeting the minimum material and physical properties set forth in ASTM C936. Efflorescence is not a cause for rejection.
 - b. Pigments conforming to ASTM C979.
2. Compressive Strength: 8,000 psi (55 MPa) average, with no individual unit under 7,200 psi (50 MPa).
3. Absorption (ASTM C140): 5 percent average with no unit greater than 7 percent.
4. Resistance to Freeze-Thaw (ASTM C1645): No breakage greater than 1.0 percent loss in dry weight of individual unit after 50 cycles.
5. Maximum allowable breakage of product is 5 percent.

2.02 EDGE RESTRAINTS

- A. Edges will be restrained by adjacent concrete elements. See the Architectural Site Plan and the Site Details.

2.03 SETTING BED SAND

- A. Install 1" deep setting bed directly below pavers.
- B. Materials:
1. Washed sand, clean, non-plastic, free from deleterious or foreign matter, symmetrically shaped, natural or manufactured from crushed rock.
 2. Do not use limestone screenings or stone dust for the setting bed.
 3. Do not use mason sand or sand conforming to ASTM C144.
 4. Gradation Requirements per ASTM C33. Percent Passing Sieve Size:
 - a. 3/8 inch (9.5 mm): 100 percent.
 - b. No. 4 (4.75 mm): 95 to 100 percent.
 - c. No. 8 (2.36 mm): 85 to 100 percent.
 - d. No. 16 (1.18 mm): 50 to 85 percent.
 - e. No. 30 (0.600 mm): 25 to 60 percent.
 - f. No. 50 (0.300 mm): 10 to 30 percent.
 - g. No. 100 (0.150 mm): 2 to 10 percent.
 - h. No. 200 (0.075 mm): 0 to 1 percent.

2.04 POLYMERIC JOINT SAND

- A. Performance requirements:
1. Non-cement formula.
 2. Non-hazing materials.
 3. Quick setting polymers.
- B. Colors:
1. The Architect shall select from the manufacturer's full line of standard colors.
- C. Approved products:
1. Dominator Polymeric Sand by Black Diamond Coatings.
 2. Gator Maxx G2 by Alliance.
 3. Equal as approved by the Architect prior to bidding.

2.05 AGGREGATE BASE

- A. Install 6" deep aggregate base below pavers and setting bed.
- B. Aggregate base is defined in Section 31 2323 Fill and Aggregate Base.

2.06 GEOTEXTILE FABRIC

- A. Performance Requirements:
1. Grab Tensile Strength (ASTM D4632): 115 pounds (511.5 N).
 2. Grab Tensile Elongation (ASTM D4632): 50 percent.
 3. Trapezoidal Tear (ASTM D4533): 50 pounds (222.4 N).

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4. Puncture (ASTM D4833): 65 pounds.
 5. Apparent Opening Size (ASTM D4751): 0.008 inch (0.212 mm), 70 U.S. Sieve.
 6. Permittivity (ASTM D4491): 2.0 sec -1.
 7. Flow Rate (ASTM D4491): 140 gal per min per sf (1630 L per min per sq m)
- B. Geotextile Material: 4 ounce, non-woven, needle punched geotextile composed of 100 percent polypropylene staple fibers that are inert to biological degradation and resists naturally encountered chemicals, alkalis, and acids.
- C. Approved Products:
1. Carthage Mills FX-40HS.
 2. U.S. Fabrics US 115NW.
 3. Mirafi 140N.
 4. Equal as approved by the Architect prior to bidding.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly constructed and prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect in writing of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- B. Prevent damage to underdrain pipes, overflow pipes, observation wells, or inlets and other drainage appurtenances during installation.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions, approved submittals and in proper relationship with adjacent construction.
 1. Lay out the system prior to installation to confirm that no cut pavers at edges will be smaller than 3" in width. Where possible, use large pavers at edges where cuts are required to minimize the number of small, cut pavers.
 2. Install paver system after concrete mow strip border is installed.
 3. Install separation geotextile on bottom and sides of prepared aggregate base. Secure in place to prevent wrinkles and folds. Overlap edges minimum of 18 inches (450 mm) in direction of drainage.
 4. Install aggregate base indicated. Compact and install to tolerances as recommended by paver manufacturer.
 5. Install and spread setting bed as recommended by paver manufacturer.
 6. Mix concrete pavers from a minimum of three bundles to produce uniform blend of colors and textures.
 7. Lay concrete pavers to pattern indicated.
 8. Install pavers with joints at the minimum size recommended by paver manufacturer but no less than 1/8" in width.
 9. Cut pavers as recommended by manufacturer. At all penetrations through the pavers and at vertical obstructions, such as walls, cut pavers precisely and with joints no larger than the joints between the pavers.
 10. Vibrate pavers to leveling course as recommended by manufacturer.
 11. Spread polymeric joint sand as recommended by the manufacturer.
 - a. Ensure dry conditions prior to installation. Pavers and joints shall be completely dry prior to joint sand installation. Do not allow polymeric joint sand to be wetted prematurely.
 - b. Vibrate until joints are completely filled to within 1/8" from the top of the pavers.

- c. After joints are filled, wet joint sand as recommended by the manufacturer to ensure proper adhesion through to the bottom of the joint. Do not over-water or under-water the joint sand.
- 12. Clean the pavers after installation. Remove all excess joint material and residue, including from low points in any irregular surfaces of the pavers.

3.04 FIELD QUALITY CONTROL

- A. Verify final elevations for conformance to the Drawings.
- B. Prevent finished grade elevations from deviating more than 3/8 inch (10 mm) under a 10 foot (3 m) straightedge or indicated slope.
- C. Lippage, Paver-to-Paver: No greater than 1/8 inch (3 mm) difference in height between adjacent pavers.

3.05 CLEANING AND PROTECTION

- A. Prevent traffic on pavers until joint material is vibrated into joints.
- B. Clean products in accordance with the manufacturers recommendations.
- C. Touch-up, repair or replace damaged products.

END OF SECTION

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**SECTION 32 1723.01
PAVEMENT MARKINGS**

PART 1 GENERAL

1.01 SUMMARY

- A. Includes But Not Limited To:
1. Furnish acrylic paint and apply pavement markings as described in Contract Documents.

1.02 REFERENCES

- A. Reference Standards:
1. Federal Specifications and Standards:
 - a. FED-STD-595C, 'Federal Standard: Colors Used in Government Procurement' (16 Jan 2008).
 - b. FED TT-P-1952F, 'Paint, Traffic and Airfield Marking, Waterborne' (17 Feb 2015).
 2. Master Painters Institute:
 - a. MPI (APL) - Master Painters Institute Approved Projects List; Master Painters and Decorators Association; Current Edition.
 3. Department of Transportation Federal Highway Administration:
 - a. FHWA MUTCD-10, 'Manual on Uniform Traffic Control Devices'.

1.03 SUBMITTALS

- A. Action Submittal:
1. Product Data:
 - a. Manufacturer's published product data and certification that product supplied meets requirements of this specification.
- B. Informational Submittal:
1. Test And Evaluation Reports:
 - a. Acrylic Paint:
 - 1) Provide reports showing compliance to FED TT-P-1952F.
- C. Closeout Submittals:
1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Record Documentation:
 - 1) Manufacturer's Documentation:
 - (a) Product data.
 - (b) Specification compliance documentation.
 - 2) Testing and Inspection Reports:
 - (a) Reports showing compliance.

1.04 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
1. Paint must meet requirements of FED TT-P-1952-F and local regulations for VOC.
 2. Paint handicap spaces to conform to ADA Standards and local code requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Acceptance Requirements:
1. Materials shall be delivered in original, unopened containers with labels intact.
 - a. Labels to include:
 - 1) Manufacturer's name and address.
 - 2) TT-P-1952F reference.
 - 3) Classification Type.
 - 4) Color.
- B. Storage And Handling Requirements:
1. Follow Manufacturer's storage and handling requirements.

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2. Protect stored material from freezing at temperatures above 35 deg F or above 115 deg F.
3. Do not invert or roll containers.

1.06 FIELD CONDITIONS

A. Ambient Conditions:

1. Acrylic Paint:
 - a. Apply only on dry clean surfaces, during favorable weather (not excessively windy, dusty, or foggy), and when damage by rain, fog, or condensation not anticipated.
 - b. Paving surface and Ambient temperature shall be minimum 50 deg F and rising.
 - c. Temperature shall not drop below 50 deg F within twenty-four (24) hour period following application.
 - d. Acetone based paints that are one hundred (100) percent acrylic shall not drop below 32 deg F within twenty-four (24) hour period following application.

PART 2 PRODUCTS

2.01 MATERIAL

A. Acrylic Paint:

1. Description:
 - a. Low VOC, ready-mixed, one- component, acrylic waterborne traffic marking paint suitable for application on concrete, asphalt, sealers, and previously painted areas of these surfaces.
2. Design Criteria:
 - a. General:
 - 1) Traffic Paint.
 - 2) Non-volatile portion of vehicle for all classification types shall be composed of one hundred (100) percent acrylic.
 - 3) Meet FED TT-P-1952F specification requirements.
 - 4) Fast drying when applied at ambient conditions requirement.
 - 5) Low VOC.
 - 6) Non-Reflectorized.
 - 7) Traffic paints not intended for use as floor paints. Do not use on pedestrian walkways or large surfaces such as ramps, floors and stairs which may become slippery when wet.
 - b. Classification:
 - 1) Type I for use under normal conditions.
 - 2) Type II for use under adverse conditions.
 - 3) Type III for increased durability.
 - c. Composition:
 - 1) Non-volatile portion for all types shall be composed of one hundred (100) percent acrylic polymer as determined by infrared spectral analysis.
 - 2) Prohibited material:
 - (a) Product does not contain mercury, lead, hexavalent chromium, toluene, chlorinated solvents, hydrolysable chlorine derivatives, ethylene-based glycol ethers and their acetates, nor any carcinogen.
 - d. Qualitative Requirements:
 - 1) Meet FED TT-P-1952F requirements for:
 - (a) Abrasion resistance.
 - (b) Accelerated package stability.
 - (c) Accelerated weathering.
 - (d) Appearance.
 - (e) Color requirements:
 - (f) Color Match (all colors except white and yellow).
 - (g) Daylight directional reflectance.
 - (h) Yellow color match.

- (i) Condition in container.
- (j) Dry-through (early washout) for Type II only.
- (k) Flexibility.
- (l) Freeze/thaw stability.
- (m) Heat-shear stability.
- (n) Scrub resistance.
- (o) Skinning.
- (p) Titanium dioxide content.
- (q) Water resistance.
- e. Quantitative requirements:
 - 1) Meet FED TT-P-1952F requirements (Table 1).
 - 2) Acetone based paints that are one hundred (100) percent acrylic and have exempt status under Federal law are exempt from meeting FED TT-P-1925F requirements.
- 3. Colors:
 - a. General:
 - 1) Architect will select colors.
 - 2) Traffic Paint will be furnished in white and any Federal Standard 595 color in accordance to FED-STD-595C:
 - (a) Blue: 35180.
 - b. 4" White Paint on 6" Black Paint:
 - 1) Parking space markings.
 - c. Blue And White:
 - 1) In parking spaces specifically designated as reserved for disabled.
- 4. Type Two Acceptable Products:
 - a. Any product meeting design criteria of this specification as approved by Architect/Owner's Representative before application. See Section 01 6200.

PART 3 EXECUTION

3.01 PREPARATION

- A. Acrylic Paint:
 - 1. Asphalt Surfaces:
 - a. Do not apply paint until asphalt has cooled.
 - b. Allow new seal coated surfaces to cure for at least twenty-four (24) hours before applying paint.
 - 2. Concrete Surfaces:
 - a. Do not apply paint to new concrete surfaces until concrete has cured seven (7) days minimum.
- B. Surfaces shall be dry and free of grease and loose dirt particles.
 - 1. Scrape and wire brush chipped, peeling, or damaged paint on existing curbs.
- C. Perform layout with chalk or lumber crayon only.

3.02 APPLICATION

- A. General:
 - 1. Mix in accordance and apply as per Manufacturer's instructions.
 - 2. Apply at locations and to dimensions and spacing as shown on Contract Drawings.
- B. Tolerances:
 - 1. General: Make lines parallel, evenly spaced, and with sharply defined edges.
 - 2. Line Widths:
 - a. Plus or minus 1/4 inch variance on straight segments.
 - b. Plus or minus 1/2 inch variance on curved alignments.
- C. Coverage:

- 1. Paint stripes added to new asphalt and concrete surfaces:
 - a. Apply single coat.
- 2. Apply traffic paint at rate of 13 to 15 mils minimum wet thickness, 8 to 9 mils dry thickness. Application at more than 15 mils may result in extended dry times and may cause lifting or cracking on some asphalt surfaces.

3.03 FIELD QUALITY CONTROL

- A. Non-Conforming Work:
 - 1. Replace or correct defective material not conforming to requirements of this specification or any work performed that is of inferior quality at no cost to Owner.

3.04 CLEANING

- A. General:
 - 1. Remove drips, overspray, improper markings, and paint material tracked by traffic by sand blasting, wire brushing, or other method approved by Architect/Owner's Representative before performance.
- B. Waste Management:
 - 1. Remove debris resulting from work of this Section. Dispose of or recycle all trash and excess material in manner conforming to current EPA regulations and local laws.

END OF SECTION

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**SECTION 32 8423
UNDERGROUND SPRINKLERS - NO CONTROLLERS**

1.PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Furnish and install landscape irrigation system as described in Contract Documents complete with accessories necessary for proper function.

1.02 RELATED REQUIREMENTS

- A. Section 01 4000 - Quality Requirements
- B. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables.
- C. Section 26 0533.13 - Conduit for Electrical Systems.
- D. Section 31 2316 - Excavation and Trenching: Excavating for irrigation piping.
- E. Section 31 2323 - Fill and Aggregate Base: Backfilling for irrigation piping.
- F. Section 32: 8466: Underground Sprinklers: Controllers.
- G. Section 32 9001: 'Common Planting Requirements' for pre-installation conference held jointly with other common planting related sections.
- H. Section 32 9120: 'Topsoil And Placement' for topsoil evaluation and placement required for topsoil grading.
- I. Section 32 9122: 'Topsoil Grading' for preparation of topsoil and addition of amendments prior to landscaping.
- J. Section 32 9223: 'Sodding'.
- K. Section 32 9300: 'Plants'.
- L. Section 33 1416 - Site Water Utility Distribution Piping.

1.03 REFERENCE STANDARDS

- A. ASTM D2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series) 2015.
- B. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems 2020.
- C. ASTM F656 Standard Specification for Primers for Use in Solvent Cement Joints of Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.

1.04 DEFINITIONS

- A. Certified Water Audit: Irrigation system audit performed by Certified Landscape Irrigation Auditor (CLIA) as defined by Irrigation Association (<https://www.irrigation.org/>). Include water audit if required by AHJ, if installing in a high wind area, or if installing in high water cost area. Remove all references if not required.
- B. High Wind Area: Area with average sustained wind speed of over 7.5 mph (12 km/hr).
- C. Landscape Management Plan (LMP): See Section 32 9001 for definition and format.

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- D. Lateral Line: Downstream from automatic control valves to application devices, heads, and emitters. Piping or tubing is under pressure during flow. In areas where potable or secondary water are used, line shall be white. In areas where non-potable or reclaimed water are used, line shall be purple.
- E. Main Line: Downstream from point of connection to automatic control valves. Piping is under water-distribution-system pressure when activated by master valve or hydrometer. In areas where potable or secondary water are used, line shall be white. In areas where non-potable or reclaimed water are used, line shall be purple.
- F. Plant Establishment Period: See Section 32 9001 for definition.
- G. Point of Connection: Location where water enters irrigation system.
- H. Post-Plant Establishment Period: Time following Plant Establishment Period.
- I. Source Pressure Test: Test to determine water source pressure.
- J. Static Water Pressure: Pressure at point of connection when system is not in operation.
- K. System Pressure Test: Test to evaluate system pressure when pressurized.
- L. Two Wire Path: See Section 32 8466 for definition.
- M. Working Pressure: Pressure at point of connection when system is in operation.

1.05 ADMINISTRATIVE REQUIREMENTS

- A. Only specify materials approved by the AHJ.
- B. Coordination: Coordinate work with other Sections.
- C. Provide sufficient notice to the Landscape Architect and all other pertinent parties to participate in the following tasks.
 - 1. Preinstallation Meeting: Convene seven days minimum prior to commencing work of this section.
 - a. Prior to irrigation system installation review mockups, testing, inspection, certification, and submittal requirements.
 - 2. System Pressure Test: Provide two days notification prior to commencing.
 - 3. Inspections: Provide seven days notification prior to commencing.
 - 4. Substantial Completion: Provide seven days notification prior to commencing.
 - 5. Final Acceptance: Provide seven days notification prior to commencing.
 - 6. Perform Winter Shut-Down and Spring Start-Up per Part 3: Provide notification upon completion.
- D. Sequencing:
 - 1. Install sleeves and conduit before installation of cast-in-place concrete site elements and paving.

1.06 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures. Submittals may be included in more than one submittal group listed below.
- B. Submittals for Review
 - 1. Do not commence work or deliver products to site until Landcape Architect approves submittals for review.
 - 2. Product Data:
 - a. Provide manufacturer's cut sheets for each system element.
 - 3. Pressure tests:
 - a. Prior to main line burial, document pressure test results as follows:

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- 1) Take photos.
 - 2) Write description including but not limited to:
 - (a) Start time,
 - (b) Completion time,
 - (c) Processes used,
 - (d) Issues encountered
 - (e) Methods of resolving issues.
- C. Submittals for Information (Coordinate with Sections 32 8466 and 32 9000):
- 1. Irrigation System Approval:
 - a. When irrigation system is approved, Landscape Architect will provide signed acknowledgement:
 - 1) Include name and signature of Landscape Architect, Landscape Architect's company, Landscape Architect's telephone number, and date of review.
 - 2) State to best of Landscape Architect's knowledge that the system is in full compliance with Contract Documents.
 - 2. Establishment Period Acknowledgement (See LMP):
 - a. Landscape Architect will provide acknowledgment of Establishment Period commencement:
 - 1) Include name and signature of Installer, Installer's company, Installer's telephone number, and date.
 - 2) Include name and signature of Owner's Representative, Owner's Representative Group name, Owner's Representative Group telephone number, and date.
 - 3) Include date when Establishment Period begins and that it extends one (1) year from that time.
 - 3. Training Acknowledgement (See LMP):
 - a. Landscape Architect will provide acknowledgement that training has been performed:
 - 1) Include name and signature of Installer, Installer's company, Installer's telephone number, and date.
 - 2) Include name and signature of Owner's Representative, Owner's Representative Group name, Owner's Representative Group telephone number, and date.
 - 3) Acknowledge Owner's Representative has been trained in operation and maintenance of system.
 - 4. Certified Water Audit - If required by AHJ.
 - a. Irrigation system zone by zone evaluation of:
 - 1) Distribution uniformity.
 - 2) Zone precipitation rates.
 - 3) Recommended run times during hottest time of year.
 - 4) Recommended system modifications.
- D. Submittals for Project Closeout
- 1. Operation and Maintenance Data (Digital Format Only):
 - a. Contractor's directions for system operation and maintenance:
 - 1) Winter start-up and spring shut-down,
 - 2) Seasonal modifications,
 - b. Manufacturer's printed literature for operating and maintaining elements of system.
 - 1) Manufacturer's parts catalog.

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- 2) Manufacturer's printed literature for operating and maintaining elements of system.
- c. Contractor's recommended run times for each valve. Combine directives from Certified Water Audit (if pertinent) and directives as found in Section 32 8466.
- d. Sytem Pressure Test Report(s)
- 2. Record Documentation:
 - a. Irrigation Drawings: Record actual locations of all concealed components. As installation occurs prepare accurate record drawings:
 - 1) Detail and dimension changes made during construction.
 - 2) Field dimension locations from permanent above grade surfaces or edges to valve boxes, manual drains, quick coupler valves, and control wire runs not in main line ditch. Field dimension to both ends of sleeves.
 - 3) Laminated
 - (a) 11 x 17 inches (275 x 425 mm).
 - (b) Show color keyed zones.
 - (c) Mount on 12 x 18 inch (300 x 450 mm) hard board drilled with two (2) 1/2 inch (13 mm) holes at top of board.
 - (d) Hang on hooks in Custodial Room or location designated by Owner's Representative.
 - 4) Un-Laminated to be included in Landscape Management Plan (LMP):
 - (a) 11 x 17 inches (275 x 425 mm).
 - (b) Show color keyed zones.
 - b. Photographs: Prior to burial take photographs of key elements including but not limited to:
 - 1) Valves
 - 2) Drains
 - 3) Hydrometer
- 3. System warranty. One year minimum.
- 4. Landscape Management Plan.
 - a. Irrigation Section. Include the following:
 - 1) Operation and Maintenance Data.
 - 2) Record Documentation including Irrigation Drawings and Photographs.
 - 3) System warranty
 - 4) Establishment Period Acknowledgement
 - 5) Training acknowledgment
 - 6) Certified Water Audit.
- E. Maintenance Material Submittals: Provide the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. One (1) heavy-duty key for stop and waste or main shut-off valve.
 - 3. One (1) quick coupler key with brass hose swivel.
- F. Final payment will not be made until all submittals are received and reviewed by the Architect and Landscape Architect

1.07 QUALITY ASSURANCE

- A. Work and materials shall comply with AHJ requirements. Nothing within contract documents should be construed to permit work not conforming to applicable codes and requirements.

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- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- C. Installer Qualifications:
 - 1. Irrigation Subcontractor
 - a. Company specializing in performing work of this section.
 - b. Minimum five (5) years experience in irrigation sprinkler installations.
 - c. Minimum five (5) satisfactorily completed irrigation sprinkler installations in past three (3) years of projects similar in size, scope, and complexity required for this project before bidding.
 - d. Use trained personnel familiar with required irrigation sprinkler procedures and with Contract Documents.
 - e. Foreman or supervisor required to attend pre-installation conference.
 - 2. Irrigation Installer
 - a. Perform installation under direction of foreman or supervisor.
 - b. Minimum three (3) years experience in irrigation sprinkler installations similar in size, scope, and complexity.
 - 3. Submit documentation upon request.
- D. Mockups:
 - 1. Provide mockups of each valve box detail at staging area.
 - 2. Mockups may be assembled without solvent weld cement so components can be used in the field.
- E. Certified Water Audit - If required by AHJ.
 - 1. Performed by Certified Water Auditor

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Storage and Handling Requirements:
 - 1. Protect materials from damage and prolonged exposure to sunlight.

1.09 WARRANTY

- A. In addition to standard one (1) year guarantee, warranty shall include:
 - 1. Filling and repairing depressions and replacing plantings due to settlement of irrigation system trenches.
 - 2. Repairing equipment and pipe not properly winterized.
 - 3. Make sure WeatherTRAK system is operational.

2.PART 2 PRODUCTS

2.01 SYSTEM

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. 3M, Austin, TX www.3m.com/elpd.
 - b. Action Machining Inc, Bountiful, UT www.actionfilters.com.
 - c. Amiad www.amiadusa.com.
 - d. Carson by Oldcastle Enclosure Solutions, Auburn, WA www.oldcastleenclosures.com.
 - e. GPH Irrigation Products, Fontana, CA www.gphirrigation.com.
 - f. Harrington Corporation (Harco), Lynchburg, VA www.harcofittings.com.

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- g. Hunter Industries, San Marcos, CA www.hunterindustries.com.
- h. IPS Corporation, Compton, CA www.ipscorp.com.
- i. Leemco, Colton, CA www.leemco.com.
- j. Matco-Norca, Inc. Brewster, NY www.matco-norca.com
- k. Mueller Company, Atlanta, GA www.muellercompany.com
- l. Netafim, Inc. www.netafimusa.com.
- m. Nibco Inc, Elkhart, IN www.nibco.com.
- n. Northstar Industries, LLC, Riverside, CA www.suresplice.com.
- o. Paige Electric, Union, NJ www.paigewire.com.
- p. Rain Bird Sprinkler Manufacturing Corp, Glendora, CA www.rainbird.com.
- q. T. Christy Enterprises, Inc. (Christy's), Anaheim, CA www.tchristy.com.
- r. VAF Filtration Systems, Arvada, CO www.vafusa.com.
- s. Weathermatic Irrigation Products, Garland, TX www.weathermatic.com.
- t. Wilkins a Zurn Company, Paso Robles, CA www.zurn.com.

B. Materials: (Remove materials that do not apply.)

- 1. Rock-Free Soil:
 - a. For use as backfill around PVC pipe.
- 2. Pea Gravel:
 - a. For use around drains, valves, and quick couplers.
 - b. 1/2 inch (13 mm) maximum dimension, washed rock.
- 3. Sand: Fine granular material naturally produced by rock disintegration and free from organic material, mica, loam, clay, and other deleterious substances.
- 4. Native Material: Soil native to project site free of wood and other deleterious materials and rocks over 1-1/2 inches (38 mm).
- 5. Topsoil:
 - a. Use soil as described in Section 32 9120 and Section 32 9122.
 - b. Achieve depths as described in Section 32 9120 and elevations described in Section 32 9122.
- 6. Pipe, Pipe Fittings, And Connections:
 - a. General:
 - 1) Pipe shall be continuously and permanently marked with Manufacturer's name, size, schedule, type, and working pressure.
 - 2) Pipe sizes shown on Contract Drawings are minimum. Larger sizes may be substituted at no additional cost to Owner.
 - b. Piping:
 - 1) Main Line: Schedule 40 PVC.
 - 2) Lateral Lines: Schedule 40 PVC.
 - 3) Backflow Assembly Piping: Galvanized steel upstream of first dielectric union. Brass next to backflow preventer. Galvanized steel downstream of second dielectric union.
 - 4) Quick Coupler Piping: Galvanized steel.
 - c. Fittings: Same material as pipe, except where otherwise detailed.
 - 1) Fittings 3 inch (76 mm) or larger: Harco or Leemco of matching size.
 - 2) Use dielectric union fittings between dissimilar metal pipes and fittings.
 - d. Sleeves:

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- 1) Under Parking Area And Driveway Paving: Schedule 40 PVC Pipe.
 - 2) All Other: Class 200 PVC Pipe.
 - 3) Sleeve diameter shall be two (2) times larger than pipe installed in sleeve.
7. Sprinkler Heads:
- a. Each type of head shall be product of single manufacturer.
 - b. Spray Heads in Lawn Areas:
 - 1) Rain Bird: 1800 PRS Series (4" and 6") RD 1800 Series (4" and 6") with MPR, U-Series, or HE-VAN nozzles. SAM optional.
 - c. Spray Heads (Field Manufactured Assemblies):
 - 1) Three (3) schedule 40 street ells or Marlex street ells connected to lateral tee to form an adjustable riser or pop-up riser as detailed.
 - 2) Risers for sprinkler heads 14 inches (355 mm) long minimum and 24 inches (610 mm) maximum.
 - (a) Hunter: FLEXsg tubing with HSBE spiral barbed fittings.
 - (b) Hydro-Rain: Blu-lock Swing pipe & fittings.
 - (c) Rain Bird: Swing Pipe with barbed fittings.
 - (d) Toro: Super Funny Pipe with barbed fittings, SPFA-5125, SPFA-51275.
8. Control Wiring: Traditional control wire shall be UF-UL listed, color coded PE insulated copper conductor direct burial size 14. For wire runs exceeding 3,300 feet (1 005.84 meter), use 12 AWG wire. Do not use green color-coded wire.
- (1) Aside from connectivity to automatic control valves, this material will be used to connect to master valve portion of hydrometer.
 - (2) Communication:
 - (3) Communication wire between controller and flow sensor portion of hydrometer to be Paige Electric PE-393. Run underground communication wire in gray electrical conduit:
 - (4) Class Two Quality Standards. See Section 01 6200:
 - (5) Paige Electric Cadweld Connection.
 - (6) Waterproof Wire Connectors:
 - (7) Control wire connections shall consist of properly-sized wire nut inserted in waterproof grease cap:
 - (8) Type Two Acceptable Products:
 - (9) Valve Box Support:
 - (10) DBY or DBR by 3M.
 - (11) 'One Step' 20111SP by King Innovation.
 - (12) DB 57905, 57505 by Orbit.
 - (13) Equal as approved by Architect before installation. See Section 01 6200.
- 2) Conduit:
- (a) Exterior applications or inside mechanical shed:
 - (1) Galvanized IMC. Where in contact with earth or concrete, wrap galvanized IMC conduit and fittings completely with vinyl tape.
 - (b) In-ground: commercial grade grey conduit.
 - (c) Size conduit as follows:
 - (d) Traditional Wiring:
- b. Valves:

- 1) Manual Drain Valves:
 - (a) Brass ball valve with 'T' handle on main lines and in valve boxes on lateral lines.
 - (b) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (1) Apollo Valves: 78-621-01 Series ball valve, 3/4 inch (19 mm).
 - 2) Isolation Valves:
 - (a) Non-rising stem gate valve, size to match pipe size (use in cold, northern climates-eco-regions 1.0, 5.0, 6.0, 7.0, 9.1, 9.2, and 10.1).
 - (b) Class Two Quality Standards. See Section 01 6200:
 - (1) Nibco: 4660T (warm climates).
 - (2) Nibco: T-113 (cold, northern climates).
 - 3) Backflow Device:
 - (a) Zurn / Wilkens 375B - 1"
 - (b) Stainless Steel Enclosures):
 - 4) Hydrometer:
 - (a) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (1) Netafim:
 - (2) LHM15TG1- MEL (Low Accurate Flow Range – 1.8 GPM),
 - 5) Quick Coupling Valves and Keys:
 - (a) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (1) Rainbird: 33DRC, 33DLRC, 33DK with SH-O swivel.
- c. Valve Accessories:
- 1) Valve Boxes And Extensions:
 - (a) Lid Colors:
 - (1) Green: Lawn areas (potable and secondary water).
 - (2) Tan: Bare soil and rock areas (potable and secondary water).
 - (b) Type Two Acceptable Products:
 - (1) Carson Industries:
 - (2) 12 Inch (300 mm) Model 1419-12.
 - (3) 10 Inch (255 mm) Model 0910.
 - (4) Equal as approved by Architect before use. See Section 01 6200.
 - 2) Valve ID tags:
 - (a) Type Two Acceptable Products:
 - (1) Christy's: Stamped ID tag: 2.25"x2.7" yellow plastic tag with alpha-numeric labeling matching zone. Contact Christy's for local supplier.
 - (2) Equal as approved by Architect before use. See Section 01 6200.
 - 3) Valve Box Supports:
 - (a) CMU blocks.
 - (b) Standard size 6 inch x 8 inch x 16 inch (150 mm x 200 mm x 400 mm)
- d. Drip System:
- 1) Drip Valve Assembly (Coordinate zone size with hydrometer limits):
 - (a) Category Four Approved Products. See Section 01 6200 for definitions of Categories:

- (1) Rainbird:
- (2) Over 15 GPM: XCZ-150-PRB-COM series (15-40 gpm). Does not include ball valve. Automatic valve will operate in some dirty water conditions.
- (3) Over 0.3 GPM and below 20 GPM: XCZ-100-B COM series (0.3-20 gpm).
- 2) Distribution Tubing (from lateral lines to emitter):
 - (a) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (1) GPH: GPST IH Series, pre-assembled flexible riser w/fittings (size as required).
 - (2) Salco: IH Series, pre-assembled flexible riser with fittings (size as required).
 - (3) Rainbird: SPX swing pipe with barbed fittings.
- 3) Drip Emitters:
 - (a) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (1) GPH: GPST-CV Series (2, 4, 6, 8, 10 gph emitters).
 - (2) Salco: PST-CV Series (2, 4 gph emitters).
- 4) Indicator Emitter:
 - (a) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (1) Tree drip indicator:
 - (2) Rainbird: XB-10PC with barbed fittings, DBC-025 diffuser cap, TS-025 stake, and XQ 1/4 inch (6.4 mm) tubing.
- 5) Distribution Tubing (from lateral lines to in-line emitter tubing).
 - (a) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (1) Flexible polyethylene pipe.
- 6) In-Line Emitter Tubing:
 - (a) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (1) Hunter: PLD Series air/vacuum relief valves, barb shut-off valves, and 17 mm barbed fittings.
 - (2) Rainbird: XFCV or XFS drip line, 1/2 inch (12.7 mm) air relief valves, flush valves, and XF series insert fittings.
 - (3) Netafim: Techline CV tubing, flush valves, and fittings.
- 7) Valve Boxes and Extensions:
 - (a) Lid Colors:
 - (1) Green: Lawn areas (potable and secondary water).
 - (2) Tan: Bare soil and rock areas (potable and secondary water).
 - (3) Purple: Reclaimed water.
 - (b) Type Two Acceptable Products:
 - (1) Carson Industries.
 - (2) 15 inch (380 mm) Model 1320-15 Super Jumbo.
 - (3) 12 Inch (300 mm) Model 1220-12 Jumbo.
 - (4) 12 Inch (300 mm) Model 1419-12.
 - (5) 10 Inch (255 mm) Model 0910.

- (6) Equal as approved by Architect before use. See Section 01 6200.
- 8) Valve ID Tags:
 - (a) Type Two Acceptable Products:
 - (1) Christy's: Stamped ID tag: 2.25"x2.7" yellow plastic tag with alpha-numeric labeling matching zone. Contact Christy's for local supplier.
 - (2) Equal as approved by Architect before use. See Section 01 6200.
- 9) Valve Box Supports:
 - (a) Standard size fired clay paving bricks without holes.
 - (b) Standard size 6 inch x 8 inch x 16 inch (150 mm x 200 mm x 400 mm) CMU Block.
- e. Solvent Cement:
 - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (a) Primer:
 - (1) Meet ASTM F656 standard and applicable sections of latest edition of *'Uniform Plumbing Code'*.
 - (2) Meet NSF/ANSI standard for use on potable water applications.
 - (3) Low VOC emissions and compliant with LEED.
 - (4) Product: Weld-On P-70 primer by IPS.
 - (b) PVC Solvent Cement:
 - (1) Heavy bodied, medium setting, high strength:
 - (2) Meet ASTM D2564 standard and applicable sections of latest edition of *'Uniform Plumbing Code'*.
 - (3) Meet NSF/ANSI standard for use on potable water applications.
 - (4) Meet CSA standards for use in pressure and non-pressure potable water applications.
 - (5) Low VOC emissions and compliant with LEED.
 - (6) Product: Weld-On 711 Low VOC PVC Cement by IPS.
 - (7) Flexible, medium bodied, fast setting, high strength (flexible pipe only):
 - (8) Meet ASTM D2564 standard and applicable sections of latest edition of *'Uniform Plumbing Code'*.
 - (9) Meet NSF/ANSI standard for use on potable water applications.
 - (10) Low VOC emissions and compliant with LEED.
 - (11) Product: Weld-On 795 Low VOC Flex PVC Cement by IPS.
 - (12) Other Components:
 - 2) Recommended by Manufacturer and subject to Architect's review and approval before installation.
 - 3) Provide components necessary to complete system and make operational.

EXECUTION

A. INSTALLERS

- 1. Acceptable Installers:
 - a. Meet Quality Assurance Installer Qualifications as specified in Part 1 of this specification.

B. EXAMINATION

- 1. Verification Of Conditions:
 - a. Perform source pressure test at stub-out on main water line provided for irrigation system, or at near-by fire hydrant.

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- b. Notify Architect if pressures over 80 psi (480 kPA) or under 65 psi (379 kPA) are found to determine if some re-design of system is necessary before beginning work on system.
- C. PREPARATION
 - 1. Protection:
 - a. Protection Of In-Place Conditions:
 - 1) Repair or replace work damaged during course of Work at no additional cost to Owner. If damaged work is new, installer of original work shall perform repair or replacement.
 - 2. Surface Preparation:
 - a. Layout of Irrigation Heads:
 - 1) Location of heads and piping shown on Contract Drawings is approximate. Actual placement may vary slightly as is required to achieve full, even coverage without spraying onto buildings, sidewalks, fences, etc.
 - 2) During layout, consult with Architect to verify proper placement and make recommendations, where revisions are advisable.
 - 3) Minor adjustments in system layout will be permitted to avoid existing fixed obstructions.
 - 4) Make certain changes from Contract Documents are shown on Record Drawings.
- D. INSTALLATION
 - 1. Trenching And Backfilling:
 - a. Pulling of pipe is not permitted.
 - b. Excavate trenches to specified depth. Remove rocks larger than 1-1/2 inch (38 mm) in any direction from bottom of trench. Separate out rocks larger than 1-1/2 inch (38 mm) in any direction uncovered in trenching operation from excavated material and remove from areas to receive landscaping.
 - c. Cover pipe both top and sides with 2 inches (50 mm) of rock-free soil or sand as specified under PART 2 PRODUCTS. Remainder of backfill to topsoil depth as specified in Section 32 9122 using native material as specified under PART 2 PRODUCTS and topsoil as specified in Section 32 9120, Section 32 9121 and Section 32 9122.
 - d. Do not cover pressure main, irrigation pipe, or fittings until Architect has inspected and approved system.
 - 2. Sleeving:
 - a. Sleeve water lines and control wires under walks and paving. Extend sleeves 6 inches (150 mm) minimum beyond walk or pavement edge. Cover sleeve ends until pipes and wires are installed to keep sleeve clean and free of dirt and debris.
 - b. Position sleeves with respect to buildings and other obstructions so pipe can be easily removed.
 - 3. Grades And Draining:
 - a. System is designed to be blown out with compressed air:
 - 1) Provide and install quick-coupling valve or valves in location for easy blowout of entire system. Install quick coupler valves with 2 lineal feet (0.60 m) minimum of galvanized pipe between valve and main line.
 - 4. Installation of Pipe:
 - a. Install pipe in manner to provide for expansion and contraction as recommended by Manufacturer.

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- b. Unless otherwise indicated on Contract Drawings, install main lines with minimum cover of 18 inches (450 mm) based on finished grade. Install lateral lines, including those connecting drip tubing, with minimum of 12 inches (300 mm) of cover based on finish grade.
 - c. Install pipe and wires under driveways or parking areas in specified sleeves 18 inches (450 mm) below finish grade or as shown on Contract Drawings.
 - d. Locate pipe so no sprinkler head will be closer than 12 inches (300 mm) from building foundation.
 - e. Cut plastic pipe square. Remove burrs at cut ends before installation so unobstructed flow will result.
 - f. Make solvent weld joints as follows:
 - 1) Do not make solvent weld joints if ambient temperature is below 35 deg F (2 deg C).
 - 2) Clean mating pipe and fitting with clean, dry cloth and apply one (1) coat of primer to each surface.
 - 3) Apply uniform coat of solvent cement to outside of pipe.
 - 4) Apply solvent cement to fitting in similar manner.
 - 5) Insert pipe completely into fitting.
 - 6) Give pipe or fitting quarter turn to insure even distribution of solvent and make sure pipe is inserted to full depth of fitting socket.
 - 7) Allow joints to set at least twenty-four (24) hours before applying pressure to PVC pipe.
 - g. Tape threaded connections with teflon tape.
 - h. Isolation Valves:
 - 1) Install as detailed and per Manufacturers recommendations.
 - i. If pipe is larger than 3 inches (75 mm), install joint restraints wherever change of direction occurs on PVC main lines.
5. Control Valves And Control Valve Wiring:
- a. Install valves in plastic boxes with reinforced heavy-duty plastic covers. Locate valve boxes within 12 inches (300 mm) to 24 inches (600 mm) of sidewalks and shrub bed edges with tops at finish grade. Do not install more than one (1) valve in single box.
 - b. Install equipment for ease of removal.
 - c. Place 3 inches (75 mm) minimum of pea gravel below bricks supporting valve boxes to drain box. Set valve boxes over valve so all parts of valve can be reached for service. Set cover of valve box even with finish grade. Valve box cavity shall be reasonably free from dirt and debris.
 - d. Wiring:
 - 1) For traditional wiring, tape control wire to side of main line every 10 feet (3.050 m). Where control wire leaves main or lateral line, enclose it in gray conduit.
 - 2) Use waterproof wire connectors consisting of properly-sized wire nut and grease cap at splices and locate all splices within valve boxes.
 - 3) Use white or gray color for common wire and other colors for all other wire. Each common wire may serve only one (1) controller.
 - 4) Run one (1) spare control wire from panel continuously from valve to valve throughout system similar to common wire for use as replacement if wire fails:
 - (a) Run spare wire to each branch of system.
 - (b) Spare wire shall be different color than other wires. Use of green wire is not acceptable.

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- (c) Mark spare control wire visibly within valve box as an 'Un-Connected Wire'. Extend spare control wires 24 inches (600 mm) and leave coiled in each valve box. Mark spare wire visibly within controller as 'Un-Connected Wire'.
6. Hydrometer:
 - a. Install as detailed on drawings and as per manufacturer's recommendations.
 - b. If installed on secondary system, install downstream of filter.
 - c. Connect communication cables to smart controller. Run cables within conduit per specification.
 7. Sprinkler Headss:
 - a. Set sprinkler heads and quick-coupling valves perpendicular to finish grade.
 - b. Do not install sprinklers using side inlets. Install using base inlets only.
 - c. Heads immediately adjacent to mow strips, walks, or curbs shall be one inch (25 mm) below top of mow strip, walk, or curb and have one inch (25 mm) to 3 inch (75 mm) clearance between head and mow strip, walk, or curb.
 - d. Set sprinkler heads at consistent distance from walks, curbs, and other paved areas and to grade by using specified components or other method demonstrated in Pre-Construction Conference.
 8. Drip Assembly:
 - a. Install pipe providing for expansion and contraction as recommended by Manufacturer.
 - b. Cut tubing square and remove burrs at cut ends.
 - c. Distribution tubing shall be between 14 inches (350 mm) minimum and 48 inches (1 200 mm) maximum long. Layout PVC lateral lines as necessary to keep distribution tubing lengths within specified tolerances.
 - d. Locate drip emitter on uphill side of plant within rootball zone.
 - e. Layout in-line tubing for trees as indicated on Contract Drawings. Layout in-line tubing for shrubs and groundcovers so plants receive water within rootball zones.
 - f. Locate in-line tubing on top of soil but under bark mulch and weed barrier fabric.
 - g. Staple in-line tubing to ground at 6 foot (1 800 mm) maximum intervals and within 12 inches (300 mm) of ends and intersections.
 - h. Assembly Using Solvent Weld Joints:
 - 1) Do not make solvent weld joint if ambient temperature is below 35 deg F (2 deg C).
 - 2) Clean mating pipe and fitting with clean, dry cloth.
 - 3) Apply uniform coat of PVC solvent cement to outside of pipe and inside socket of fitting.
 - 4) Insert pipe completely into fitting.
 - 5) Give pipe or fitting quarter turn to insure even distribution of solvent and make sure pipe is inserted to full depth of fitting socket.
 - 6) Allow joints to set twenty-four (24) hours minimum before applying pressure to pipe.
 - i. Assembly Using 'Funny Pipe' Type Joints:
 - 1) Connect distribution tubing to lateral line using barbed ell fitting.
 - 2) Connect fitting to distribution tubing using straight barbed fitting with 1/2 inch (13 mm) threaded end.
 9. Arrange valve stations to operate in an easy-to-view progressive sequence around building. Tag valves with waterproof labels showing final sequence station assignments.
- E. FIELD QUALITY CONTROL
1. Field Tests and Inspections:

- a. Irrigation System:
 - 1) System Pressure Test:
 - (a) Notify Landscape Architect two (2) working days minimum before conducting test.
 - (b) In presence of Landscape Architect, pressure test main line with all valves installed.
 - (c) Test pressure at 100 psi (690 kPA) minimum for two (2) hours minimum.
 - (d) Verify there are no leaks.
 - (e) Receive Landscape Architect approval to proceed prior to backfilling.
 - 2) Test report:
 - (a) Following pressure test, create pressure test report. Document pressure test results through providing photos, listing processes used, issues encountered, and measures taken to correct problems.
 - 3) Certified Water Audit:
 - (a) Certified Water Audit for complete system to determine zone precipitation rates and efficiency.
 - (b) Provide to Landscape Architect in clear and concise report.
 - (c) Use to develop watering schedule.
- b. Substantial Completion Walkthrough:
 - 1) Landscape Architect or designated representative(s) will inspect site and create list of non-conforming items to be resolved prior to Landscape Final Acceptance. Date on this list will act as date of Landscape Substantial Completion.
 - 2) Installations completed after water source has been turned off for season, as determined by Landscape Architect, will be inspected following spring after system can be checked for proper operation.
- c. Irrigation Approval:
 - 1) Irrigation will be approved when Certified Water Audit has been performed and all non-conforming work is brought into conformance with Landscape Architect's and Certified Water Audit's directives.
- 2. Non-Conforming Work: Non-conforming work as covered in General Conditions applies, but is not limited to following:
 - a. Underground Sprinkler System:
 - 1) Correct any work found defective or not complying with Contract Document requirements at no additional cost to Owner.

F. ADJUSTING

- 1. Sprinkler Heads:
 - a. Adjust sprinkler heads to proper grade when turf is sufficiently established to allow walking on it without appreciable harm. Such lowering and raising of sprinkler heads shall be part of original contract with no additional cost to Owner.
 - b. Adjust sprinkler heads for proper distribution and trim so spray does not fall on building.
- 2. Watering Time:
 - a. Adjust watering time of valves to provide proper amounts of water to plants.

G. CLOSEOUT ACTIVITIES

- 1. Training:
 - a. After system is installed and approved, instruct Owner's designated personnel in complete operation and maintenance procedures using Landscape Management Plan (LMP).

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- 1) Describe difference between plant establishment schedule and long-term maintenance schedule.
- 2) Describe annual and regular filter maintenance.
2. Winterization and Spring Start-Up:
 - a. During first year of operation, Installer shall shut-down irrigation system prior to freezing temperatures and re-start irrigation system at beginning of growing season:
 - 1) Winter Shut-Down is intended to remove all potentially damaging water from irrigation system. Perform following as well as any other efforts necessary to properly winterize system:
 - (a) Turn off water source at point of connection.
 - (b) Blow out system with pressurized air, turning on each valve until water is cleared out of system. Run through system twice. Only blow out components suitable to receive pressurized air. Hydrometers, for instance, should not be blown out. Do not use excessive air pressure that will damage pipes and parts.
 - (c) Turn controller off.
 - (d) Open all manual drain valves.
 - (e) Drain, wrap, protect, or remove any backflow device exposed to freezing temperatures using manufacturer's recommendations and best practices. Coordinate method with Owner's Representative.
 - (f) Drain and remove pumps for Owner's Representative storage.
 - (g) Drain filters using manufacturer's recommendations.
 - (h) Check sprinkler heads to make sure they are below sidewalk and curb levels and not vulnerable to snowplow damage. Lower heads to proper elevation.
 - (i) Notify Owner's Representative when system has been turned off.
 - 2) Spring start-up shall include following:
 - (a) Close all manual valves.
 - (b) Clean pump filters and replace if necessary.
 - (c) Remove freeze protection as required.
 - (d) Turn on water source at point of connection.
 - (e) Verify that controller(s) and rain sensor are properly operating. Change battery in controller(s) and sensor(s) as required.
 - (f) Flush entire system. Run each valve for two (2) minutes to check for damage, leaks, and coverage.
 - (g) Repair and adjust system as needed. Fine tune heads for efficient coverage.
 - (h) Notify Owner's Representative when system has been charged and is in full repair.

END OF SECTION

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**SECTION 32 8466
UNDERGROUND SPRINKLERS - CONTROLLERS**

1.PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Furnish and install irrigation controllers as described in Contract Documents complete with accessories necessary for proper function.

1.02 RELATED REQUIREMENTS:

- A. Section 01 4000: 'Quality Requirements'.
- B. Section 32: 8423: 'Underground Sprinklers'.
- C. Section 32: 9001: 'Common Planting Requirements'.
- D. Division 26: Power to controller.

1.03 DEFINITIONS

- A. Landscape Management Plan (LMP): See Section 32 9001 for definition.
- B. Plant Establishment Period: See Section 32 9001 for definition.
- C. Smart Controller: Irrigation clocks that automatically adjust irrigation run times in response to environmental changes using sensors and weather information to manage watering times and frequency.
- D. Two Wire Path: Conducts power to solenoid valves and also conducts communication signals from Controller to each device on system.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate work with other sections.
- B. Pre-Installation Conference:
 - 1. Participate in pre-installation conference as specified in Section 32 8423 and Section 32 9000:
 - a. In addition to agenda items specified in those Sections, review following:
 - 1) Submittal requirements.
 - 2) For projects with smart controllers, review 'Smart Controller Installation Checklist' which can be accessed on the AEC website here: https://aec.churchofjesuschrist.org/aec/design_guidelines/
 - 3) Training Acknowledgement requirements for operation of smart controller.
 - 4) Review Tests and Reports for smart controllers.

1.05 SUBMITTALS

- A. See Section 01 3000-Administrative Requirements, for submittal procedures. Submittals may be included in more than one submittal group listed below.
- B. Submittals for Review:
 - 1. Do not commence work or deliver products to site until Landcape Architect approves submittals for review.
 - 2. Product Data:
 - a. Manufacturer's cut sheets for each element of system.
- C. Submittals for Information:
 - 1. Training Acknowledgement:
 - a. Landscape Architect will provide certificate acknowledging training has been performed:
 - 1) Include name and signature of Installer, Installer's company, Installer's telephone number, and date.

- 2) Include name and signature of Owner's Representative, Owner's Representative Group name, Owner's Representative Group telephone number, and date.
 - 3) Acknowledge Owner's Representative has been trained in operation of controller.
2. Smart Controller Checklist completed by factory approved installer.
 - a. Complete and sign 'Smart Controller Installation Checklist'.
 - 1) Access 'Smart Controller Checklist' through:
 - (a) https://aec.churchofjesuschrist.org/aec/design_guidelines/
 - (b) Go to the Landscape sub-section.
- D. Submittals for Project Closeout:
1. Operations And Maintenance Data (Digital Format Only):
 - a. Contractor's directions for controller operation and maintenance:
 - 1) Winter start-up and spring shut-down,
 - 2) Seasonal activation and shutdown,
 - b. Manufacturer Instructions:
 - 1) Manufacturer's printed literature on operation and maintenance of operating elements of system.
 - c. Contractor's recommended run times for each valve. Include sufficient time for plants to thrive during the following periods:
 - 1) Plant Establishment period.
 - 2) Post-Plant Establishment period.
 - d. Smart Controller Subscription Terms:
 - 1) HydroPoint WeatherTRAK:
 - (a) ET subscription.
 - 2) Rain Master Eagle Plus:
 - (a) Wireless communication fees and internet service for cellular communications.
 - (b) Wireless communication fees and internet service for ethernet /Wi-Fi communications.
 2. Record Documentation:
 - a. Testing and Inspection Reports
 - 1) When pertinent, completed 'Smart Controller Installation Checklist'.
 3. Warranty Documentation
 - a. Smart Controller Warranty
 - 1) Manufacturer's extended Warranty for smart controller.
 - b. Automatic Controller Warranty.
 4. Landscape Management Plan (LMP) In addition to items listed in 32 8423 include the following:
 - a. Controller Operation and Maintenance Data
 - b. Smart controller checklist.
 - c. Controller warranty
 - d. Controller training acknowledgment.
- E. Final payment for system authorized as per Section 32 8423.

1.06 QUALITY ASSURANCE

- A. Regulatory Requirements:
1. General:
 - a. Work and materials shall be in accordance with latest rules and regulations, and other applicable state or local laws.
 - b. Nothing in Contract Documents is to be construed to permit work not conforming to these codes.

B. Qualifications:

1. Smart Controller Installer:
 - a. Manufacture approved certified installers familiar with required irrigation system and smart controller installation procedures:
 - 1) WeatherTRAK: Factory approved installer having completed WeatherTRAK certified contractor training (see www.weathertrak.com for details).
 - 2) Agree to complete reporting documents.
 - 3) Agree to instruct Owner's designated personnel in complete operation and maintenance of smart controller.
 - 4) Agree to assist Landscape Architect in completing Watering Schedule for Landscape Management Plan (LMP).
 2. Controller Installer:
 - a. Irrigation Subcontractor
 - 1) Company specializing in performing work of this section.
 - 2) Minimum five (5) years experience in irrigation sprinkler installations.
 - 3) Minimum five (5) satisfactorily completed irrigation sprinkler installations in past three (3) years of projects similar in size, scope, and complexity required for this project before bidding.
 - 4) Use trained personnel familiar with required irrigation sprinkler procedures and with Contract Documents.
 - 5) Foreman or supervisor required to attend pre-installation conference.
 - b. Irrigation Installer
 - 1) Perform installation under direction of foreman or supervisor.
 - 2) Minimum three (3) years experience in irrigation sprinkler installations similar in size, scope, and complexity.
 3. Submit documentation upon request.
- C. Testing and Inspection.**
1. Owner will provide Certified Water Audit as specified in Section 32 8423:

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Storage And Handling Requirements:**
1. Protect materials from damage and prolonged exposure to sunlight.

1.08 WARRANTY

- A. Warranty:**
1. Smart Controller:
 - a. Provide Manufacturer's extended warranty for five (5) years to be free of design, materials, and workmanship defects.
 2. Automatic Controller:
 - a. Provide Manufacturer's extended warranty for product to be free of design, materials, and workmanship defects for following:
 - 1) Hunter: Standard five (5) year warranty.
 - 2) Rain Bird: Standard three (3) year warranty.

2.PART 2 PRODUCTS**2.01 SYSTEM**

- A. Manufacturers:**
1. HydroPoint Data Systems, Inc., Petaluma, CA www.hydropoint.com.
 2. Rain Bird Sprinkler Manufacturing Corp, Glendora, CA www.rainbird.com.
- B. Approved Distributors:**
1. HydroPoint Data Systems, Inc. (Weather/TRAK) Petaluma, CA www.hydropoint.com.

- a. For CA, AZ, NV, TX, NM, CO, NC, NY, NJ, OR, and WA contact:
 - 1) Charles Zaher (707) 338-7029, czaher@hydropoint.com.
 - b. Utah (and all other states) contact:
 - 1) Sprinkler Supply - West Jordan, UT, Joe Jackson (801) 404-1371 (801) 566-8172 joe@sprinklersupplyco.com.
- C. Smart Controllers:
- 1. Hydropoint WeatherTRAK:
 - a. Traditional Wiring option:
 - 1) Model LC+ (12 station).
 - b. Inspection of system.
 - c. Vandal resistant powder coated steel finish suitable for either indoor or outdoor environments. Provide stainless steel where outdoor conditions require non-corrosive material.
 - d. Wall mounted enclosure assembly.
 - e. Key-Lock.
 - f. Low Profile Antenna.
 - g. Universal Radio remote interface.
 - h. One (1) year ET subscription.
 - i. On-site post-installation controller inspection and start-up by authorized service provider.
 - j. Site consultation (For O&M and R&I projects).
 - k. All other components required for complete and operational system.
- D. Automatic Rain Sensors:
- a. Not Used with Smart WeatherTRAK
- E. Hydrometer: See Section 32 8423 and Irrigation Drawing Legend
- F. Other Components:
- 1. Recommended by Manufacturer and subject to Landscape Architect's review and approval before installation.
 - 2. Provide components necessary to complete system and make operational.

3.PART3 EXECUTION

3.01 PREPARATION

- A. Protection:
- 1. Protection Of In-Place Conditions:
 - a. Repair or replace work damaged during course of Work at no additional cost to Owner. If damaged work is new, installer of original work shall perform repair or replacement.
 - b. Do not cut existing tree roots measuring over 2 inches (50 mm) in diameter in order to install irrigation lines.

3.02 INSTALLATION

- A. Controllers:
- 1. Install as detailed and as per manufacturer's recommendations.
 - 2. In hot climates, install out of sun exposure.
 - 3. Install grounding as per Manufacturer's recommendations:
 - a. Note: if controller is mounted within building, coordinate grounding with Electrical Engineer.
 - 4. Install automatic rain sensor as per Manufacturer's recommendations.
 - 5. Provide sticker with Facility Manager's Contact information inside Controller but in plain view.

- B. Smart Controller:
 1. Fill out 'Smart Controller Installation Checklist' provided in Attachment of this specification during installation of Controller.
 2. Install communication connections as required: Wireless and/or ethernet.

3.03 FIELD QUALITY CONTROL

- A. Field Tests and Inspections:
 1. Verify controllers are fully operational and installed per manufacturer's recommendations.
 2. Smart Controller Testing:
 - a. Use 'Smart Controller Installation Checklist' or 'Manufacturer's Operational Report' to test system to verify following:
 - 1) Verify all aspects of smart controller installation checklist or 'Manufacturer's Operational Report' are complete.
 - 2) Verify controller is installed correctly and will automatically adjust irrigation run times in response to environmental changes using sensor and weather information to manage watering times and frequency.
 - 3) Sign 'Smart Controller Installation Checklist' to be included in Closeout Submittals.
 3. Substantial Completion Walkthrough. See Section 32 8423.
 4. Irrigation Approval. See Section 32 8423.
- B. Non-Conforming Work: Non-conforming work as covered in General Conditions applies, but is not limited to following:
 1. Underground Sprinkler System:
 - a. Correct any work found defective or not complying with Contract Document requirements at no additional cost to Owner.

3.04 ADJUSTING

- A. Watering Time:
 1. Adjust zone watering times to provide proper amounts of water to plants.

3.05 CLOSEOUT ACTIVITIES

- A. Training:
 1. After system is installed and approved, instruct Owner's designated personnel in complete operation and maintenance procedures using Landscape Management Plan (LMP).
 - a. Describe difference between plant establishment schedule and post plant establishment schedule.
- B. Smart Controller Training:
 1. Manufacturer's approved Distributor to instruct Owner's designated personnel in complete operation and maintenance of smart controller.
 2. Manufacturer's approved Distributor to review terms of Warranty, Maintenance procedures and contact information with Owner's Representative.

END OF SECTION

**SECTION 32 9001
COMMON PLANTING REQUIREMENTS**

1.PART 1 GENERAL**1.01 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Common procedures and requirements for landscaping work.
 - 2. Provide maintenance for new landscaping as described in Contract Documents.
- B. Related Requirements:
 - 1. Pre-Installation conferences held jointly with Section 32 9001 as described in Administrative Requirements on Part 1 of this specification section:
 - 2. Section 01 4000: 'Quality Assurance – Qualifications'.
 - 3. Section 31 0500: 'Common Earthwork Requirements'.
 - 4. Section 31 1000: 'Clearing and Grubbing'.
 - 5. Section 31 1413: 'Topsoil Stripping And Stockpiling'.
 - 6. Section 31 2000: 'Grading'.
 - 7. Section 31 2316: 'Excavation'.
 - 8. Section 31 2323: 'Fill'.
 - 9. Section 32 8423: 'Underground Sprinklers'.
 - 10. Section 32 9120: 'Topsoil And Placement'.
 - 11. Section 32 9122: 'Topsoil Grading'.
 - 12. Section 32 9223: 'Sodding'.
 - 13. Section 32 9300: 'Plants'.

1.02 REFERENCES

- A. Definitions:
 - 1. Landscape Management Plan (LMP): LMP is an Owner's Representative's quick reference maintenance document. It combines elements from Irrigation Sections 32 8000 and Planting Sections 32 9000. The LMP document is created from Operations and Maintenance Data, Warranty Documentation, and Record Documentation. This is a digital format only document. Deliver to Church Headquarters for inclusion in "as-built" catalog. Send to mfd-asbuilt@churchofjesuschrist.org. Access sample LMP through Landscape Resources Website located at:
 - a. <https://aec.churchofjesuschrist.org/aec/landscape/>.
 - 2. Landscape Final Acceptance: Inspection, no less than (30) days following substantial completion, when all work has been completed, demonstrated, and approved by the Landscape Architect. Coordinate with 32 8000 and 32 9000 Sections.
 - 3. Plant Establishment Period: Time required for plants to successfully develop root systems into surrounding soil. Following this period, irrigation run times are typically modified. For purposes of this contract, the plant establishment period is one (1) year from date of Substantial Completion.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate work with other Sections.
- B. Pre-Installation Conference:
 - 1. Participate in MANDATORY pre-installation conference and held jointly with following sections:
 - a. Section 32 8423: 'Underground Sprinklers'.
 - b. Section 32 9120: 'Topsoil And Placement'.
 - c. Section 32 9122: 'Topsoil Grading'.
 - d. Section 32 9223: 'Sodding'.
 - e. Section 32 9300: 'Plants'.
 - 2. In addition to agenda items specified in Section 01 3000, review the following:

- a. Site Visits:
 - 1) Landscape Architect to visit site five (5) times during project construction.
 - 2) If site conditions necessitate additional visits, Landscape Architect can schedule addition site visits with approval from Architect.
 - 3) During construction, addition site visits may be approved in writing by Architect or Owner for special considerations before commencement.
 - 4) Site visits caused by lack of work progress by Landscape Subcontractor shall be reimbursed to Landscape Architect by Landscape Subcontractor for the amount determined by Architect and Owner for additional site visits.
- b. Coordination:
 - 1) Landscape Subcontractor and Landscape Architect to coordinate site visits and include Architect and General Contractor in communications.
- c. Landscape Maintenance:
 - 1) Establish responsibility for maintenance of new landscaping during all phases of construction period.
- d. Percolation Test:
 - 1) Discuss percolation test requirements per Section 32 9300.
- e. Review additional agenda items as specified in related sections listed above.
3. Approved Site Visits:
 - a. Site Visit No. 1:
 - 1) Description:
 - (a) Landscape pre-installation Conference.
 - 2) Schedule: Conduct pre-installation conference after completion of Finish Grading specified in Section 31 0500 and (1) week minimum before beginning landscape work.
 - 3) Required Attendees:
 - (a) Project Manager, Facilities Manager, Architect, General Contractor, Landscape Subcontractor, Excavator, and Landscape Architect.
 - (b) Include Landscaping Subcontractor Foreman and those responsible for installation of landscaping to be in attendance.
 - 4) Related Sections:
 - (a) Section 31 0500: 'Common Earthwork Requirements'.
 - (b) Section 32 8423: 'Underground Sprinklers: No Controllers'.
 - (c) Section 32 8466: 'Underground Sprinklers: Controllers'.
 - (d) Section 32 9120: 'Topsoil And Placement'.
 - (e) Section 32 9122: 'Topsoil Grading'.
 - (f) Section 32 9223: 'Sodding'.
 - (g) Section 32 9300: 'Plants'.
 - 5) Notes:
 - (a) Verify project site conditions and review scope of work before installation begins.
 - (b) Verify appropriate sub-grades have been established.
 - b. Site Visit No. 2:
 - 1) Description:
 - (a) Irrigation system pressure test compliance, main line inspection, valve inspection.
 - 2) Schedule: Conduct site visit one (1) week minimum after notification before beginning irrigation system pressure test.
 - 3) Required Attendees:
 - (a) General Contractor, Landscape Subcontractor, Landscape Architect.
 - 4) Recommended Attendees:
 - (a) Project Manager, Facilities Manager.
 - 5) Related Sections:

- (a) Section 32 8423: 'Underground Sprinklers'.
- (b) Section 32 9120: 'Topsoil And Placement'.
- (c) Section 32 9122: 'Topsoil Grading'.
- 6) Notes:
 - (a) Verify finish grading in preparation for planting.
- c. Site Visit No. 3:
 - 1) Description:
 - (a) Inspect and approve plant quality, plant quantity, plant pits, plant pit backfill, planting depths, and removal of packaging/distribution materials, wire, and ties.
 - 2) Schedule: Conduct site visit one (1) week minimum after notification from Contractor before beginning site visit no. 3.
 - 3) Required Attendees:
 - (a) General Contractor, Landscape Subcontractor, Landscape Architect.
 - 4) Recommended Attendees:
 - (a) Project Manager, Facilities Manager.
 - 5) Related Sections:
 - (a) Section 32 9300: 'Plants'.
 - 6) Notes:
 - (a) Inspect irrigation system installation, inspect weed barrier fabric.
- d. Site Visit No. 4:
 - 1) Description:
 - (a) Comprehensive Substantial Completion inspection prior to beginning thirty (30) day Landscape Subcontractor maintenance period.
 - 2) Schedule: Conduct site visit one (1) week minimum after notification before beginning site visit no. 4.
 - 3) Required Attendees:
 - (a) Project Manager, Facilities Manager, Architect, General Contractor, Landscape Subcontractor, Landscape Architect.
 - 4) Related Sections:
 - (a) Section 32 8423: 'Underground Sprinklers'.
 - (b) Section 32 9300: 'Plants'.
 - 5) Notes:
 - (a) Verify contract requirements have been followed including but not limited to: planting compliance, irrigation system coverage and irrigation system operation.
- e. Site Visit No. 5:
 - 1) Description:
 - (a) At the end of thirty (30) day Landscape Subcontractor maintenance period, verify deficient items have been corrected and verify no others exist.
 - 2) Schedule: Conduct site visit one (1) week minimum after notification before beginning site visit no. 5.
 - 3) Required Attendees:
 - (a) Project Manager, Facilities Manager, Architect, General Contractor, Excavation Subcontractor, Landscape Subcontractor, Landscape Architect.
 - 4) Related Sections:
 - (a) Section 32 8423: 'Underground Sprinklers'.
 - (b) Section 32 9300: 'Plants'.
 - 5) Notes:
 - (a) Review Landscape Management Plan (LMP) with Owner's Representative. Provide landscape maintenance training.

1.04 SUBMITTALS

- A. See Section 01 3000-Administrative Requirements, for submittal procedures. Submittals may be included in more than one submittal group listed below.
- B. Submittals for Information:
 - 1. Establishment Period Acknowledgement:
 - a. Landscape Architect will provide acknowledgment of Establishment Period commencement:
 - 1) Certificate will include name and signature of Contractor, Contractor's company, Contractor's telephone number, and date.
 - 2) Certificate will include name and signature of Owner's Representative, Owner's Representative's Group name, Owner's Representative Group telephone number, and date.
 - 3) Certificate will acknowledge date when Establishment Period begins and that it extends one (1) year from that time.
- C. Submittals for Project Closeout:
 - 1. Operations and Maintenance Data:
 - a. Landscape maintenance recommendations.
 - b. Individual plant maintenance recommendations.
 - c. Plant establishment maintenance recommendations.
 - d. Post-plant establishment maintenance recommendations.
 - 2. Record Documentation:
 - a. Landscape Drawings:
 - 1) As installation occurs, prepare accurate record drawings. Submit electronic copy prior to final inspection. Drawing shall include:
 - (a) Detail and dimension changes made during construction.
 - (b) Take dimensions from permanent constructed surfaces or edges located at or above finish grade.
 - 3. Landscape Warranty - See Section 32 9300.
 - 4. Landscape Management Plan (LMP):
 - a. Landscape Section. Include the following:
 - 1) Operations and Maintenance Data:
 - 2) Record Documentation including Landscape Drawings.
 - 3) Landscape Warranty
 - 4) Establishment Period Acknowledgement

1.05 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Herbicides:
 - a. Products shall be recognized for intended use by AHJ.
 - 2. Invasive and Non-native plants:
 - a. Comply with all applicable laws governing invasive and non-native plants.
- B. Installer Qualifications:
 - 1. Acceptable Installers (Consultant to remove if not included):
 - a.
 - b.
 - c.
 - 2. Landscape Subcontractor. Requirements of Section 01 4301 applies, but not limited to following:
 - a. Company specializing in performing work of this section.
 - b. Minimum five (5) years' experience in landscaping installations.
 - c. Minimum five (5) satisfactorily completed installations in past three (3) years of projects similar in size, scope, and complexity required for this project before bidding.
 - d. Upon request, submit documentation.
 - 3. Installer:

- a. Planting shall be performed under direction of foreman or supervisor with minimum three (3) years' experience in landscape installations similar in size, scope, and complexity.
 - b. Foreman or supervisor required to attend pre-installation conference.
 - c. Use trained personnel familiar with required planting procedures and with Contract Documents.
4. Submit documentation upon request.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Storage And Handling Requirements:
 1. Deliver packaged materials in containers showing weight, analysis, and name of Manufacturer.
 2. Deliver sod, plants, trees, and shrubs in healthy and vigorous condition.
 3. Protect materials from deterioration during delivery.
- B. Storage And Handling Requirements:
 1. Store in location on site where they will not be endangered and where they can be adequately watered and kept in healthy and vigorous condition.
 2. Protect materials from deterioration while stored at site.

2.PART 2 PRODUCTS – NOT USED

3.PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification Of Conditions:
 1. Inspect site and Contract Documents to become thoroughly acquainted with locations of irrigation, ground lighting, and utilities.

3.02 PREPARATION

- A. Before proceeding with work, verify dimensions and quantities. Report variations between Drawings and site to Architect before proceeding with landscape work.
 1. Plant totals are for convenience of Contractor only and are not guaranteed. Verify amounts shown on Drawings.
 2. All planting indicated on Contract Documents is required unless indicated otherwise.
- B. Protection:
 1. Mitigate or eliminate if possible conditions that will create hazards. Post signs or barriers as required.
 2. Provide adequate means for protection from damage through excessive erosion, flooding, heavy rains, etc. Repair or replace damaged areas.
 3. Keep site well drained and landscape excavations dry.

3.03 INSTALLATION

- A. Interface With Other Work:
 1. Do not plant trees and shrubs until major construction operations are completed. Do not commence landscaping work until work of Section 31 2216 and Section 32 8423 has been completed and approved.
- B. Coordinate installation of planting materials during normal planting seasons for each type of plant material required.
- C. Hand excavate as required.
- D. Maintain grade stakes until parties concerned mutually agree upon removal.
- E. When conditions detrimental to plant growth are encountered, such as rubble fill or adverse drainage conditions, notify Architect before planting.

3.04 FIELD QUALITY CONTROL

- A. Field Inspection:

1. Landscape Architect will inspect landscaping installation for Substantial Completion.
- B. Non-Conforming Work. Non-conforming work as covered in the General Conditions applies, but is not limited to the following:
 1. Replace damaged plantings within (10) days of notification at no additional cost to Owner.
 2. Repair damage to irrigation, ground lighting, utilities, paving, concrete curb and gutters and other items adjacent to landscaping caused by work of this Section or replace at no additional cost to Owner.

3.05 CLEANING

- A. Waste Management:
 1. Immediately clean up soil or debris spilled onto pavement and dispose of deleterious materials.

3.06 CLOSEOUT ACTIVITIES

- A. Instruction to Owner:
 1. Include following training:
 - a. Review Landscape Management Plan (LMP):
 - 1) Review maintenance recommendations.
 - b. Review Maintenance as specified at the end of this specification.
 2. Establishment Period Acknowledgement (coordinate with 32 8000 section(s)):
 - a. Landscape Architect will acknowledge Establishment Period commencement.

3.07 PROTECTION

- A. Protect planted areas against traffic or other use immediately after planting is completed by placing adequate warning signs and barricades.
- B. Provide adequate protection of planted areas against trespassing, erosion, and damage of any kind. Remove this protection after Architect has accepted planted areas.

3.08 MAINTENANCE

- A. General:
 1. Before beginning maintenance period, plants shall be in at least as sound, healthy, vigorous, and in approved condition as when delivered to site, unless accepted by Architect in writing at final landscape inspection.
 2. Maintain landscaping for thirty (30) continuous days minimum after Final Completion. If maintenance period is interrupted by non-growing season or irrigation winter shut-down, begin maintenance period after start of growing season the following Spring. and continue one (1) continuous month there from.
 3. Replace landscaping that is dead or appears unhealthy or non-vigorous as directed by Landscape Architect before end of maintenance period. Make replacements within ten (10) days of notification. Lawn being replaced shall be guaranteed and maintained an additional thirty (30) days from date of replacement.
- B. Sodded Lawn:
 1. Maintain sodded lawn areas until lawn complies with specified requirements and throughout maintenance period.
 2. Water sodded areas in sufficient quantities and at required frequency to maintain sub-soil immediately under sod continuously moist 3 to 4 inches (75 to 100 mm) deep.
 3. Cut grass first time when it reaches 3 inches (75 mm) high. Continue to mow at least once each week throughout maintenance period. Remove clippings.
 4. Apply herbicide as necessary to maintain weed-free lawn. Apply herbicide in accordance with manufacturer's instructions during calm weather when air temperature is between 50 and 80 deg F (10 and 27 deg C).
 5. At end of thirty (30) day maintenance period, fertilize lawns as recommended in Section 32 9122.
- C. Trees, Shrubs, And Plants:

1. Maintain by pruning, cultivating, and weeding as required for healthy growth.
2. Restore planting basins.
3. Tighten and repair stake and guy supports and reset trees and shrubs to proper grades or vertical positions as required.
4. Spray as required to keep trees and shrubs free of insects and disease.
5. Provide supplemental water by hand as needed in addition to water from sprinkling system.

END OF SECTION

**SECTION 32 9120
TOPSOIL AND PLACEMENT**

1.PART 1 GENERAL**1.01 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Perform topsoil evaluation and placement required prior to topsoil grading as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 31 0500: 'Common Earthwork Requirements':
 - 2. Section 31 1413: 'Topsoil Stripping And Stockpiling'.
 - 3. Section 31 2200: 'Grading'.
 - 4. Section 32 9001: 'Common Planting Requirements':
 - 5. Section 32 9122: 'Topsoil Grading'.

1.02 REFERENCES**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Pre-Installation Conference:
 - 1. Participate in MANDATORY pre-installation conference as specified in Section 32 9001.
 - 2. In addition to agenda items specified in Section 01 3100 and Section 32 9001, review following:
 - a. Review finish grade elevation and tolerance requirements.
 - b. Review surface preparation requirements including disking, tilling, ripping, or aerating.
 - c. Review Attachment 'Topsoil Testing Report' including:
 - 1) Landscape Architect, Contractor, Testing, and Soil Testing Laboratory Instructions.
 - d. Review Field Quality Control testing requirements for 'Topsoil Testing Report' including:
 - 1) Corrections required for topsoil not meeting requirements of this specification.
 - 2) Approval requirement of 'Topsoil Testing Report' by Landscape Architect.
 - 3) Submittals required as identified in Closeout Submittals.

1.04 SUBMITTALS

- A. See Section 01 3000-Administrative Requirements, for submittal procedures. Submittals may be included in more than one submittal group listed below.
 - B. Submittals for Review:
 - 1. Do not commence work or deliver products to site until Landcape Architect approves submittals for review.
 - 2. Testing And Evaluation Reports:
 - a. Completed 'Topsoil Testing Report'. Follow testing directives of Part 3 of this specification.
 - 1) Access 'Topsoil Testing Report' template through:
 - (a) https://aec.churchofjesuschrist.org/aec/design_guidelines/
 - (b) Go to the Landscape sub-section.
 - 2) Owner will pay for one (1) final test.
 - 3) Additional test(s) if necessary will be paid by Contractor.
 - b. Submit report stating location of imported topsoil source and describe recent use(s).
- C. Submittals for Information
 - 1. Submit delivery slips indicating amount of topsoil delivered to Project site.
- D. Submittals for Project Closeout:
 - 1. Record Documentation:

- a. Final Landscape Architect approved 'Topsoil Testing Report'.
- b. Imported topsoil source and recent use as described above.
2. Landscape Management Plan (LMP):
 - a. Landscape Section. Include the following:
 - 1) 'Topsoil Testing Report'.

2.PART 2 PRODUCTS

2.01 MATERIALS

- A. Topsoil:
 1. Design Criteria:
 - a. Topsoil used in landscaped areas, whether imported, stockpiled, or in place, shall be weed free, fertile, loose, friable soil meeting following criteria:
 - 1) Chemical Characteristics:
 - (a) 5 to 8.0.
 - (b) Soluble Salts: less than 3.0 mmhos/cm.
 - (c) Sodium Absorption Ratio (SAR): less than 6.0.
 - (d) Organic Matter: greater than one percent.
 - 2) Physical Characteristics:
 - (a) Gradation as defined by USDA triangle of physical characteristics as measured by hydrometer.
 - (b) Sand: 15 to 60 percent.
 - (c) Silt: 10 to 60 percent.
 - (d) Clay: 5 to 30 percent.
 - (e) Clean and free from toxic minerals and chemicals, noxious weeds, rocks larger than or equal to 1-1/2 inch (38 mm) in any dimension, and other objectionable materials.
 - (f) Soil (Coordinate screening as specified in Section 31 1413 'Topsoil Stripping And Stockpiling' to meet these characteristics):
 - (g) Soil shall not contain more than five (5) percent by volume of rocks measuring over 1/4 inch (6 mm) in largest size.
 - (h) Soil shall be topsoil in nature.
 - (i) Soil resembling road base or other like materials are not acceptable.

3.PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification Of Conditions:
 1. Do not commence work of this Section until grading tolerances specified in Section 31 2200 are met.
 2. Do not commence work of this Section until coordination with Section 32 9122 'Topsoil Grading'.
 3. Receive approval from Landscape Architect of subgrade elevations prior to commencement of this Work.

3.02 PREPARATION

- A. Protection Of In-Place Conditions:
 1. Protect utilities and site elements from damage.
- B. Surface Preparation:
 1. Surfaces to receive Imported and Stockpiled Topsoil:
 - a. Disk, till, rip, or aerate with approved agricultural aerator to depth of 6 inches (150 mm).
 - b. Place specified and approved topsoil on prepared surface.

3.03 PERFORMANCE

- A. General:
 - 1. After Surface Preparation requirements are completed, limit use of heavy equipment to areas no closer than 6 feet (1.80 meter) from building or other permanent structures. Use hand held tillers for preparation of subsoil in areas closer than 6 feet (1.80 m).
 - 2. Do not disturb existing shrub or tree roots to remain.
- B. Topsoil Depth/Quantity:
 - 1. Total topsoil depth of 5 inches (125 mm) minimum in all lawn planting areas.
 - 2. No topsoil as defined in this Section is required over tree and shrub planting areas or tree areas as long as what is in place is not excessively rocky or otherwise unfavorable to healthy plant growth. Install 12" of stockpiled soils if possible.
 - 3. Provide no less than quantity required to achieve tolerance described in Section 32 9122 'Topsoil Grading' along with additional soil amendments required. Installer of this section responsible for providing sufficient topsoil material.
- C. Imported Topsoil:
 - 1. Place tested and approved topsoil:
 - a. Before placing topsoil, remove organic material, rocks and clods greater than 1-1/2 inch (38 mm) in any dimension, and other objectionable materials.
 - b. Do not place topsoil whose moisture content makes it prone to compaction during placement process.
 - c. Do not place topsoil when sub-grade is either wet or frozen enough to cause clodding.
- D. Stockpiled Topsoil:
 - 1. Stockpile upper layer of existing soils for redistribution to tree and shrub planting areas.
- E. In Place Topsoil:
 - 1. If any, leave in place in areas where tree and shrubs are to be installed.
- F. Grading:
 - 1. Slope grade away from building for 12 feet (3.60 m) minimum from walls at slope of 1/2 inch in 12 inches (13 mm in 300 mm) minimum unless otherwise noted.
 - a. High point of finish grade at building foundation shall be 6 inches (150 mm) minimum below finish floor level.
 - b. Direct surface drainage in manner indicated on Contract Documents by molding surface to facilitate natural run-off of water.
 - c. Fill low spots and pockets with topsoil and grade to drain properly.

3.04 FIELD QUALITY CONTROL

- A. Testing And Inspections:
 - 1. Topsoil Testing:
 - a. Test topsoil for project suitability using Section 1 described 'Topsoil Testing Report':
 - 1) Testing requirements:
 - (a) If testing report shows topsoil does not meet topsoil Design Criteria (Section 2) and Topsoil Testing Report, 'Soil Test Data' and 'Rocks' requirements, topsoil is non-conforming. Corrections and re-testing are required until topsoil meets requirements.
 - (b) Use new 'Topsoil Testing Report', each time topsoil is tested.
 - (c) After topsoil is approved by Landscape Architect, submit final 'Topsoil Testing Report' as specified in Part 1 'Submittals'.
- B. Non-Conforming Work:
 - 1. If topsoil does not meet topsoil Design Criteria and 'Topsoil Testing Report: Soil Test Data' requirements topsoil will be re-tested at no cost to Owner.
 - a. Correction procedures:
 - 1) Topsoil not meeting specified physical characteristics of sand, silt, and clay shall be removed from site.

- 2) Topsoil not meeting specified organic or fertility specifications may be amended in place with materials recommended in Topsoil Testing Report.
 - 3) If amendments are necessary, submit proposed amendments and application rates required to bring topsoil up to minimum specified requirements.
 - 4) Re-test topsoil and remove and amend as required until it meets minimum specified requirements.
- b. Submit report to Landscape Architect for approval.
 - c. Receive approval from Landscape Architect prior to planting.

END OF SECTION

**SECTION 32 9122
TOPSOIL GRADING**

1.PART 1 GENERAL**1.01 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Perform topsoil grading required to prepare site for installation of landscaping as described in Contract Documents.
 - 2. Perform topsoil placement and finish grading work required to prepare site for installation of landscaping as described in Contract Documents.
 - 3. Furnish and apply soil amendments as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 31 0500: 'Common Earthwork Requirements':
 - 2. Section 31 1413: 'Topsoil Stripping And Stockpiling'.
 - 3. Section 31 2200: 'Grading'.
 - 4. Section 32 9001: 'Common Planting Requirements':
 - a. Pre-installation conference held jointly with other common planting related sections.
 - 5. Section 32 9120: 'Topsoil And Placement'.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference:
 - 1. Participate in MANDATORY pre-installation conference as specified in Section 32 9001.
 - 2. In addition to agenda items specified in Section 01 3000, review the following:
 - a. Review compost requirements to be within acceptable range as per Attachment 'Compost Quality Guidelines For Landscaping' and 'Compost Verification Report' in this specification.
 - b. Review soil fertility amendments and fertilizer requirements as per Attachment 'Topsoil Testing Report' in Section 32 9120.

1.03 SUBMITTALS

- A. See Section 01 3000-Administrative Requirements, for submittal procedures. Submittals may be included in more than one submittal group listed below.
 - B. Submittals for Review:
 - 1. Do not commence work or deliver products to site until Landscape Architect approves submittals for review.
 - 2. Product Data:
 - a. Soil Amendments and Fertilizer:
 - 1) Soil amendment and fertilizer literature and chemical / nutrient analysis.
 - 2) Proposed application rates necessary to bring topsoil up to specified requirements.
 - 3) Product source location.
 - 3. Samples:
 - a. Soil Amendments and Conditioners:
 - 1) 2.5 lb sample for each product delivered in resealable plastic bag(s).
 - 4. Testing And Evaluation Reports:
 - a. 'Compost Verification Report':
 - 1) Signed copy certifying compost meets requirements of this specification
 - (a) Access 'Compost Verification Template' through:
 - (1) https://aec.churchofjesuschrist.org/aec/design_guidelines/
 - (2) Go to the Landscape sub-section.
- C. Submittals for Information:
 - 1. Soil Fertility Amendments and Fertilizer:

- a. Upon request submit delivery slips indicating amount of soil amendments, compost, conditioner, and fertilizer delivered to Project site.
- D. Submittals for Project Closeout:
 - 1. Landscape Management Plan (LMP):
 - a. Landscape Section. Include the following:
 - 1) Signed final Compost Verification Report.

2.PART 2 PRODUCTS

2.01 MATERIALS

- A. Soil Amendments:
 - 1. Incorporate following soil amendments into topsoil used for Project:
 - a. Acceptable Soil Amendments, Soil Conditioners, And Application Rates. (Choose one):
 - 1) Soil Pep'.
 - 2) 'Compost'
 - 3) Other amendments and conditioners as specified by 'Topsoil Testing Report' such as lime, gypsum, Axis, etc.
 - 4) Substitutions: See Section 01 6000-Product Requirements.
 - (a) Equal as approved by Landscape Architect prior to bid.
 - b. Acceptable Fertilizers And Application Rates:
 - 1) Substitutions: See Section 01 6000-Product Requirements.
 - (a) Equal as approved by Landscape Architect prior to bid.

3.PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification Of Conditions:
 - 1. Do not commence work of this Section until imported, stockpiled and in place topsoil are placed as specified in Section 32 9120 'Topsoil And Placement'.

3.02 PREPARATION

- A. Protection Of In-Place Conditions:
 - 1. Protect utilities and site elements from damage.
- B. Surface Preparation:
 - 1. Surfaces that meet specified topsoil elevations.
 - a. Seven (7) days maximum before beginning seeding and planting:
 - 1) Loosen topsoil 6 inch (150 mm) deep, dampen thoroughly, and cultivate to properly break up clods and lumps.
 - 2) Rake area to remove clods, rocks, weeds, roots, debris or other material 1-1/2 inches (38 mm) or more in any dimension.
 - 3) Grade and shape landscape area to bring surface to true uniform planes free from irregularities and to provide drainage and proper slope to catch basins.
 - 2. Addition of Soil Amendments:
 - a. Add specified soil amendments at specified rates to topsoil as directed by Topsoil Testing Report found in Section 32 9120 'Topsoil And Placement'.
 - b. Add specified fertilizers at specified rates into topsoil as directed by Soil Testing Laboratory.
 - c. Roto-till or otherwise mix soil amendments evenly into topsoil.
 - d. Incorporate and leach soil amendments which require leaching, such as gypsum, within such time limits that soil is sufficiently dry to allow proper application of fertilizer and soil conditioners.

3.03 PERFORMANCE

- A. General:

1. Limit use of heavy equipment to areas no closer than 6 feet (1.80 meter) from building or other permanent structures. Use hand held tillers for preparation of subsoil in areas closer than 6 feet (1.80 m).
 2. Do not expose or damage existing shrub or tree roots.
- B. Finish Grade Tolerances (As shown on General Planting Details in Contract Documents):
1. Finish topsoil grade of planting areas before planting and after addition of soil additives shall be specified distances below top of adjacent pavement of any kind:
 - a. Sodded Areas: 2 inches (50 mm) below.
 - b. Tree and Shrub Areas (not individual trees): 4 inches (100 mm) below.
- C. Placed Topsoil:
1. At locations where topsoil has been placed as per Section 32 9120 'Topsoil And Placement', perform the following:
 - a. Remove existing vegetation as required in preparation for new landscaping.
 - b. Remove organic material, rocks and clods greater than 1-1/2 inch (38 mm) in any dimension, and other objectionable materials.
- D. Grading:
1. Coordinate grading as described in Section 32 9120 'Topsoil And Placement'.
- E. Immediately before planting lawn and with topsoil in semi-dry condition, roll areas that are to receive lawn in two directions at approximately right angles with water ballast roller weighing 100 to 300 lbs (45 to 135 kg), depending on soil type.
- F. Rake or scarify and cut or fill irregularities that develop as required until area is true and uniform, free from lumps, depressions, and irregularities.

3.04 PROTECTION

- A. After landscape areas have been prepared, take no heavy objects over them except lawn rollers.

END OF SECTION

**SECTION 32 9223
SODDING****1.PART 1 GENERAL****1.01 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install sodded lawn as described in Contract Documents.

1.02 RELATED REQUIREMENTS

- A. Section 32 8423: Irrigation System - No Controllers.
- B. Section 32 8466: Irrigation System - Controllers
- C. Section 32 9001: Common Planting Requirements:
 - 1. Pre-installation conference held jointly with other common planting related sections.
- D. Section 32 9120: 'Topsoil And Placement'.
- E. Section 32 9122: 'Topsoil Grading'.

1.03 REFERENCES

- A. TPI (SPEC) Certificate: Certify grass species and location of sod source.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference:
 - 1. Participate in pre-installation conference as specified in Section 32 9001.

1.05 SUBMITTALS

- A. Submittals for Information:
 - 1. Sod Seed Mix:
 - a. Written certification confirming sod seed mix and quality:
 - 1) Include species used.
 - 2) Include supplier name and contact information.
- B. Submittals for Closeout:
 - 1. Operations And Maintenance Data:
 - a. Sod Seed Mix.
 - 2. Landscape Management Plan (LMP):
 - a. Landscape Section:
 - 1) Sod Seed Mix.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Approval Requirements:
 - 1. Harvest, deliver, store, and handle sod in accordance with requirements of Turfgrass Producers International (TPI) (formally American Sod Producers Association) Specifications for Turfgrass Sod Materials and Transplanting / Installing.
 - 2. Schedule deliveries to coincide with topsoil operations and laying. Keep storage at job site to minimum without causing delays.
 - a. Deliver, unload, and store sod on pallets within 24 hours of being lifted.
 - b. Do not deliver small, irregular, or broken pieces of sod.
- B. Storage And Handling Requirements:
 - 1. Cut sod in pieces approximately 3/4 to one inch (19 to 25 mm) thick. Roll or fold sod so it may be lifted and handled without breaking or tearing and without loss of soil.
 - 2. During wet weather, allow sod to dry sufficiently to prevent tearing during lifting and handling.
 - 3. During dry weather, protect sod from drying before installation. Water as necessary to insure vitality and to prevent excess loss of soil in handling. Sod that dries out before installation will be rejected.

2.PART 2 PRODUCTS**2.01 MATERIALS**

- A. Description:
 - 1. Superior sod grown from certified, high quality, seed of known origin or from plantings of certified grass seedlings or stolons:
 - a. Assure satisfactory genetic identity and purity.
 - b. Assure over-all high quality and freedom from noxious weeds or an excessive amount of other crop and weedy plants at time of harvest.
 - 2. Sod shall be composed of Bio Blue from Biogross located in West Jordan, Utah. This is 80% drought resistant Bluegrass and 20% Perennial Rye Grass.

3.PART 3 EXECUTION**3.01 INSTALLATION**

- A. Interface With Other Work:
 - 1. Do not commence work of this Section until work of Sections 32 9122 and 32 9300 has been completed and approved.
- B. Tolerances:
 - 1. Final grade of soil after sodding of lawn areas is complete shall be one inch (25 mm below top of adjacent pavement of any kind.
- C. Laying of Sod:
 - 1. Lay sod during growing season and within 48 hours of being lifted.
 - 2. Lay sod while top 6 inches (150 mm) of soil is damp, but not muddy. Sodding during freezing temperatures or over frozen soil is not acceptable.
 - 3. Lay sod in rows perpendicular to slope with joints staggered. Butt sections closely without overlapping or leaving gaps between sections. Cut out irregular or thin sections with a sharp knife.
 - 4. Lay sod flush with adjoining existing sodded surfaces.
 - 5. Do not sod slopes steeper than 3:1. Consult with Architect for alternate treatment.
- D. After Laying of Sod Is Complete:
 - 1. Roll horizontal surface areas in two directions perpendicular to each other.
 - 2. Repair and re-roll areas with depressions, lumps, or other irregularities. Heavy rolling to correct irregularities in grade will not be permitted.
 - 3. Water sodded areas immediately after laying sod to obtain moisture penetration through sod into top 6 inches (150 mm) of topsoil.

3.02 FIELD QUALITY CONTROL

- A. Field Inspection:
 - 1. Sodded areas will be accepted at Project closeout if:
 - a. Sodded areas are properly established.
 - b. Sod is free of bare and dead spots and is without weeds.
 - c. No surface soil is visible when grass has been cut to height of 2 inches (50 mm).
 - 2. Sodded areas have been mowed a minimum of twice.

END OF SECTION

**SECTION 32 9300
PLANTS**

1.PART 1 GENERAL**1.01 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install landscaping plants as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 32 8423: 'Underground Sprinklers: No Controllers' for irrigation system.
 - 2. Section 32 8466: 'Underground Sprinklers: Controllers' for irrigation system controllers.
 - 3. Section 32 9001: 'Common Planting Requirements' for:
 - a. Pre-installation conference held jointly with other common planting related sections.
 - 4. Section 32 9120: 'Topsoil And Placement'.
 - 5. Section 32 9122: 'Topsoil Grading'.
 - 6. Section 32 9219: 'Seeding'.
 - 7. Section 32 9223: 'Sodding'.

1.02 REFERENCES

- A. Definitions:
 - 1. Landscape Management Plan (LMP): See Section 32 9001 for definition.
 - 2. Plant Establishment Period: See Section 32 9001 for definition.
- B. ANSI/AHIA Z60.1 - American National Standard for Nursery Stock; 2014
- C. ANSI A300 Part 1 - American National Standard for Tree Care Operations -- Tree, Shrub and Other Woody Plant Maintenance -- Standard Practices; 2017

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference:
 - 1. Participate in MANDATORY pre-installation conference as specified in Section 32 9001.

1.04 SUBMITTALS

- A. See Section 01 3000-Administrative Requirements, for submittal procedures. Submittals may be included in more than one submittal group listed below.
- B. Submittals for Review:
 - 1. Do not commence work or deliver products to site until Landcape Architect approves submittals for review.
 - 2. Testing and Evaluation Reports
 - a. Percolation Test Report:
 - 1) Submit written report based on testing described in Part 3.
 - 3. Samples:
 - a. Tree staking systems.
 - b. Weed barrier
 - c. Organic mulch.
 - d. Rock mulch.
- C. Submittals for Information:
 - 1. Establishment Period Acknowledgement. See Section 32 9001:
- D. Submittals for Closeout:
 - 1. Operations and Maintenance Data:
 - a. See Section 32 9001.
 - 2. Record Documentation
 - a. See Section 32 9001.
 - 3. Landscape Warranty. See 'Warranty' below.
 - 4. Landscape Management Plan (LMP):

- a. Landscape Section. See Section 32 9001.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
 1. Deliver trees, shrubs, ground covers, and plants after preparations for planting have been completed and install immediately.
 2. Do not prune before delivery, except as approved by Landscape Architect.
 3. Protect bark, branches, and root systems from sun scald, drying, whipping, and other handling and tying damage.
 4. Do not bend or bind-tie trees or shrubs in such a manner as to destroy natural shape.
 5. Provide protective covering during delivery.
- B. Storage And Handling Requirements;
 1. Handle balled stock by root ball or container. Do not drop trees and shrubs during delivery.
 2. If planting is delayed more than six hours after delivery, set planting materials in shade and protect from weather and mechanical damage.
 3. Set balled stock on ground and cover ball with soil, saw dust, or other acceptable material approved by Landscape Architect.
 4. Do not remove container-grown stock from containers before time of planting.
 5. Do not store plant material on pavement.
 6. Water root systems of trees and shrubs stored on site with fine spray. Water as often as necessary to maintain root systems in moist condition. Do not allow plant foliage to dry out.

1.06 WARRANTY

- A. Special Warranty:
 1. Provide written warranties as follows:
 - a. Warranty will begin after Final Completion Site Review and owner acceptance. If the thirty (30) days of the warranty period is interrupted by non-growing season or irrigation winter shut-down, begin warranty period after start of growing season the next Spring. Thereafter, continue warranty per the period described herein. The landscape and irrigation cannot be accepted as final during winter months of November through April.
 - b. Warranty shrubs, ground covers, and vines to live and remain in strong, vigorous, and healthy condition for 90 days minimum from date of Final Completion and meet or exceed material standards set forth in Materials heading of Part 2 of this specification.
 - c. Warranty trees to live and remain in strong, vigorous, and healthy condition and meet or exceed material standards set forth in Materials heading of Part 2 of this specification for one year from date of Final Completion and acceptance of the project.
 - d. Warranty lawns to be green, thick and weed free until the end of the maintenance period.
 - e. When trees are completely accepted at end of warranty period, remove staking.

2.PART 2 PRODUCTS

2.01 MATERIALS

- A. Plants:
 1. Conform to requirements of Plant List and Key on Contract Documents and to ANSI/AHIA Z60.1 .
 2. Nomenclature:
 - a. Plant names used in Plant List conform to 'Standardized Plant Names' by American Joint Committee on Horticultural Nomenclature except in cases not covered. In these instances, follow custom of nursery trade. Plants shall bear tag showing genus, species, and variety of at least 10 percent of each species delivered to site.

3. Quality:
 - a. Plants shall be sound, healthy, vigorous, free from plant disease, insect pests or their eggs, noxious weeds, and have healthy, normal root systems. Container stock shall be well established and free of excessive root-bound conditions.
 - b. Do not prune plants or top trees prior to delivery.
 - c. Plant materials shall be subject to approval by Landscape Architect as to size, health, quality, and character.
 - d. Bare root trees are not acceptable.
 - e. Provide plant materials from licensed nursery or grower.
4. Measurements:
 - a. Measure height and spread of specimen plant materials with branches in their normal position as indicated on Contract Documents or Plant List.
 - b. Measurement should be average of plant, not greatest diameter. For example, plant measuring 15 inches (375 mm) in widest direction and 9 inches (225 mm) in narrowest would be classified as 12 inch (300 mm) stock.
 - c. Plants properly trimmed and transplanted should measure same in every direction.
 - d. Measure caliper of trees 6 inches (150 mm) above surface of ground.
 - e. Where caliper or other dimensions of plant materials are omitted from Plant List, plant materials shall be normal stock for type listed.
 - f. Plant materials larger than those specified may be supplied, with prior written approval of Landscape Architect, and:
 - 1) If complying with Contract Document requirements in all other respects.
 - 2) If at no additional cost to Owner.
 - 3) If sizes of roots or balls are increased proportionately.
5. Shape and Form:
 - a. Plant materials shall be symmetrical or typical for variety and species and conform to measurements specified in Plant List.
 - b. Well grown material will generally have height equal to or greater than spread. However, spread shall not be less than 2/3's of height.

2.02 ACCESSORIES

- A. Planting Mix:
 1. Mixture of three (3) parts excavated soil and one part well rotted composted manure, approved commercial mix, or other amendment recommended in 'Topsoil Testing Report'.
- B. Fertilizer:
 1. Fertilizer as recommended in 'Topsoil Testing Report'.
- C. Tree Stakes:
 1. 2 inch (50 mm) diameter Lodgepole Pine, Douglas Fir, White Fir, or Hemlock Fir.
- D. Tree Staking Ties:
 1. 3/2 inch (800 mm) Cinch-Tie tree ties by V.I.T. Products Inc, Escondido, CA www.vitproducts.com.
- E. Tree Guys:
 1. Duckbill Model 68DTS guying kit.
- F. Pre-Emergent Herbicide:
 1. Ronstar G granular by Bayer Crop Science, Monheim, Germany www.bayercropscience.com.
 2. Surflan AS liquid by United Phosphorous Inc, Trenton, NJ www.upi-usa.com.
- G. Weed Barrier:
 1. DeWitt Pro 5 Fabric.
 2. Other approved equal.
- H. Organic Mulch:
 1. Do Not Use

- I. Rock Mulch:
 - 1. Rock mulch.
 - a. M1 - 1.5-2" Crushed Rock
 - b. Light color rock.
 - 2. Rock mulch.
 - a. M2 - 3-6" Crushed Rock
 - b. Dark colored rock.
- J. Boulders:
 - a- Browns Canyon Tan Boulders
 - b- Approved equal.
 - c. Boulders shall be the specified diameter on all three sides.
- K. Substitutions: See Section 01 6000 - Product Requirements.
 - 1. Equals as approved by Landscape Architect prior to bid.

3.PART 3 EXECUTION

3.01 EXAMINATION

- A. Evaluation And Assessment:
 - 1. Before proceeding with work, check and verify dimensions and quantities. Report variations between Drawings and site to Landscape Architect before proceeding with work of this Section.
 - 2. Plant totals are for convenience only and are not guaranteed. Verify amounts shown on Contract Documents. All planting indicated on Contract Documents is required unless indicated otherwise.
 - 3. Do not commence with this Work until all work including grading tolerances specified in Section 32 9122 'Topsoil Grading' are completed and approved.

3.02 PREPARATION

- A. Plant Approval:
 - 1. Compliance:
 - a. Prior to any plant installation, evaluate plants for compliance with material standards.
 - b. Remove plants from site that do not comply.
 - 2. Inspection:
 - a. Prior to any tree installation, inspect one (1) extra deciduous tree and one (1) extra evergreen tree for root health.
 - b. In presence of Landscape Architect or by video recording, remove root container/packing material and inspect root balls for soil depth, firmness and root structure by washing soil off of roots.
 - c. If delivered plants exhibit soil 1 inch (25 mm) or more above root collar, demonstrate that all trees have had excess soil removed prior to planting or that they meet standard.
 - d. Remove and replace tree plant material if roots are loose, significantly circling, significantly asymmetrical or damaged.
 - e. Continue inspection process until trees meet standard.
- B. Layout individual tree and shrub locations and areas for multiple plantings:
 - 1. Stake locations and outline areas.
 - 2. Secure Landscape Architect's approval before planting.
 - 3. Make minor adjustments as may be requested.

3.03 INSTALLATION

- A. Excavation:
 - 1. If underground construction work or obstructions are encountered in excavation of planting holes, Landscape Architect will select alternate locations.
 - 2. Plant Excavation Size:

- a. Diameter: Twice diameter of root ball or container minimum.
 - b. Depth: Equal to container or root ball depth.
 3. Unless excavated material meets topsoil requirements as specified in Section 32 9120, remove from landscape areas and do not use for landscaping purposes.
 4. Roughen sides and bottoms of excavations.
 5. Perform percolation test and create report.
 - a. With approval of Landscape Architect, select five (5) typical planting excavations throughout site for drainage testing.
 - 1) Fill selected excavations with water and verify that water drains away at rate of 3 inches (75 mm) per hour minimum.
 - 2) If it doesn't, select three (3) excavations approximately 5 feet (1 500 mm) away from each non-draining excavation and repeat tests. Continue testing process until non-draining areas have been identified.
 - 3) Within excavations located in identified non-draining areas, auger 6 inch (150 mm) diameter hole 4 feet (1 200 mm) deep in low point of each excavation and fill with tamped planting mix.
 - b. Create report identifying area where water did not drain properly and describe corrective measures taken.
 - c. Do not plant trees or shrubs in holes that do not properly drain.
- B. Planting:
1. Removing Binders And Containers:
 - a. Remove top one / third of wire basket and burlap binders.
 - b. Remove plastic and twine binders from around root ball and tree trunk.
 - c. Remove plastic containers.
 - d. Remove wood boxes from around root ball. Remove box bottoms before positioning plant in hole. After plant is partially planted, remove remainder of box without injuring root ball.
 2. Plant immediately after removing binding material and containers:
 - a. Place tree and shrub root balls on undisturbed soil.
 - b. After watering and settling, top of tree root balls shall be approximately two inches (50 mm) higher than finished grade and trunk flare is visible.
 - c. Shrub root balls shall be approximately one inch (25 mm) higher than finished grade.
 3. Properly cut off broken or frayed roots.
 4. Center plant in hole, remove remaining wire basket and burlap taking care not to damage root ball:
 - a. Replace damaged material.
 - b. Backfill with specified planting mix.
 - c. Except in heavy clay soils, make ring of mounded soil around hole perimeter to form watering basin.
 5. Add fertilizer in plant pit as per 'Topsoil Testing Report' and during proper season.
 6. Fill landscape excavations with tamped planting mix and recommended fertilizer:
 - a. Compact in 6 inch (150 mm) lifts.
 - b. Settle by watering to ensure top of root ball is 2 inches (50 mm) higher for trees and one inch (25 mm) higher for shrubs than surrounding soil following compaction and settling.
 7. Do not use muddy soil for backfilling.
 8. Make adjustments in positions of plants as directed by Landscape Architect.
 9. Thoroughly water trees and shrubs immediately after planting.
 10. At base of each tree, leave 36 inch (900 mm) diameter circle free of any grass.
- C. Tree and Shrub Pruning:
1. Prune trees and shrubs to remove dead, broken, and split branches in conformance with ANSI A300 (Part 1) Pruning.
- D. Supports for New Trees:

1. Provide new supports for trees noted on Contract Documents to be staked.
 - a. Remove nursery stakes delivered with and attached to trees.
 - b. Support shall consist of at least two (2) tree stakes driven into hole base before backfill so roots are not damaged. Place stakes vertically and run parallel to tree trunk. Install stakes so 3 feet (900 mm) of stake length is below finish grade.
 - c. Deciduous Trees:
 - 1) Place tree ties 6 to 12 inches (150 to 300 mm) below crotch of main tree canopy. Second set of tree ties may be required 18 to 24 inches (450 to 600 mm) above finish grade, if directed by Landscape Architect.
 - 2) Remove tops of tree stakes so top of stake is 6 inches (150 mm) below main tree canopy to prevent damage to tree branches and canopy growth.
 - d. Evergreen Trees:
 - 1) Place tree ties 2/3's of height of tree up from root ball.
 2. Provide root guying kits to support 24 inch (600 mm) box, 3 inch (75 mm) caliper and larger trees.
 3. Staking and guying should allow some tree movement.
- E. Ground Covers:
1. Container-grown unless otherwise specified on Contract Documents. Space evenly to produce a uniform effect, staggered in rows and intervals shown.
- F. Post Planting Weed Control:
1. Apply specified pre-emergent herbicide to shrub and ground cover planting areas and grass-free areas at tree bases after completion of planting.
 2. Areas shall be weed free prior to Landscape Final Acceptance.
- G. Weed Barrier Fabric:
1. M1 and M2 cobble rock areas to receive fabric.
 2. Achieve 100 percent coverage over ground areas away from root ball.
 3. Overlap seams 6 inches (150 mm) minimum.
 4. Staple at 5 feet (1500 mm) on center each way and within 3 inches (75 mm) of edge of shrub bed, with two (2) at each corner.
- H. Mulching:
1. After application of herbicide, mulch shrub and ground cover planting areas with 3 inches (75 mm) minimum deep layer of specified organic or rock mulch.
 2. Place mulch to uniform depth and rake to neat finished appearance.
 3. Mulch shall be deep enough to cover all fabric so it is not visible between the rock.

END OF SECTION

**SECTION 33 0110
DISINFECTION OF WATER UTILITY PIPING SYSTEMS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Disinfection of site domestic water lines and site fire water lines specified in Section 33 1416.
- B. Disinfection of building domestic water piping specified in Section 22 1005.

1.02 RELATED REQUIREMENTS

- A. Section 22 1005 - Plumbing Piping: Disinfection of building domestic water piping system.
- B. Section 33 1416 - Site Water Utility Distribution Piping.

1.03 REFERENCE STANDARDS

- A. AWWA B300 - Hypochlorites 2018.
- B. AWWA B301 - Liquid Chlorine 2018.
- C. AWWA B302 - Ammonium Sulfate 2016.
- D. AWWA B303 - Sodium Chlorite 2018.
- E. AWWA C651 - Disinfecting Water Mains 2014.

1.04 QUALITY ASSURANCE

- A. Water Treatment Firm: Company specializing in disinfecting potable water systems specified in this Section with minimum three years documented experience.
- B. Testing Firm: Company specializing in testing potable water systems, certified by governing authorities of the State in which the Project is located.
- C. Submit bacteriologist's signature and authority associated with testing.

PART 2 PRODUCTS

2.01 DISINFECTION CHEMICALS

- A. Chemicals: AWWA B300 Hypochlorite, AWWA B301 Liquid Chlorine, AWWA B302 Ammonium Sulfate, and AWWA B303 Sodium Chlorite.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that piping system and water well has been cleaned, inspected , and pressure tested.
- B. Schedule disinfecting activity to coordinate with start-up, testing, adjusting and balancing, demonstration procedures, including related systems.

3.02 DISINFECTION

- A. Use method prescribed by the applicable state or local codes, or health authority or water purveyor having jurisdiction, or in the absence of any of these follow AWWA C651.
- B. Flush with municipal domestic water until clear of all residue and clean flowing
- C. Inject treatment disinfectant into piping system.
- D. Maintain disinfectant in system for 24 hours.
- E. Flush, circulate, and clean until required cleanliness is achieved; use municipal domestic water.
- F. Replace permanent system devices removed for disinfection.

3.03 FIELD QUALITY CONTROL

- A. Test samples in accordance with AWWA C651.

END OF SECTION

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**SECTION 33 1416
SITE WATER UTILITY DISTRIBUTION PIPING**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Water pipe for site conveyance lines.
- B. Pipe valves.
- C. Water meter:
 - 1. Furnish and install piping for domestic water supply from water main to within 5 feet (1.50 meter) of building as described in Contract Documents complete with meter, shut-off valve, and connections.
 - 2. Furnish and install piping from water main to meter inside of building as described in Contract Documents complete with shut-off valve and connections.
- D. Fire Suppression water system
 - 1. Water piping
 - 2. In-building riser
 - 3. Post-Indicator Valve (if required).
 - 4. Fire hydrants.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 Cast in place Concrete 'Structural Cast-In-Place Concrete Forming' for installation of sleeve where piping penetrates slab.
 - 1. Mix Type concrete mixes and admixtures.
 - 2. Pre-installation conference held jointly with other concrete specifications.
- B. Section 21 1300 - 'Wet-Pipe Sprinkler Systems'.
- C. Section 21 1316 - 'Dry-Pipe Sprinkler Systems'.
- D. Section 09 9113 - Exterior Painting.
- E. Section 21 1313 - Wet-Pipe Sparinkler Systems
- F. Section 31 2316 - Excavation and Trenching for excavation and trenches
- G. Section 31 2323 - Fill
- H. Section 31 2316.13 - Trenching: Excavating, bedding, and backfilling.

1.03 REFERENCE STANDARDS

- A. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings 2018.
- B. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings 2018.
- C. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength 2021.
- D. ASTM B88 - Standard Specification for Seamless Copper Water Tube 2020.
- E. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40 2017.
- F. ASTM D2467 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80 2020.
- G. ASTM D3035 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter 2021.
- H. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding 2011 (Amended 2012).
- I. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings 2017.
- J. AWWA C500 - Metal-Seated Gate Valves for Water Supply Service 2009.

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- K. AWWA C502 - Dry-Barrel Fire Hydrants 2018.
- L. AWWA C606 - Grooved and Shouldered Joints 2015.
- M. AWWA C800 - Underground Service Line Valves and Fittings 2014.
- N. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Transmission and Distribution 2016.
- O. AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 1/2 In. (13 mm) Through 3 In. (76 mm), for Water Service 2017.
- P. AWWA C904 - Cross-Linked Polyethylene (PEX) Pressure Tubing, 1/2 In. (13 mm) Through 3 In. (76 mm), for Water Service 2016.
- Q. UL 246 - Hydrants for Fire-Protection Service Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Conduct a preinstallation meeting at least one week prior to the start of the work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on pipe materials, pipe fittings, valves and accessories.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- D. Certificates: Fire Suppression
 - 1. Provide one (1) copy of completed NFPA 13 'Contractor's Material and Test Certification for Underground Piping' as specified in 'Field Quality Control' in Part 3 of this specification:
- E. Project Record Documents: Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.06 QUALITY ASSURANCE

- A. Perform Work in accordance with utility company requirements.
- B. Regulatory Agency Sustainability Approvals:
 - 1. Install exterior fire water system according to NFPA 13, NFPA 24, and AWWA Manual M41, 'Ductile-Iron Pipe and Fittings' procedures unless specified otherwise below.
 - 2. Install hydrant in accordance with AWWA C502.
 - 3. Install exterior fire water system up to and including pipe flange 12 inches (300 mm) above floor inside building.
 - 4. Bury fire service mains at least 6 inch (150 mm) deeper than municipal water works piping. Additional depth of cover is necessary because of lack of water circulation in fire service mains.

PART 2 PRODUCTS

2.01 WATER PIPE FOR DOMESTIC AND FIRE SUPPRESSION

- A. Fire Suppression:
 - 1. PVC meeting AWWA C900 requirements:
 - a. Blue-Brut by Ipex Inc.
 - b. Blue Brute by JM Eagle.
 - c. Approved equal by Architect prior to installation.
 - 2. Fittings:
 - a. Ductile iron pipe fitting in accordance with AWWA C110 and rubber gaskets joints in accordance with AWWA C111/A21.11.
 - b. Same manufacturer as pipe.
- B. Domestic Water:

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1. HDPE meeting ANSI/AWWA C901, ASTM D3035, ASTM F714, ASTM D2737, ASTM D2239.
 - a. Small diameter pressure-rated HDPE Pipe by JM Eagle.
 - b. Approved equal by Architect prior to installation.
 2. Fittings:
 - a. Compression.
- C. Trace Wire: Magnetic detectable conductor, clear plastic covering, imprinted with "Water Service" in large letters.
- D. Water Meter: As required by local agency furnishing water.
- E. Tamper Switch:
 1. UL/ULC listed and FM approved.
 2. Weather and tamper resistant.
 3. Single Pole Double Throw Switch.
 4. Approved Products:
 - a. Potter Electric Signal: Model PCVS.
- F. Anchorages:
 1. Provide anchorages for tees, plugs, caps, bends, and hydrants in accordance with NFPA 24.
 2. Miscellaneous Fittings:
 - a. Clamps, Straps, And Washers: Steel, meeting requirements of ASTM A506.
 - b. Rods: Steel, meeting requirements of ASTM A575.
 - c. Rod Couplings: Malleable iron, meeting requirements of ASTM A197/A197M.
 - d. Bolts: Steel, meeting requirements of ASTM A307.
 - e. Cast Iron Washers: Meeting requirements of ASTM A126, Class A.
 - f. Thrust Block: 2500 psi (17.92 MPa) concrete.
- G. In-Building Riser:
 1. Meet NSF International Standards for Lead Free, NSF 61-G certified, 200 psi (1.38 MPa) maximum pressure and one piece.
 2. UL/ULC listed and FM approved.
 3. AWWA C900 Inlet/DIP and AWWA C606 Outlet.
 4. Corrosion resistant stainless steel construction, type 304.
 5. Includes test cap and coupler.
 6. Approved Products. See Section 01 6200 for def:
 - a. In-Building Riser (Series IBC) by Ames:
 - b. Size to match project requirements.

2.02 VALVES

- A. Valves: Manufacturer's name and pressure rating marked on valve body.
- B. Gate Valves Up To 3 Inches:
 1. Brass or Bronze body, non-rising stem, inside screw, single wedge or disc, compression ends, with control rod, post indicator, valve key, and extension box.
 2. Compatible with piping system and approved by pipe manufacture
- C. Gate Valves 3 Inches and Over:
 1. AWWA C500, iron body, bronze trim, non-rising stem with square nut, single wedge, flanged ends, control rod, post indicator, valve key, and extension box.
 2. Cast iron body with bolted bonnet.
 3. Indicator post pattern.
 4. Non-rising stem.
 5. 175 psi (1.21 MPa) working pressure.
 6. Approved Products.
 - a. Nibco:

- 1) Model M-609 with mechanical connection.
- 2) Model F-609 with flanged connection.
- b. Mueller:
 - 1) Model A-2052-5 with mechanical connection.
 - 2) Model A-2052-6 with flanged connection.
- D. Stop And Waste Valves:
 - 1. Use with lawn sprinkler system using domestic water. If AHJ does not allow stop and waste valves, specify acceptable shut-off valve for lawn sprinkler system.
 - 2. Approved Products
 - a. Mueller: Mark II Oriseal stop and waste valve H10288.
 - b. Mueller: Buffalo screw type curb box H-10350 complete with lid and H-10349 enlarged base.
- E. Provide cast iron valve box for fire protection valve. Encase valve box in concrete.
- F. Manufacturers:
 - 1. Ames Fire & Waterworks: www.amesfirewater.com/#sle.
 - 2. Ipex Inc, Englewood, CO www.ipexinc.com.
 - 3. Mueller Company: www.muellerflo.com/#sle.
 - 4. Nibco Inc : www.nibco.com/#sle.
 - 5. Potter Electric Signal Company, St Louis, MO www.pottersignal.com.
 - 6. Potter-Roemer, Santa Ana, CA www.potterroemer.com.

2.03 FIRE HYDRANTS

- A. Hydrants: AWWA C502, UL 246, dry barrel type.
 - 1. Dry-barrel fire hydrant (base valve type) complying with AWWA C150-A21.50, with 150 psi (1.03 MPa) working pressure with two 2-1/2 inch (64 mm) hose connections and one 4-1/2 inch (115 mm) pumper connection with caps and chains.
 - 2. Nozzle cap nuts to match operating stem nuts.
 - 3. Minimum 6 inch (150 mm) supply pipe.
 - 4. Hose and Streamer Connection: Match sizes with utility company, two hose nozzles , one pumper nozzle.
 - 5. Pressure Rating: Minimum 150 PSI working pressure. Higher if required by utility company.

2.04 BEDDING AND COVER MATERIALS

- A. Bedding: As specified in Section 31 2316.13.
- B. Cover: As specified in Section 31 2316.13.

2.05 ACCESSORIES

- A. Backflow Preventer: Usually provided inside the building.
- B. Meter: As required by local agency furnishing water.
- C. Pipe Sleeve at slab penetration:
 - 1. Quality Standard. See Section 01 6200:
 - 2. Any material rigid enough to resist deformation when concrete poured.
 - 3. Size: Provide 2 inch (50 mm) minimum space between piping assembly and sleeve.
- D. Casing Spacer: Stainless steel spacer designed to maintain pipe casing integrity.
 - 1. Manufacturers:
 - a. Advance Products & Systems, LLC: www.apsonline.com/#sle.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that building service connection and municipal utility water main size, location, and invert are as indicated.

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- B. Verify location of water meter, underground or in building.

3.02 PREPARATION

- A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare pipe connections to equipment with flanges or unions.

3.03 TRENCHING

- A. See the sections on excavation and fill for additional requirements.
- B. Hand trim excavation for accurate placement of pipe to elevations indicated.
- C. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.
- D. Excavate and backfill as specified in Sections 31 2316 and 31 2323 with following additional requirements:
 1. Runs shall be as close as possible to those shown on Contract Drawings.
 2. Excavate to required depth.
 3. Bottom of trenches shall be hard. Tamp as required.
 4. Remove debris from trench before laying pipe.
 5. Do not cut trenches near footings without consulting Architect.
 6. Excavate trenches so outside pipe will be at least 12 inches (300 mm) minimum below frost line or 48 inches (1200 mm) minimum below finish grade, whichever is deeper.
 7. Backfill only after pipe lines have been tested and inspected, and approved by Architect.
 8. Install piping system so it may contract and expand freely. Eliminate completely cross connections, backflow, and water hammer.

3.04 INSTALLATION - PIPE

- A. Perform trenching and backfilling required for work of this Section
- B. Maintain separation of water main from sewer piping in accordance with local codes.
- C. Group piping with other site piping work whenever practical.
- D. Install top of pipe at least 12 inches below frost line.
- E. Install crosslinked polyethylene tubing and fittings to AWWA C904.
- F. Place 18 gauge yellow tracer wire alongside when installing pipe:
 1. Tracer wire shall run from water main isolation valve to and past all connections and each fire hydrant and fire riser.
- G. Route pipe in straight line.
- H. Install pipe to allow for expansion and contraction without stressing pipe or joints.
- I. Slope water pipe and position drains at low points.
- J. Install shut-off valve at meter.
- K. Fire Suppression
 1. Regulatory Agency Sustainability Approvals:
 - a. Install exterior fire water system according to NFPA 13, NFPA 24, and AWWA Manual M41, 'Ductile-Iron Pipe and Fittings' procedures unless specified otherwise below.
 - b. Install hydrant in accordance with AWWA C502.
 - c. Install exterior fire water system up to and including pipe flange 12 inches (300 mm) above floor inside building.
 - d. Bury fire service mains at least 6 inch (150 mm) deeper than municipal water works piping. Additional depth of cover is necessary because of lack of water circulation in fire service mains.

3.05 INSTALLATION - VALVES AND HYDRANTS

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- A. Set valves on solid bearing.
- B. Center and plumb valve box over valve. Set box cover flush with finished grade.
- C. Set hydrants plumb; locate pumper nozzle perpendicular to and facing roadway in accordance with Section 21 1100.
- D. Set hydrants to grade, with nozzles at least 20 inches above ground in accordance with Section 21 1100.
- E. Locate control valve 4 inches away from hydrant.
- F. Provide a drainage pit 36 inches square by 24 inches deep filled with 2 inches washed gravel. Encase elbow of hydrant in gravel to 6 inches above drain opening. Do not connect drain opening to sewer.
- G. Paint hydrants in accordance with Section 09 9113.
 - 1. Fire Hydrant Color-Code:
 - a. Caps and Nozzle caps should be painted IAW NFPA 24:
 - 1) Less ten 500 gpm: Red
 - 2) 500 to 999 gpm: Orange
 - 3) 1000 to 1499 gpm: Green
 - 4) 1500 gpm and above Light Blue
- H. Provide anchorages for tees, plugs, caps, bends, and hydrants in accordance with NFPA 24.
- I. Miscellaneous Fittings:
 - 1. Clamps, Straps, And Washers: Steel, meeting requirements of ASTM A506.
 - 2. Rods: Steel, meeting requirements of ASTM A575.
 - 3. Rod Couplings: Malleable iron, meeting requirements of ASTM A197/A197M.
 - 4. Bolts: Steel, meeting requirements of ASTM A307.
 - 5. Cast Iron Washers: Meeting requirements of ASTM A126, Class A.
 - 6. Thrust Block: 2500 psi (17.92 MPa) concrete.

3.06 SERVICE CONNECTIONS

- A. Provide water service to utility company requirements with reduced pressure backflow preventer and water meter with bypass valves and sand strainer.
- B. Anchor service main to interior surface of foundation wall.

3.07 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Treat and test water supply until bacteriological testing results are negative.
- C. Pressure test water piping to 100 pounds per square inch.
 - 1. Pressure Test: Before covering pipes, test system in presence of Architect or governing agency at 100 psi (0.69 MPa) hydrostatic pressure for two (2) hours and show no leaks
- D. Field Tests
 - 1. Sterilization And Negative Bacteriological Test:
 - a. Sterilize potable water system with solution containing 200 parts per million minimum of available chlorine and maintaining a pH of 7.5 minimum. Introduce chlorinating materials into system in manner approved by Architect. Allow sterilization solution to remain for twenty-four (24) hours and open and close valves and faucets several times during that time.
 - b. After sterilization, flush solution from system with clean water until residual chlorine content is less than 0.2 parts per million.
 - c. Water system will not be accepted until negative bacteriological test is made on water taken from system. Repeat dosing as necessary until such negative test is accomplished.
- E. Field Tests: Fire Suppression Piping System

1. Test system according to NFPA 13 (2010, 2013, and 2016), figure 10.10.1, 'Contractor's Material and Test Certification for Underground Piping':
2. Provide signed copy of certificate with field test information with Closeout Submittals:
 - a. Certificate to include following information in 'Additional explanation and notes' area of certificate with following:
 - b. In-Building Riser: Manufacturer brand, size, material and size of trust blocking.

3.08 CLOSEOUT

- A. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 1. Record Documentation:
 2. Signed NFPA 13 'Contractor's Material and Test Certification for Underground Piping' with 'In-Building Riser' information included.

END OF SECTION

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**SECTION 33 3113
SITE SANITARY SEWERAGE GRAVITY PIPING**

PART 1 GENERAL**1.01 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Perform excavating and backfilling required for work of this Section.
 - 2. Furnish and install sanitary sewage system as described in Contract Documents beginning at 5 feet from where it enters building and connecting to serving sewer system.

1.02 SECTION INCLUDES

- A. Sanitary sewerage drainage piping, fittings, and accessories.
- B. Connection of building sanitary drainage system to municipal sewers.

1.03 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Concrete for cleanout base pad construction.
- B. Section 22 1313: 'Facility Sanitary Sewers' for sanitary sewage system within building and within 5 feet of building.
- C. Section 31 0500: 'Common Earthwork Requirements' for:
 - 1. Pre-installation conference held jointly with other common earthwork related sections.
- D. Section 31 2316 - Excavation and Trenching: Excavating of trenches.
- E. Section 31 2323 - Fill and Aggregate Base: Bedding and backfilling.

1.04 DEFINITIONS

- A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

1.05 REFERENCE STANDARDS

- A. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings 2020.
- B. ASTM A746 - Standard Specification for Ductile Iron Gravity Sewer Pipe 2018.
- C. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings 2020a.
- D. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings 2016.

1.06 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

1.07 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating pipe and pipe accessories.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- D. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.

1.08 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals
 - 1. Install cleanouts in accordance with local governing authority and State codes.

PART 2 PRODUCTS**2.01 SEWER PIPE MATERIALS**

- A. Provide products that comply with applicable code(s).

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- B. ABS:
 1. ABS Schedule 40 solid wall plastic pipe and fittings meeting requirements of ASTM D2661 joined with pipe cement meeting requirements of ASTM D2235.
- C. Cast Iron Soil Pipe: ASTM A74, service type, hub and spigot end.
 1. Joint Seals for Cast Iron Pipe: ASTM C564 rubber gaskets.
- D. PVC:
 1. Schedule 40 solid wall plastic pipe and fittings meeting requirements of ASTM D2665 joined using cement primer meeting requirements of ASTM F656 and pipe cement meeting requirements of ASTM D2564.
 2. Gasket joint gravity sewer pipe and fittings meeting requirements of ASTM D3034. Joints shall be integral wall and elastomeric gasket.
- E. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.

2.02 PIPE ACCESSORIES

- A. Trace Wire: Magnetic detectable conductor, clear plastic covering, imprinted with "Sewer Service" in large letters.
- B. Casing Spacer: Polyethylene spacer designed to maintain pipe casing integrity.
 1. Manufacturers:
 - a. Advance Products & Systems, LLC; www.apsonline.com/#sle.
 - b. American Brass & Iron; : www.abifoundry.com/#sle.
 - c. Anaco-Husky: www.anaco-husky.com/#sle.
 - d. Clamp-All Corp: www.clampall.com/#sle.
 - e. MG Piping Products Co: www.mgcoupling.com/#sle.
 - f. Substitutions: See Section 01 6000 - Product Requirements.

2.03 BEDDING AND COVER MATERIALS

- A. Pipe Bedding Material: As specified in Section 31 2323.
- B. Pipe Cover Material: As specified in Section 31 2323.

PART 3 EXECUTION

3.01 GENERAL

- A. Perform work in accordance with applicable code(s).
- B. Verification Of Conditions:
 1. Before installation, inspect pipe for defects and cracks.
 2. Do not use defective, damaged, or unsound pipe.

3.02 PREPARATION

- A. Excavate and backfill as specified in Sections 31 2316 and Section 31 2323 with following additional requirements:
 1. Runs shall be as close as possible to those shown on Contract Drawings.
 2. Excavate to required depth and grade to obtain fall required.
 3. Bottom of trenches shall be hard. Tamp as required.
 4. Remove debris from trench before laying pipe.
 5. Do not cut trenches near footings without consulting Architect/Engineer.
 6. Excavate trenches so outside pipe will be 12 inches minimum below frost line or 18 inches minimum below finish grade, whichever is deeper.

3.03 TRENCHING

- A. See Section 31 2316 for additional requirements.
- B. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.04 INSTALLATION - PIPE

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- A. General:
- B. When work is not in progress, close open ends of pipe and fittings so no trench water, soil, or other substances will enter pipes or fittings.
 - 1. Keep trenches free from water until pipe jointing material has set. Do not lay pipe when condition of trench or weather is unsuitable for such work.
- C. Trench width at top of pipe:
 - a. Minimum: 18 inches or diameter of pipe plus one foot, whichever is greater.
 - b. Maximum: Outside diameter of pipe plus two feet.
- D. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on layout drawings.
- E. Install pipe, fittings, and accessories in accordance with manufacturer's instructions. Seal watertight.
- F. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch in 10 feet.
 - 1. Deflections from straight line or grade, as required by vertical curves, horizontal curves, or offsets, shall not exceed $6/D$ inches per linear foot of pipe where D represents nominal diameter of pipe expressed in inches.
 - 2. Deflections to be determined between center lines extended of two connecting pipes.
 - 3. If alignment requires deflection in excess of these limitations, provide special bends or sufficient number of shorter lengths of pipe to provide angular deflections within limits approved by Architect.
 - 4. Laying:
 - a. Pipe laying shall proceed up-grade with spigot ends of bell-and-spigot pipe pointing in direction of flow.
 - b. Lay each pipe true to line and grade and in such manner as to form close concentric joint with adjoining pipe and to prevent sudden offsets of flow line.
 - c. As work progresses, clear interior of pipe of dirt and superfluous materials. Where cleaning after laying is difficult because of small pipe, keep suitable swab or drag in pipe and pull forward past each joint immediately after jointing has been completed.
 - d. Make joints between cast iron pipe and other types of pipe with standard manufactured cast-iron adapters and fittings.
 - e. Valve, plug, or cap, as directed by Architect, where pipe ends are left for future connections.
- G. Cast Iron Pipe And Fittings:
 - 1. Shape trench bottom to give substantially uniform circumferential support to lower third of each pipe. Provide depression under bell of each joint to maintain even bearing of sewer pipe.
 - 2. Connect to street main as required by local authorities.
 - 3. Use jacks to make-up gasketed joints.
- H. Plastic Pipe And Fittings:
 - 1. Install in accordance with Manufacturer's recommendations and ASTM D2321.
 - 2. Stabilize unstable trench bottoms.
 - 3. Bed pipe true to line and grade with continuous support from firm base.
 - a. Bedding depth: 4 to 6 inches.
 - b. Material and compaction to meet ASTM standard noted above.
 - 4. Excavate bell holes into bedding material so pipe is uniformly supported along its entire length. Blocking to grade pipe is forbidden.
 - 5. Piping and joints shall be clean and installed according to Manufacturer's recommendations. Break down contaminated joints, clean seats and gaskets and reinstall.
 - 6. Do not use backhoe or power equipment to assemble pipe.

- 7. Initial backfill shall be 12 inches (above top of pipe with material specified in referenced ASTM standard.
- 8. Minimum cover over top of pipe:
 - a. 36 inches before allowing vehicular traffic over pipe.
 - b. 48 inches before use of compaction equipment other than hand or impact tampers.
- I. Connect to building sanitary sewer outlet and municipal sewer system , through installed sleeves.
- J. Install trace wire 6 inches above top of pipe; coordinate with Section 31 2316.13.

3.05 FIELD QUALITY CONTROL

- A. Perform field inspection and testing in accordance with Section 01 4000.
- B. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.
- C. Protection:
 - 1. Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.

END OF SECTION

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**SECTION 33 4211
STORMWATER GRAVITY PIPING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Stormwater drainage piping.
- B. Stormwater pipe accessories.

1.02 RELATED REQUIREMENTS

- A. Section 31 2316 - Excavation and Trenching: Excavating of trenches.
- B. Section 31 2316.13 - Trenching: Excavating, bedding, and backfilling.
- C. Section 31 2323 - Fill and Aggregate Base: Bedding and backfilling.

1.03 REFERENCE STANDARDS

- A. AASHTO M 36 - Standard Specification for Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains 2016.
- B. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings 2020.
- C. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe 2020.
- D. ASTM C76M - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe (Metric) 2020.
- E. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets 2020.
- F. ASTM C443M - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (Metric) 2020.
- G. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings 2020a.
- H. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications 2020.
- I. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings 2016.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating pipe, pipe accessories, and cut sheets.
- C. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.
- D. Project Record Documents:
 - 1. Record location of pipe runs, connections, and invert elevations.
 - 2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

PART 2 PRODUCTS

2.01 STORMWATER PIPE MATERIALS

- A. Concrete Pipe: Reinforced, ASTM C76 (ASTM C76M), Class II with Wall type A; mesh reinforcement, bell and spigot end joints.
- B. Reinforced Concrete Pipe Joint Device: ASTM C443 (ASTM C443M) rubber compression gasket joint.
- C. Plastic Pipe: ASTM D3034, Type PSM, Poly Vinyl Chloride (PVC) material, bell and spigot style solvent sealed joint end.

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- D. Corrugated Polyethylene Pipe And Fittings:
 1. Meet requirements of AASHTO M 252 or AASHTO M 294, Type S.
 2. Corrugated, helical or annular, exterior with smooth interior and gasketed connectors.

2.02 PIPE ACCESSORIES

- A. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.
- B. Trace Wire: Magnetic detectable conductor, clear plastic covering, imprinted with "Stormwater Service" in large letters.

2.03 CATCH BASIN, CLEANOUT, AND AREA DRAIN COMPONENTS

- A. Catch Basins, Curb Inlets, Etc:
 1. Concrete:
 2. Construct of 5000 psi (34.47 MPa) minimum concrete.
 3. Include cover inlet with cast iron frame and grate as shown on Drawings.
- B. PVC:
 1. Comply with requirements of ASTM D3212, ASTM F794, and ASTM F1336.
 2. Metal grates, Frames, and hoods shall comply with ASTM A536, Grade 70-50-05.
 3. Type One Acceptable Products:
 - a. Nyloplast-ADS, Buford, GA (866) 888-8479. www.nyloplast-us.com.
 - b. Pedestrian grates required at all area drains in landscaping.
 - c. Equal as approved by Architect before bidding.

PART 3 EXECUTION

3.01 TRENCHING

- A. See Section 31 2316 - Excavation and Trenching and Section 31 2323 - Fill and Aggregate Base for additional requirements.
- B. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.02 INSTALLATION

- A. Install pipe, fittings, and accessories in accordance with manufacturer's instructions. Seal watertight.
 1. Plastic Pipe: Also comply with ASTM D2321.
- B. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch in 10 feet.
- C. Connect to building storm drainage system, foundation drainage system, and utility/municipal system.
- D. Install continuous trace wire 6 inches above top of pipe; coordinate with Section 31 2316.

3.03 FIELD QUALITY CONTROL

- A. Perform field inspection in accordance with Section 01 4000 - Quality Requirements.
- B. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

3.04 PROTECTION

- A. Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.

END OF SECTION

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**SECTION 33 5216
GAS HYDROCARBON PIPING**

PART 1 GENERAL**1.01 SUMMARY**

- A. Includes But Not Limited To:
 1. Furnish and install gas piping and fittings as described in Contract Documents from gas main to meter.
 2. Provide, make necessary arrangements for, and pay necessary fees to local gas utility company for gas service lines and proper size gas meter.
- B. Perform excavation and backfill required for work of this Section.

1.02 SECTION INCLUDES

- A. Pipe and fittings for natural gas distribution on site outside buildings.

1.03 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Foundations for concrete meter base.
- B. Section 05 0523 - Metal Fastening for welding standards and requirements.
- C. Section 22 1005 - Plumbing Piping.
- D. Section 23 1123 - Facility Natural-Gas Piping.
- E. Section 26 0583 - Wiring Connections.
- F. Section 31 2316 - Excavation and Trenching for excavating, bedding, and backfilling
- G. Section 31 2323 - Fill and Aggregate Base: Bedding and backfilling.

1.04 REFERENCE STANDARDS

- A. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300 2016.
- B. ASME BPVC - Boiler and Pressure Vessel Code 2019.
- C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless 2020.
- D. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service 2019.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Project Record Documents: Record actual locations of pipe mains, valves, connections, and invert elevations. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.06 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 1. Lay underground pipe in accordance with federal pipeline safety regulations and local gas utility company regulations and specifications.
- B. Qualifications: Requirements of Section 01 4301 applies, but not limited to following:
 1. Polyethylene Pipe Installers:
 - a. Properly trained and certified in procedure for joining polyethylene pipe.
 2. Welders:
 - a. Certified and bear evidence of certification 30 days before commencing work on project.
 - b. If there is doubt as to proficiency of welder, Owner's Representative may require welder to take another test.
 - c. This shall be done at no cost to Owner.
 - d. Certification shall be by Pittsburgh Testing Laboratories or other approved authority.

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1) Welders Certification: In accordance with ASME BPVC-IX.

C. Welding Materials and Procedures: Comply with ASME BPVC and applicable state regulations.

PART 2 PRODUCTS

2.01 PIPE

A. Manufacturers:

1. As required by local gas company.
2. Substitutions: See Section 01 6000 - Product Requirements.

B. Pipe And Fittings Above Ground (Steel): ASTM A53/A53M, Schedule 40 black:

1. Fittings (butt-welded if not fitted): ASME B16.3 malleable iron, ASME B16.11 forged steel, or ASTM A234/A234M wrought steel welding type.
2. Joints: Threaded.

C. Pipe And Fittings Below Ground (Polyethylene):

1. Polyethylene pipe and fittings meeting requirements of ASTM D2513 and SDR11.
2. Yellow color.
3. Joints: Mechanical or compression fit or fusion.
4. Do not store polyethylene pipe so it is exposed to sunlight.

D. Trace Wire: Magnetic detectable conductor, clear plastic covering, imprinted with "Natural Gas Service " in large letters.

2.02 GAS COCKS AND VALVES

A. Gas Cocks Up to 2 Inches: 150 psig water or gas (WOG), bronze body, bronze tapered plug, non-lubricated, Teflon packing, threaded ends with cast iron curb box, cover, and key.

B. Gas Cocks Over 2 Inches: 125 psig WOG, Cast iron body and tapered plug, non-lubricated, Teflon packing, threaded ends, with cast iron curb box, cover, and key.

PART 3 EXECUTION

3.01 TRENCHING

A. See Section 31 2316 and 31 2323 for excavation, bedding, and backfilling.

B. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.02 INSTALLATION - PIPING

A. Excavate and backfill as specified in Section 31 2316 and 31 2323 with following additional requirements:

1. Runs shall be as close as possible to those shown on Contract Drawings.
2. Excavate to required depth.
3. Bottom of trenches shall be hard. Tamp as required.
4. Remove debris from trench before laying pipe.
5. Do not cut trenches near footings without consulting Architect.
6. Place 4 inches of sand around pipe before trench is backfilled.
7. Bury outside pipe 12 inches minimum below frost line or 18 inches minimum below finish grade, whichever is deeper.
 - a. Establish elevations of buried piping to ensure not less than 24 inches of cover in non-travelled areas and 48 inches of cover in driveways and parking areas.
8. Backfill only after pipe lines have been tested, inspected, and approved by Architect.

B. General installation shall be as specified in Division 23:

1. Steel pipe 2-1/2 inches and larger shall have welded fittings and joints.
2. Provide 24 inch minimum steel pipe between vertical rise of riser and end of polyethylene line if anode-less riser is not used. Use plastic-to-steel transition or compression fitting between end of service line and steel meter riser. Provide cathodic protection for steel riser or use anode-less riser.

3. Place tracer wire along side of polyethylene pipe from meter to main and to the building.
- C. Group piping with other site piping work whenever practical.
- D. Route piping in straight line.
- E. Install piping to conserve space and not interfere with use of site space.
- F. Install piping to allow for expansion and contraction without stressing pipe or joints.
- G. Install cocks and other fittings.
- H. Install trace wire 6 inches above top of pipe; coordinate with Section 31 2316.13.
- I. Center and plumb valve box over valve. Set box cover flush with finished ground surface. Prevent shock or stress from being transmitted through valve box to valve.

3.03 FIELD QUALITY CONTROL

- A. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

END OF SECTION

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