
PROJECT MANUAL

A STAKE SUITE ADDITION FOR:

Syracuse Lake View YSA Stake Suite Syracuse UT Lake View YSA Stake

3301 WEST 6000 SOUTH
ROY, UTAH
PROPERTY NUMBER: 548-6467-24020101

MAY 5, 2025

OWNER

THE CHURCH OF JESUS CHRIST OF LATTER-DAY SAINTS

ARCHITECT



ea architecture

EVANS & ASSOCIATES ARCHITECTURE
11576 SOUTH STATE STREET • STE 103B
DRAPER • UT 84020
801.553.8272

CIVIL ENGINEER

EXCEL ENGINEERING, INC.

12 WEST 100 NORTH, #201, AMERICAN FORK, UTAH 84003
(801) 756-4504

LANDSCAPE ARCHITECT

IN SITE DESIGN GROUP

17 NORTH 470 WEST, AMERICAN FORK, UTAH 84003
(801) 756-5043

STRUCTURAL ENGINEER

BHB CONSULTING ENGINEERS, PC

2766 SOUTH MAIN STREET, SALT LAKE CITY, UTAH 84115
(801) 355-5656

MECHANICAL ENGINEER

VBFA

181 EAST 5600 SOUTH, SUITE 130, MURRAY, UTAH 84107
(801) 530-3148

ELECTRICAL ENGINEER

ENVISION ENGINEERING

240 EAST MORRIS AVE, #201, MURRAY, UTAH 84115
(801) 534-1130

AUDIO/VIDEO ENGINEER

ENVISION ENGINEERING

240 EAST MORRIS AVE, #201, MURRAY, UTAH 84115
(801) 534-1130

I N T R O D U C T O R Y I N F O R M A T I O N

B L A N K P A G E

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BIDDING REQUIREMENTS

FIXED SUM PROJECT (U.S.)

INVITATION TO BID (U.S.)

1. GENERAL CONTRACTORS INVITED TO BID THE PROJECT:

See the Bid Invitation and Information Form

2. PROJECT:

Syracuse Lake View YSA Stake Suite
Syracuse UT Lake View YSA Stake

3. LOCATION:

3301 West 6000 South
Roy, Utah

4. OWNER:

The Church of Jesus Christ of Latter-day Saints, a Utah corporation sole
c/o
Utah North Project Management Office
435 North Wall Avenue, Suite D
Ogden, Utah 84404

5. CONSULTANT:

Evans & Associates Architecture
11576 South State Street, Suite 103b
Draper, Utah 84020

6. DESCRIPTION OF PROJECT:

- A. A stake suite addition.
- 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 180 calendar days and will be as noted in the Agreement.

9. BID OPENING: Bids will be received by Owners preferred method at (time and date at place) to be announced. Bids will be publicly opened at (time and date at place) to be announced.

10. BIDDING DOCUMENTS:

- A. 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 at a time and place to be announced.
- B. Liquidated Damages - Conditions governing liquidated damages are specified in the General Conditions and in the Supplementary Conditions.
- C. Examination Schedule for Existing Building and Site
 - 1) The building will be available at the pre-bid meeting.
- D. Exemption from local taxes - See Supplementary Conditions

END OF DOCUMENT

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 GSH Geotechnical, 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.

END OF DOCUMENT

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 _____

Wood Flooring _____

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 _____

EIFS _____

Soffit / Fascia _____

Steeple _____

Millwork _____

Drywall _____

Ceramic Tile _____

Acoustical Tile _____

Painting _____

Wall Coverings _____

Elevators / Lifts _____

Draperies _____

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:** _____

CONSTRUCTION MATERIAL ASBESTOS STATEMENT (U.S.)

**PROJECTS FOR:
THE CHURCH OF JESUS CHRIST OF LATTER-DAY SAINTS,
a Utah corporation sole**

Building Name: _____

Building Plan Type: _____

Building Address: _____

Building Owner: The Church of Jesus Christ of Latter-day Saints, a Utah corporation sole.

Project Number: _____

Completion Date: _____

As PROJECT CONSULTANT and principal in charge; based on my best knowledge, information, inspection, and belief; I certify that on the above referenced Project, no asbestos-containing building materials were specified in the construction documents or given approval in shop drawings or submittals.

Project Consultant and Principal in Charge (signature) Date

Company Name

As GENERAL CONTRACTOR in charge of construction; based on my best knowledge, information, inspection, and belief; I affirm that on the above-referenced Project, no asbestos-containing building materials were used in the construction.

General Contractor (signature) Date

Company Name

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:	CONTRACTOR:
The Church of Jesus Christ of Latter-day Saints, a Utah corporation sole	(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: _____
_____	License No: _____
Reviewed By: _____	Date Signed: _____

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 \$500.00 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 \$500.00 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 \$250.00 per day.

ITEM 3 - PERMITS

1. Delete Section 3.6, Paragraph B of the General Conditions and replace with the following:
 - 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. The Owner will reimburse the contractor for all permits after proper receipts and backup has been submitted.

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

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

SECTION 01 1100**SUMMARY OF WORK****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
 - 1. Administrative and procedural requirements Summary of Work requirements.

1.2 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.

1.3 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.
 - 2. Work furnished and installed by Owner include, but are not limited to, following:
 - a. High Security Cylinders and Cores.
 - b. Selected Commercial Toilet Accessories.
 - c. Carpet and Carpet Base.

PART 2 - PRODUCTS Not Used**PART 3 - EXECUTION Not Used****END OF SECTION**

SECTION 01 1200**MULTIPLE CONTRACT SUMMARY****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
1. Administrative and procedural requirements for Multiple Contracts.

1.2 SUMMARY OF CONTRACTS

- A. 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. Sheet Carpeting. See Section 09 6816.
 3. Soap dispensers, paper towel dispensers, and toilet tissue dispensers. See Section 10 2813
 4. Testing and Inspection. See Section 01 4523 "Testing and Inspection" for testing and inspection, and testing laboratory services for materials, products, and construction methods:
 - a. Aggregate Base. See Section 31 1123.
 - b. Air System Testing, Adjusting, and Balance. See Section 01 4546.
 - c. Asphalt Paving. See Section 32 1216.
 - d. Concrete. See Section 03 3111.
 - e. Concrete Moisture Vapor Emission and Alkalinity level. See Section 09 0503, Section 09 6466, Section 09 6519, and Section 09 6567.
 - f. Drill-In Mechanical Anchors / Adhesive Anchors / Screw Anchors. See Section 03 1511 and Section 04 0519.
 - g. Fill / Engineering Fill. See Section 31 2323.
 - h. Font Water System. See Section 01 4543.
 - i. Headed Concrete Anchor Studs / Deformed Bar Anchors. See Section 03 1511.
 - j. Hot Water Heating System. See Section 01 4549.
 - k. Masonry (Non-structural). Tests and inspections is not required. See Section 04 0501 'Common Masonry Requirements'.
 - l. Reinforcement Bars. See Section 03 2100 (Epoxy-Coated Reinforcement Bars. See Section 03 2116).
 - m. Shop-Fabricated Wood Trusses: Metal Plate Connected Wood Trusses. See Section 06 1753.
 - n. Wood Panel Product Sheathing. See Section 06 1636.
 5. Tile Carpeting. See Section 09 6813.
- B. 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.
2. Furnishings.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

END OF SECTION

SECTION 01 1400**WORK RESTRICTIONS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
1. Administrative and procedural requirements for Work Restrictions.

1.2 PROJECT CONDITIONS

- A. During construction period, Contractor will have use of premises for construction operations. Contractor will ensure that Contractor, its employees, subcontractors, and their employees comply with following requirements:
1. Confine operations to areas within Contract limits shown on Drawings. Do not disturb portions of site beyond Contract limits.
 2. Do not allow alcoholic beverages, illegal drugs, or persons under their influence on Project site.
 3. Do not allow use of tobacco in any form on Project Site.
 4. Do not allow pornographic or other indecent materials on site.
 5. Do not allow work on Project site on Sundays except for emergency work.
 6. Refrain from using profanity or being discourteous or uncivil to others on Project Site or while performing The Work.
 7. Wear shirts with sleeves, wear shoes, and refrain from wearing immodest, offensive, or obnoxious clothing, while on Project Site.
 8. Do not allow playing of obnoxious and loud music on Project Site. Do not allow playing of any music within existing facilities.
 9. Do not build fires on Project Site.
 10. Do not allow weapons on Project Site, except those carried by law enforcement officers or other uniformed security personnel who have been retained by Owner or Contractor to provide security services.
- B. Existing Facilities:
1. Reasonably accommodate use of existing facilities by Owner.
- C. 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.

PART 2 - PRODUCTS Not Used**PART 3 - EXECUTION Not Used****END OF SECTION**

SECTION 01 2900**PAYMENT PROCEDURES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
 - 1. Administrative and procedural requirements to prepare and process Applications for Payments.

1.2 PAYMENT REQUESTS

- A. Use Payment Request forms provided by Owner.
- B. Each Payment Request will be consistent with previous requests and payments certified by Architect and paid for by Owner.
- C. Request Preparation:
 - 1. Complete every entry on Payment Request form.
 - 2. Entries will match data on approved schedule of values and Contractor's Construction Schedule. Use updated schedules if revisions have been made.
 - 3. Submit signed Payment Request to Architect with current Construction Schedule.
- D. 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.
- E. Provide Affidavit of Contractor and Consent of Surety with Payment Request following Substantial Completion.

1.3 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.

PART 2 - PRODUCTS Not Used**PART 3 - EXECUTION Not Used****END OF SECTION**

SECTION 01 3100**PROJECT MANAGEMENT AND COORDINATION****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
 - 1. Administrative and procedural requirements for Project Management and Coordination on Projects.

1.2 PROJECT COORDINATION

- A. 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.
- B. Project designation for this Project is LDS 548-6467.
- C. 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.

1.3 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.

1.4 PROJECT MEETINGS AND CONFERENCES

- A. Preconstruction Conference:
 - 1. Attend preconstruction conference and organizational meeting scheduled by Architect at Project site or other convenient location.
 - 2. Be prepared to discuss items of significance that could affect progress, including such topics as:
 - a. Construction schedule.
 - b. Critical Work sequencing.
 - c. Current problems.
 - d. Designation of responsible personnel.
 - e. Distribution of Contract Documents.
 - f. Equipment deliveries and priorities.
 - g. General schedule of inspections by Architect and its consultants.
 - h. General inspection of tests.
 - i. Office, work, and storage areas.
 - j. Preparation of record documents and O & M manuals.
 - k. Procedures for processing interpretations and Modifications.
 - l. Procedures for processing Payment Requests.
 - m. Project cleanup.

- n. Security.
 - o. Status of permits.
 - p. Submittal of Product Data, Shop Drawings, Samples, Quality Assurance / Control submittals.
 - q. Use of the premises.
 - r. Work restrictions.
 - s. Working hours.
3. Architect will record minutes of meetings and distribute copies to Owner and Contractor within three (3) working days.
- B. Progress Meetings:
- 1. Attend progress meetings at Project site at regularly scheduled intervals determined by Architect, at least once a month.
 - 2. Progress meetings will be open to Owner, Architect, Subcontractors, and anyone invited by Owner, Architect, and Contractor.
 - 3. Be prepared to discuss items of significance that could affect progress, including following:
 - a. Progress since last meeting.
 - b. Whether Contractor is on schedule.
 - c. Activities required to complete Project within Contract Time.
 - d. Labor and materials provided under separate contracts.
 - e. Off-site fabrication problems.
 - f. Access.
 - g. Site use.
 - h. Temporary facilities and services.
 - i. Hours of work.
 - j. Hazards and risks.
 - k. Project cleanup.
 - l. Quality and Work standards.
 - m. Status of pending modifications.
 - n. Documentation of information for Payment Requests.
 - o. Maintenance of Project records.
 - 4. Architect will prepare minutes of progress meetings and distribute copies of minutes to Owner and Contractor within three (3) working days.
- C. Pre-Installation Conferences:
- 1. Attend pre-installation conferences specified in Contract Document.
 - a. If possible, schedule these conferences on same day as regularly scheduled Progress Meetings. If this is not possible, coordinate scheduling with Architect.
 - b. Request input from attendees in preparing agenda.
 - 2. Be prepared to discuss following items:
 - a. Requirements of Contract Documents.
 - b. Completed work necessary for installation of items or systems.
 - c. Conditions not in compliance with installation requirements.
 - d. Installation and inspection schedule.
 - e. Coordination between trades.
 - f. Space and access limitations.
 - g. Testing.
 - 3. Architect will prepare meeting minutes and distribute minutes to Owner and Contractor within three (3) working days.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

END OF SECTION

SECTION 01 3200**CONSTRUCTION PROGRESS DOCUMENTATION****PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes But is Not Limited To:**

1. Administrative and procedural requirements for documenting the progress of construction during performance of the Work.

1.2 SCHEDULING OF WORK**A. Bar Chart Schedule:**

1. Submit horizontal bar chart schedule before Preconstruction Conference. Provide separate time bar for each construction activity listed on Owner's payment request form. Within each time bar, show estimated completion percentage. Provide continuous vertical line to identify first working day of each week. Show each activity in chronological sequence. Show graphically sequences necessary for completion of related portions of The Work. As The Work progresses, place contrasting mark in each bar to indicate actual completion.
2. Provide copies of schedule for Architect and Owner and post copy in field office.
3. Revise schedule monthly. Send copy of revised schedule to Owner and Architect and post copy in field office.
4. Project Management Software Programs:
 - a. 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.

B. Daily Construction Reports:

1. Prepare daily reports of operations at Project including at least following information:
 - a. List of Subcontractors at site.
 - b. Approximate count of personnel at site by trade.
 - c. High and low temperatures, general weather conditions.
 - d. Major items of equipment on site.
 - e. Materials, equipment, or Owner-furnished items arriving at or leaving site.
 - f. Accidents and unusual events.
 - g. Site or structure damage by water, frost, wind, or other causes.
 - h. Meetings, conferences, and significant decisions.
 - i. Visitors to the job including meeting attendees.
 - j. Stoppages, delays, shortages, losses.
 - k. Any tests made and their result if known.
 - l. Meter readings and similar recordings.
 - m. Emergency procedures.
 - n. Orders and requests of governing authorities.
 - o. Modifications received, carried out.
 - p. Services connected, disconnected.
 - q. Equipment or system tests and start-ups.
 - r. Brief summary of work accomplished that day.
 - s. Signature of person preparing report.
2. Submit daily reports to Architect at least weekly.
3. Maintain copies of daily reports at field office.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

END OF SECTION

SECTION 01 3300**SUBMITTAL PROCEDURES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
 - 1. Administrative and procedural requirements for Submittal Procedures.
- B. Related Requirements:
 - 1. Section 01 7800: 'Closeout Submittals' for administrative and procedural requirements for closeout submittals.

1.2 SUBMITTAL SCHEDULE

- A. Furnish submittal schedule within 20 days after receipt of Notice to Proceed, listing items specified to be furnished for review to Architect including product data, shop drawings, samples, and Informational submittals.
 - 1. Coordinate submittal schedule with Contractor's construction schedule.
 - 2. 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.
- 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.

1.3 SUBMITTAL PROCEDURES

- A. Coordination:
 - 1. Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently before performance of related construction activities to avoid delay.
 - a. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - b. Coordinate transmittal of different types of submittals required for related elements of The Work so processing will not be delayed by need to review submittals concurrently for coordination. Architect reserves right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
 - 2. Processing Time:
 - a. Allow sufficient review time so installation will not be delayed by time required to process submittals, including time for resubmittals.
 - 1) Allow 21 days for initial review. Allow additional time if processing must be delayed allowing coordination with subsequent submittals. Architect will promptly advise Contractor when submittal being processed must be delayed for coordination.

- 2) If an intermediate submittal is necessary, process same as initial submittal.
 - 3) Allow 10 days for reprocessing each submittal.
 - 4) 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.
3. 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.
4. Transmittal:
- a. Package each submittal appropriately for transmittal and handling. Transmit each submittal from Contractor to Architect using transmittal letter. On transmittal, record relevant information and requests for data. Include Contractor's certification that information complies with Contract Document requirements, or, on form or separate sheet, record deviations from Contract Document requirements, including minor variations and limitations.
 - b. Submittals received from sources other than Contractor or not marked with Contractor's approval will be returned without action.

1.4 ACTION SUBMITTALS

- A. Product Data:
1. Submit Product Data, as required by individual Sections of Specifications.
 2. 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.
 3. Certify that proposed product complies with requirements of Contract Documents. List any deviations from those requirements on form or separate sheet.
 4. Submit electronic files PDF: Architect will return a PDF copy marked with action taken and with corrections or modifications required.
- B. Shop Drawings:
1. Submit newly prepared graphic data to accurate scale. Except for templates, patterns, and similar full-size Drawings, submit Shop Drawings on sheets at least **8-1/2 by 11 inches (215 by 280 mm)** but no larger than **36 by 48 inches (915 by 1 200 mm)**. 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.
 2. Do not reproduce Contract Documents or copy standard information as basis of Shop Drawings. Standard printed information prepared without specific reference to Project is not acceptable as Shop Drawings.
 3. Review and designate (stamp) approval of shop drawings. Unless otherwise specified, submit electronic files PDF: Architect will return a PDF copy marked with action taken and with corrections or modifications required. Shop drawings not required by Contract Documents, but requested by Contractor or supplied by Subcontractor, need not be submitted to Architect for review.

C. Samples:

1. 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.
2. 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.
3. 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.
4. 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.
5. 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.

1.5 INFORMATIONAL SUBMITTALS

- A. Informational submittals are design data, test reports, certificates, manufacturer's instructions, manufacturer's field reports, and other documentary data affirming quality of products and installations. Submit electronic files: PDF. Architect will return a PDF copy marked with action taken and with corrections or modifications required.
 1. Certificates: Describe certificates intended to document affirmations by Contractor or others that the work is in accordance with the Contract Documents, but do not repeat provisions of Parts 2 or 3.
 2. Delegated Design Submittals / Design Data: Describe submittals intended to demonstrate design work prepared by Contractor's licensed professionals.
 3. Test And Evaluation Reports: Describe submittal of test reports or evaluation service reports intended to document required tests.
 4. Manufacturer Instructions: Describe submittals intended to document manufacturer instructions.
 5. Source Quality Control Submittals: Describe submittal of source quality control documentation.
 6. Field Quality Control Submittals: Describe submittal of field quality control documentation.
 7. Manufacturer Reports: Describe submittal of Manufacturer reports as documentation of manufacturer activities.
 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 qualifications of entities employed by Contractor.

1.6 CLOSEOUT SUBMITTALS

- A. This title groups submittals that occur during project closeout. Coordinate with section 01 7800 Closeout Submittals.
 1. As Built Record Drawings as defined in the Agreement.
 2. Project Manual: Complete Project Manual including Addenda and Modifications as defined in General Conditions.
 3. Maintenance Contracts: Describe submittal of the maintenance contract specific to the Section.
 4. Operations & Maintenance Data: Describe submittal of operation and maintenance data necessary for products of the Section.
 5. Warranty Documentation: Describe submittal of final executed warranty document specific to the Section.
 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.

1.7 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.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

END OF SECTION

SECTION 01 3500**SPECIAL PROCEDURES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
 - 1. Administrative and procedural requirements for Special Procedures.

1.2 REFERENCES

- A. Association Publications:
 - 1. U.S. Department of Labor, Occupational Safety and Health Administration:
 - a. 29 CFR 1926 OSHA, 'Construction Industry Regulations' (January 2014 or latest version).
 - 1) 29 CFR 1926.20, 'General Safety And Health Provisions'.
 - 2) 29 CFR 1926.64, 'Hot Work Permit'.
 - 3) 29 CFR 1926.352, 'Fire Prevention'.
 - 4) 29 CFR 1926.500, 'Fall Protection'.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Acceleration of Work:
 - 1. 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.
 - 2. Owner may request proposal for completion of The Work at date earlier than expiration of Contract Time:
 - a. 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.
 - b. 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.

1.4 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Meet regulations of 29 CFR 1926 OSHA, 'Construction Industry Regulations'.
 - 2. Owner's Safety Requirements:
 - a. Personal Protection:
 - 1) Contractor shall ensure:
 - a) 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.
 - b) Personnel working on Project shall wear hard hats and safety glasses as required by regulation and hazard.
 - c) 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.
 - b. Contractor Tools And Equipment:
 - 1) Contractor shall ensure:

- a) Tools and equipment are in good working condition, well maintained, and have necessary guards in place.
- b) Ground Fault Circuit Interrupters (GFCI) is utilized on power cords and tools.
- c) Scaffolding and man lifts are in good working condition, erected and maintained as required by governmental regulations.
- d) Ladders are in good condition, well maintained, used as specified by Manufacturer, and secured as required.
- c. Miscellaneous:
 - 1) Contractor shall ensure:
 - a) Protection is provided on protruding rebar and other similar objects.
 - b) General Contractor Superintendent has completed the OSHA 10-hour construction outreach training course or equivalent.
 - c) Implementation and administration of safety program on Project.
 - d) Material Safety Data Sheets (MSDS) are provided for substances or materials for which an MSDS is required by governmental regulations before bringing on site.
 - e) Consistent safety training is provided to employees on Project.
 - f) Implement and coordinate Lockout / Tagout procedures with Owner's Representative as required.
 - 2) Report accidents involving injury to employees on Project that require off-site medical treatment to Owner's designated representative.
- d. Hot Work Permit:
 - 1) 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.
 - 2) 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.

PART 2 - PRODUCTS Not Used**PART 3 - EXECUTION Not Used**

END OF SECTION

SECTION 01 4000**QUALITY REQUIREMENTS****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Related Requirements:
 - 1. Section 01 3100: 'Project Management and Coordination' for Pre-Installation Conferences for testing and inspection.
 - 2. Section 01 3200: 'Construction Progress Documentation' for developing a schedule of required tests and inspections.
 - 3. Section 01 3300: 'Submittal Procedures'.
 - 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 01 7300: 'Executions' for cutting and patching for repair and restoration of construction disturbed by testing and inspecting activities.
 - 7. Divisions 01 thru 49 establish responsibility for providing specific testing and inspections.

1.3 REFERENCES

- A. Definitions:
 - 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. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with requirements indicated; and having complied with requirements of authorities having jurisdiction.
 - 4. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a construction operation, including installation, erection, application, and similar operations.
 - a. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to trades people of corresponding generic name.
 - 5. Mockups: Full-size, physical assemblies that are constructed on-site. Mockups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Approved mockups establish standard by which the Work will be judged.

6. 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.
7. 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.
8. 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.
9. Service Provider: Agency or firm qualified to perform required tests and inspections.
10. Source Quality Control Testing: Tests and inspections that are performed at source, i.e., plant, mill, factory, or shop.
11. Testing Agency: Entity engaged to perform specific tests, inspections, or both.
12. Testing Agency Laboratory: Agency or firm qualified to perform field and laboratory tests to determine characteristics and quality of materials and workmanship.
13. Verification: Act of reviewing, inspecting, testing, etc. to establish and document that product, service, or system meets regulatory, standard, or specification requirements.

B. Reference Standards:

1. International Code Council (IBC) (2015 or most recent edition adopted by AHJ):
 - a. IBC Chapter 17, 'Structural Tests and Special Inspections'.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Conflicting Requirements:

1. General:
 - a. If compliance with two or more standards is specified and standards establish different or conflicting requirements for minimum quantities or quality levels, comply with most stringent requirement.
 - b. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.
2. Minimum Quantity or Quality Levels:
 - a. Quantity or quality level shown or specified shall be minimum provided or performed.
 - b. Actual installation may comply exactly with minimum quantity or quality specified, or it may exceed minimum within reasonable limits.
 - c. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for context of requirements.
 - d. Refer uncertainties to Architect for decision before proceeding.

B. 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.

C. Scheduling:

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.5 QUALITY ASSURANCE

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 and Section 01 4523. 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. Quality Assurance Services:
1. 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.
 2. Owner or Owner's designated representative(s) will perform quality assurance to verify compliance with Contract Documents.
- C. 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.
- D. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with following requirements, using materials indicated for completed Work:
1. Coordinate with individual section in Division 01 through Division 49 if there are any additional requirements or modification to these requirements:
 - a. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
 - b. Notify Architect seven days in advance of dates and times when mockups will be constructed.
 - c. Demonstrate proposed range of aesthetic effects and workmanship.
 - d. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
 - 1) Allow seven days for initial review and each re-review of each mockup.
 - e. Maintain mockups during construction in undisturbed condition as standard for judging completed Work.
 - 1) Demolish and remove mockups when directed, unless otherwise indicated.

1.6 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.
- B. Manufacturer's Field Services: Where indicated, engage factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 01 3300: 'Submittal Procedures'.
- C. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality control services, and provide reasonable auxiliary services as requested. Notify Testing Agency sufficiently in advance of operations to permit assignment of personnel. Provide following:
 - 1. Access to the Work.
 - 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 - 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist Testing Agency in obtaining samples.
 - 4. Facilities for storage and field curing of test samples.
 - 5. Delivery of samples to testing agencies.
 - 6. Preliminary design mix proposed for use for material mixes that require quality control by Testing Agency.
 - 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- D. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections:
 - 1. Civil And Structural Testing:
 - a. Civil and structural field tests, laboratory testing, and inspections are provided by Owner's independent Testing Agency as specified in Section 01 4523 'Testing And Inspection Services'. 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.
 - 2) Contractor bears full responsible for compliance with all contract requirements and quality control on project and will be responsible for quality of asphalt mixture and asphalt installation.
 - b. Weekly Activities:
 - 1) Ensure that non-compliance log is current.
 - 2) Provide summary reports of performed Work.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Provide materials and comply with installation requirements specified in other 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 7300 'Execution' for cutting and patching.
- B. Protect construction exposed by or for Quality Assurance and Quality Control activities.

- C. Repair and protection are Contractor's responsibility, regardless of assignment of responsibility for Quality Assurance and Quality Control Services.

END OF SECTION

SECTION 01 4200**REFERENCES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
1. Reference standards, definitions, specification format, and industry standards.

1.2 REFERENCES

- A. Definitions:
1. Approved: The term "approved," when used to convey Architect's action on Contractor's submittals, applications, and requests, is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
 2. Directed: The term "directed" is a command or instruction by Architect. Other terms including "requested," "authorized," "selected," "approved," and "permitted" have the same meaning as "directed."
 3. Experienced: The term "experienced," when used with an entity, means having successfully completed a minimum often previous projects similar in size and scope to this Project; being familiar with the special requirements indicated, and having complied with requirements of authority having jurisdiction.
 4. Furnish: The term "furnish" means supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
 5. General: Basic Contract definitions are included in the Conditions of the Contract.
 6. Indicated: The term "indicated" refers to requirements expressed by graphic representations, or in written form on Drawings, in Specifications, and in other Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the user locate the reference.
 7. Install: The term "install" describes operations at Project site including unloading, temporary storage, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
 8. Installer: An "Installer" is the Contractor, or another entity engaged by the Contractor, as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
 9. Project Site: The term "Project site" means the space available for performing construction activities. The extent of the Project site is shown on the Drawings and mayor may not be identical with the description of the land on which the Project is to be built.
 10. Provide: The term "provide" means to furnish and install, complete and ready for the intended use.
 11. Regulations: The term "regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
 12. Submitted: The terms "submitted," "reported," "satisfactory" and similar words and phrases means submitted to Architect, reported to Architect and similar phrases.
 13. Testing Agencies: A "testing agency" is an independent entity engaged to perform specific inspections or tests, either at the Project site or elsewhere, or to report on and, if required, to interpret results of those inspections or tests.
 14. Trades: Using terms such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespersons of the corresponding generic name.
- B. References Standards:

1. Specification Format: Specifications will follow MasterFormat™ 2004 for organizing numbers and titles. (The Construction Specifications Institute, Project Resource Manual/CSI Manual of Practice, 5th Edition. New York, McGraw-Hill, 2005).
 - a. Specification Identifications:
 - 1) The Specifications use section numbers and titles to help cross referencing in the Contract Documents.
 - 2) Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of sections in the Contract Documents.
 - b. Specification Language:
 - 1) Specifications should be prepared, with concern and respect for their legal status. Specifications should be Clear, Concise, Correct and Complete.
 - 2) Streamlining: Streamlining is used to list products, materials, reference standards, and other itemized specifications. This technique places the subject first and provides keywords for quick reference
 - c. Sentence Structure:
 - 1) Specifications to be written in the "Imperative Mood".
 - a) The verb that clearly defines the action becomes the first word in the sentence.
 - b) The imperative sentence is concise and readily understandable.
 - 2) Streamlining is used to list products, materials, reference standards, and other itemized specifications. This technique places the subject first and provides keywords for quick reference.
 - d. Abbreviated Language:
 - 1) Abbreviations should be used only on drawings and schedules where space is limited.
 - 2) Abbreviations with multiple meanings should be avoided, unless used in different disciplines where their meaning is clear from the context in which they are used.
 - 3) Abbreviations should be limited to five or fewer letters
 - a) The verb that clearly defines the action becomes the first word in the sentence.
 - e. Symbols:
 - 1) Caution should apply to symbols substituted for words or terms.
 - f. Numbers:
 - 1) The use of Arabic numerals rather than words for numbers is recommended.

C. Industry Standards:

1. Except where Contract Documents specify otherwise, construction industry standards will apply and are made a part of Contract Documents by reference.
2. 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.
3. 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.
4. Trade Association names and titles of general standards are frequently abbreviated. The following acronyms or abbreviations, as referenced in Contract Documents, are defined to mean association names. Names and addresses are subject to change and are believed to be, but are not assured to be, accurate and up to date as of date of Contract Documents.

AABC	Associated Air Balance Council	Washington	DC	(202) 737-0202	www.aabchq.com
AAMA	American Architectural Manufacturers Association	Schaumburg	IL	(847) 303-5664	www.aamanet.org
AASHTO	American Association of State Highway & Transportation Officials	Washington	DC	(202) 624-5800	www.aashto.org

AAMA	American Architectural Manufacturers Association	Schamamburg	IL	(847) 303-5774	www.aamanet.org
AASHTO	American association of State Highways and Transportation Officials	Washington	DC		www.transportation.org www.aashto.org
ACI	American Concrete Institute International	Farmington Hills	MI	(248) 848-3700	www.aci-int.org
AGA	American Gas Association	Washington	DC	(202) 824-7000	www.aga.org
AHRI	Air Conditioning Heating & Refrigeration Institute	Arlington	VA	(703) 524-8800	www.ari.org
AIA	American Institution of Architects	Washington	DC	(202) 626-7300	www.aia.org
AISC	American Institute of Steel Construction	Chicago	IL	(312) 670-2400	www.aisc.org
AISI	American Iron & Steel Institute	Washington	DC	(202) 452-7100	www.steel.org
AITC	American Institution of Timber Construction	Englewood	CO	(303) 792-9559	www.aitc-glulam.org
AMCA	Air Movement & Control Association International	Arlington Heights	IL	(847) 394-0150	www.amca.org
ANSI	American National Standards Institute	New York	NY	(212) 642-4900	www.ansi.org
APA	APA-Engineered Wood Association	Tacoma	WA	(253) 565-6600	www.apawood.org
API	American Petroleum Institute	Washington	DC	(202) 682-8000	www.api.org
AQMD	South Coast Air Quality Management District	Diamond Bar	CA	(909) 396-2000	www.aqmd.gov
ASHRAE	American Society of Heating, Refrigerating, & Air-Conditioning Engineers	Atlanta	GA	(404) 636-8400	www.ashrae.org
ASME	American Society of Mechanical Engineers International	New York	NY	(800) 843-2763	www.asme.org
ASTM	ASTM International	West Conshohocken	PA	(610) 832-9500	www.astm.org
AWI	Architectural Woodwork Institute	Potomac Falls	VA	(571) 323-3636	www.awinet.org
AWPA	American Wood Protection Association	Birmingham	AL	(205) 733-4077	www.awpa.com
AWS	American Welding Society	Miami	FL	(800) 443-9353	www.aws.org
AWWA	American Water Works Assoc	Denver	CO	(303) 794-7711	www.awwa.org
BHMA	Builders Hardware Manufacturers Association	New York	NY	(212) 297-2122	www.buildershardware.com
BIA	Brick Industry Association	Reston	VA	(703) 620-0010	www.bia.org
CFI	International Certified Floor-covering Installers, Inc.	Kansas City	MO	(816) 231-4646	www.cfi-installers.org
CRI	Carpet & Rug Institution	Dalton	GA	(706) 278-3176	www.carpet-rug.com
CRSI	Concrete Reinforcing Steel Institute	Schaumburg	IL	(847) 517-1200	www.crsi.org
CISPI	Cast Iron Soil Pipe Institute	Chattanooga	TN	(423) 892-0137	www.cispi.org
DHI	Door & Hardware Institute	Chantilly	VA	(703) 222-2010	www.dhi.org
DIPRA	Ductile Iron Pipe Research Association.	Birmingham	AL	(205) 402-8700	www.dipra.org
EIMA	EIFS Industry Members Association	Morrow	GA	(800) 294-3462	www.eima.com
FM	FM Global	Johnston	RI	(401) 275-3000	www.fmglobal.com

FSC	Forest Stewardship Council	Bonn, Germany		+49 (0) 228 367 66 0	www.fsc.org
GA	Gypsum Association	Hyattsville	MD	(301) 277-8686	www.gypsum.org
GS	Green Seal	Washington	DC	(202) 872-6400	www.greenseal.org
HPVA	Hardwood Plywood & Veneer Association	Reston	VA	(703) 435-2900	www.hpva.org
ICC	International Code Council	Washington	DC	(888) 422-7233	www.iccsafe.org
ICC-ES	ICC Evaluation Service	Whittier	CA	(562) 699-0543	www.icc-es.org
ICBO	International Conference of Building Officials				(See ICC)
ISO	International Organization for Standardization	Geneva, Switzerland			www.iso.org
ISSA	International Slurry Surfacing Association	Annapolis	MD	(410) 267-0023	www.slurry.org
KCMA	Kitchen Cabinet Manufacturers Association	Reston	VA	(703) 264-1690	www.kcma.org
LPI	Lightning Protection Institute	Maryville	MO	(800) 488-6864	www.lightning.org
MFMA	Maple Flooring Manufacturers' Association	Deerfield	IL	(888) 480-9138	www.maplefloor.org
MSS	Manufacturer's Standardization Society of The Valve and Fittings Industry	Vienna	VA	(703) 281-6613	www.mss-hq.com
NAAMM	National Association of Architectural Metal Manufacturers	Glen Ellyn	IL	(630) 942-6591	www.naamm.org
NEC	National Electric Code	(from NFPA).			
NEMA	National Electrical Manufacturer's Association	Rosslyn	VA	(703) 841-3200	www.nema.org
NFPA	National Fire Protection Association	Quincy	MA	(800) 344-3555	www.nfpa.org
NFRC	National Fenestration Rating Council	Greenbelt	MD	(301) 589-1776	www.nfrc.org
NSF	NSF International	Ann Arbor	MI	(734) 769-8010	www.nsf.org
PCA	Portland Cement Association	Skokie	IL	(847) 966-6200	www.cement.org
PCI	Precast / Prestressed Concrete Institute	Chicago	IL	(312) 786-0300	www.pci.org
PEI	Porcelain Enamel Institute	Norcross	GA	(770) 676-9366	www.porcelainenamel.com
RFCI	Resilient Floor Covering Institute	LaGrange	GA	(706) 882-3833	www.rfci.com
SCTE	Society of Cable Telecommunications Engineers	Exton	PA	(800) 542-5040	www.scte.org
SDI	Steel Deck Institute	Fox River Grove	IL	(847) 458-4647	www.sdi.org
SDI	Steel Door Institute	Westlake	OH	(440) 899-0010	www.steeldoor.org
SIGMA	Sealed Insulating Glass Manufacturer's Association	Chicago	IL	(312) 644-6610	www.arcat.com
SJI	Steel Joist Institute	Myrtle Beach	SC	(843) 293-1995	www.steeljoist.org
SMACNA	Sheet Metal & Air Conditioning Contractors National Association	Chantilly	VA	(703) 803-2980	www.smacna.org
SPIB	Southern Pine Inspection Bureau	Pensacola	FL	(850) 434-2611	www.spib.org
SSMA	Steel Stud Manufacturer's Association	Glen Ellyn	IL	(630) 942-6592	www.ssma.com
TCNA	Tile Council of North America	Anderson	SC	(864) 646-8453	www.tileusa.com
TPI	Truss Plate Institute	Alexandria	VA	(703) 683-1010	www.tpinst.org

TPI	Turfgrass Producers International (formally American Sod Producers Association)	East Dundee	IL	(847) 649-5555	www.turfgrasssod.org
UL	Underwriters Laboratories	Camas	WA	(877) 854-3577	www.ul.com
WDMA	Window and Door Manufacturer's Association	Chicago	IL	(312) 321-6802	www.nwwda.org
WWPA	Western Wood Products Association	Portland	OR	(503) 224-3930	www.wwpa.org

D. Federal Government Agencies:

- Names and titles of federal government standard or specification producing agencies are often abbreviated. Following acronyms or abbreviations referenced in Contract Documents represent names of standard or specification producing agencies of federal government. Names and addresses are subject to change but are believed to be, but are not assured to be, accurate and up to date as of date of Contract Documents.

CS	Commercial Standard (U S Department of Commerce)	Washington	DC	(202) 512-0000	www.doc.gov
EPA	Environmental Protection Agency	Washington	DC	(202) 272-0167	www.epa.gov
FCC	Federal Communications Commission	Washington	DC	(888) 225-5322	www.fcc.gov
FS	Federal Specifications Unit (Available from GSA)	Washington	DC	(202) 619-8925	www.gsa.gov
MIL	Military Standardization Documents (U S Department of Defense)	Philadelphia	PA	(215) 697-2179	www.dod.gov
NIST	National Institute of Standards and Technology, technology Administration (US Department of Commerce)	Gaithersburg	MD	(301) 975-4500	www.ts.nist.gov
OSHA	Occupational Safety & Health Administration (U S Department of Labor)	Washington	DC	202) 219-8148	www.osha.gov
PS	Product Standard of NBS (U S Department of Commerce)	Washington	DC	(202) 512-1800	www.doc.gov

E. Governing Regulations / Authorities:

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

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

END OF SECTION

SECTION 01 4301**QUALITY ASSURANCE - QUALIFICATIONS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Related Documents:
 - 1. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Requirements:
 - 1. Section 01 4000: 'Quality Requirements' includes administrative and procedural requirements for quality assurance and quality control.
 - 2. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.

1.2 REFERENCES

- A. Definitions:
 - 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. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
 - 3. Testing Agency: Entity engaged to perform specific tests, inspections, or both.
 - 4. Testing Agency Laboratory: Agency or firm qualified to perform field and laboratory tests to determine characteristics and quality of materials and workmanship.
- B. Reference Standards:
 - 1. ASTM International:
 - a. ASTM E329-18, 'Standard Specification for Agencies Engaged in Construction Inspection and/or Testing.'

1.3 QUALIFICATIONS

- A. Qualifications: Qualifications paragraphs in this Article establish minimum qualification levels required; individual Specification Sections specify additional requirements:
 - 1. Manufacturers / Distributors / Fabricator / Suppliers / Installers 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. Owner established Relationships:
 - 1) Where heading 'Category One, Two, or Three Approved' *Manufacturers / Suppliers / Distributors / Installers* is used to identify list Owner established Relationships, Owner has established relationships that extend beyond requirements of this Project.
 - 2) No other *Manufacturers / Suppliers / Distributors / Installers* will be acceptable.
 - 3) Follow specified procedures to preserve relationships between Owner and specified *Manufacturers / Suppliers / Distributors / Installers* and advantages that accrue to Owner from those relationships.
 - 4) Following areas of the Work have restrictions on sub-bids by Contractor:

- a) Aluminum-Framed Entrances And Storefronts, Section 08 4113: Category Three Approved, no other Manufacturer / Installers accepted.
 - b) Architectural Woodwork, Section 06 4001: Category Three Approved, no other Fabricator accepted except approved Alternate Fabricator.
 - c) Asphalt Shingles, Section 07 3113: Category Three Approved, no other Manufacturer / Installers accepted.
 - d) Common Finish Hardware Requirements, Section 08 7101: Category Three Approved, no other Supplier accepted:
 - (1) Accessories, Section 08 7109.
 - (2) Accessories for Pairs of Doors, Section 08 7105.
 - (3) Closing Devices, Section 08 7106.
 - (4) Hanging Devices, Section 08 7102.
 - (5) Operating Trim, Section 08 7104.
 - (6) Protective Plates and Trim, Section 08 7107.
 - (7) Securing Devices, Section 08 7103.
 - (8) Stops and Holders, Section 08 7108.
 - e) Flush Wood Doors: Factory Finished, Clear, Section 08 1429: Category Three Approved, no other Supplier accepted.
 - f) Hollow Metal Frames, Section 08 1213: Category Three Approved, no other Supplier accepted.
 - g) Sheet Carpeting, Section 09 6816: Category One Approved, no other Manufacturer / Installers accepted.
 - h) Tile Carpeting, Section 09 6813: Category One Approved, no other Manufacturer / Installers accepted.
 - i) Wood Framing, Division 06 'Wood', Category Three Approved, no other Supplier accepted for USA Projects Only except approved Supplier:
 - (1) Glue-Laminated Construction, Section 06 1800.
 - (2) Structural Composite Lumber, Section 06 1712.
 - (3) Wood Framing, Section 06 1100.
 - (4) Wood 'I' Joists, Section 06 1733.
 - (5) Wood-Panel Product Sheathing, Section 06 1636.
- b. 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.
 - 3) Following areas of the Work have restrictions on sub-bids by which may be accepted by Contractor:
 - a) Architectural Woodwork, Sections 06 4001: Alternate Fabricator approved by Architect before bidding.
 - b) Audio Systems, Section 27 5117: Alternate Installers approved by Owner before bidding.
 - c) Ceramic Tiling, Section 09 3013: No other Suppliers accepted.
 - d) Electric And Electronic Control System for HVAC, Section 23 0933, No other Distributors accepted.
 - e) Rough Carpentry, Sections 06 1100, 06 1636, 06 1712, 06 1733, and 06 1800: Alternate Supplier approved by Architect before bidding.
 - f) Sound, Division 27: Installers approved by Architect before bidding.
 - g) Video Systems, Section 27 4117: Alternate Installers approved by Owner before bidding.
- c. 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.
 - a) Underground Sprinklers, Section 32 8423: Acceptable Landscape Installers approved by Landscape Architect before bidding. Equal Landscape Installers to be approved by Architect before bidding.
 - 2) Following areas of the Work have restrictions on sub-bids by Contractor:

- a) Baptismal Font Railing, Section 11 9119, Acceptable Installers are listed for each state. Equal Installers to be approved by Architect before installation.
- 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:
 - 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.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

END OF SECTION

SECTION 01 4523**TESTING AND INSPECTING SERVICES****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. This Section includes testing, inspections, special testing, special inspections, and testing laboratory services for materials, products, and construction methods as specified hereafter for the Work.
- B. Specified tests, inspections, and related actions do not limit Contractor's quality control procedures to fully comply with Contract Document requirements in all regards.
- C. Costs: Costs of initial services for testing and inspection personnel will be paid by Owner unless otherwise noted.
 - 1. If initial tests indicate non-compliance with contract document requirements, any subsequent testing will be performed by same personnel and paid for by Contractor.
- D. Related Requirements:
 - 1. Section 01 4000: 'Quality Requirements' includes administrative and procedural requirements for quality assurance and quality control.
 - 2. Section 01 4301: 'Quality Assurance – Qualifications' establishes minimum qualification levels required.
 - 3. Division 01 through Division 49 establish responsibility for providing specific testing and inspections and Field Tests and Inspections.

1.3 REFERENCES

- A. Association Publications:
 - 1. Council of American Structural Engineers. 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).
 - 2. International Code Council (IBC):
 - a. IBC Chapter 17, 'Structural Tests and Special Inspections'.
- B. Definitions:
 - 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. Field Quality Control: Testing, Inspections, Special Testing and Special Inspections to assure compliance to Contract Documents.
 - 4. Inspection/Special Inspection:
 - a. Inspection: Not required by code provisions but may be required by Contract Documents.
 - b. Special Inspection: Inspection required of materials, installation, fabrication, erection or placement of components and connections requiring special expertise to ensure compliance

- with approved construction documents and reference standards (required by code provisions and by Contract Documents).
- c. Special 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. Special 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.
5. Mockups: Full-size, physical assemblies that are constructed on-site. Mockups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation. They are not samples. Approved mockups establish standard by which the Work will be judged.
 6. 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.
 7. 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.
 8. Quality Assurance: Testing, Inspections, Special Testing and Special Inspections provided for by Owner.
 9. Quality Control: Testing, Inspections, Special Testing and Special Inspections provided for by Contractor.
 10. Special Inspection: See Inspection.
 11. Special Inspector: Certified individual or firm that implements special inspection program for project.
 12. Special Test: See Test.
 13. 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.
 14. Testing Agency: Entity engaged to perform specific tests, inspections, or both.
 15. Testing Agency Laboratory: Agency or firm qualified to perform field and laboratory tests to determine characteristics and quality of materials and workmanship.
 16. 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. ASTM International:
 - a. ASTM A898/A898M-17, 'Standard Specification for Straight Beam Ultrasonic Examination of Rolled Steel Structural Shapes'.
 - b. ASTM C42/C42M-18, 'Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete'.
 - c. ASTM C138/C138M-17a, 'Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete'.
 - d. ASTM C597-16, 'Standard Test Method for Pulse Velocity Through Concrete'.
 - e. ASTM C803/C803M-18, 'Standard Test Method for Penetration Resistance of Hardened Concrete'.
 - f. ASTM C805/C805M-13a, 'Standard Test Method for Rebound Number of Hardened Concrete'.
 - g. ASTM C1019-18, 'Standard Test Method for Sampling and Testing Grout'.
 - h. ASTM C1021-08(2014), 'Standard Practice for Laboratories Engaged in Testing of Building Sealants'.
 - i. ASTM C1077-17, 'Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation'.
 - j. ASTM C1093-15a, 'Standard Practice for Accreditation of Testing Agencies for Masonry'.
 - k. ASTM D3666-16, 'Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials'.

- I. ASTM D3740-12a, 'Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction'.
 - m. ASTM E114-15, 'Standard Practice for Ultrasonic Pulse-Echo Straight-Beam Examination by the Contact Method'.
 - n. ASTM E164-13, 'Standard Practice for Contact Ultrasonic Testing of Weldments'.
 - o. ASTM E329-18: 'Standard Specification for Agencies Engaged in Construction Inspection and/or Testing'.
 - p. ASTM E488-18, 'Standard Test Methods for Strength of Anchors in Concrete Elements'.
 - q. ASTM E543-15, 'Standard Specification for Agencies Performing Nondestructive Testing'.
 - r. ASTM E587-15, 'Standard Practice for Ultrasonic Angle-Beam Examination by the Contact Method'.
 - s. ASTM E709-15, 'Standard Guide for Magnetic Particle Testing'.
 - t. ASTM E1212-17, 'Standard Practice for Quality Management Systems for Nondestructive Testing Agencies'.
 - u. ASTM F710-17, 'Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring'.
 - v. ASTM F2170-18, 'Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes'.
2. Code of Federal Regulations:
 - a. 29 CFR 1910, Subpart A, Section 1910.7, 'Definition and Requirements for a Nationally Recognized Testing Laboratory'.
3. International Code Council Code (IBC) (2018 or most recent edition adopted by AHJ):
 - a. IBC Chapter 17, 'Special Inspections And Tests'.
 - 1) Section 1704, 'Special Inspections And Tests, Contractor Responsibility And Structural Observations'.
 - 2) Section 1705, 'Required Special Inspection And Tests'.
 - a) Section 1705.2, 'Steel Construction'.

1.4 SUBMITTALS

- A. Informational Submittals:
 1. General: Additional submittal requirements are specified in Individual Sections in Division 01 through Division 50.
 2. Certificates:
 - a. Testing Agency will submit certified written report of each inspection, test, or similar service.
 3. Tests and Evaluation Reports:
 - a. 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:
 - 1) 1 copy to Owner's Representative.
 - 2) 1 copy to Architect.
 - 3) 1 copy to Consulting Engineers (Engineer of Record).
 - 4) 1 copy to General Contractor.
 - 5) 1 copy to Authorities Having Jurisdiction (if required).
 - b. 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.
 - c. Submittal Format:
 - 1) Schedule of Tests and Inspections: Prepare in tabular form and include following:
 - a) Specification Section number and title.
 - b) Description of test and inspection.
 - c) Identification of applicable standards.
 - d) Identification of test and inspection methods.
 - e) Number of tests and inspections required.
 - f) Time schedule or time span for tests and inspections.
 - g) Entity responsible for performing tests and inspections.
 - h) Requirements for obtaining samples.
 - 2) Certified written reports of each inspection, test, or similar service will include, but not be limited:

- a) Date of issue.
 - b) Project title and number.
 - c) Name, address, and telephone number of Testing Agency.
 - d) Dates and locations of samples and tests or inspections.
 - e) Names of individuals making tests and inspections.
 - f) Description of the Work and test and inspection method.
 - g) Identification of product and Specification Section.
 - h) Complete test or inspection data.
 - i) Test and inspection results and an interpretation of test results.
 - j) Record of temperature and weather conditions at time of sample taking and testing and inspecting.
 - k) Comments or professional opinion on whether tested or inspected Work complies with Contract Document requirements.
 - l) Name and signature of laboratory inspector.
 - m) Recommendations on retesting and re-inspecting.
4. Source Quality Control Submittals:
- a. Testing Agency will submit following prior to commencing the Work:
 - 1) Qualifications of Testing Agency management and personnel designated to project.
 - 2) Testing Agency 'Written Practice for Quality Assurance'.
 - 3) Qualification records for Inspector and non-destructive testing technicians designated for project.
 - 4) Testing Agency non-destructive testing procedures, equipment calibration records, and personnel training records.
 - 5) Testing Agency Quality Control Plan for monitoring and control of testing operations.
 - 6) Welding Inspection Procedures (Structural Steel testing).
 - 7) Bolting Inspection Procedures (Structural Steel testing).
 - 8) Shear Connector Stud Inspection Procedures (Structural Steel testing).
 - 9) Seismic Connections Inspection Procedures (Structural Steel testing).

1.5 QUALITY ASSURANCE

- A. Owner or Owner's designated representative(s) will perform quality assurance. Owner's quality assurance procedures may include observations, inspections, testing, verification, monitoring and any other procedures deemed necessary by Owner to verify compliance with Contract Documents.
- B. Owner will employ independent Testing Agencies to perform certain specified testing, as Owner deems necessary.
- C. Certification:
 - 1. Product producers and associations, which have instituted approved systems of quality control and which have been approved by document approval agencies, are not required to have further testing.
 - 2. Concrete mixing plants, plants producing fabricated concrete and wood or plywood products certified by agency, lumber, plywood grade marked by approved associates, and materials or equipment bearing underwriters' laboratory labels require no further testing and inspection.
- D. Written Practice for Quality Assurance:
 - 1. Testing Agency will maintain written practice for selection and administration of inspection personnel, describing training, experience, and examination requirements for qualification and certification of inspection personnel.
 - 2. Written practice will describe testing agency procedures for determining acceptability of structure in accordance with applicable codes, standards, and specifications.
 - 3. Written practice will describe Testing Agency inspection procedures, including general inspection, material controls, visual welding inspection, and bolting inspection.

1.6 QUALITY CONTROL

- A. Quality Control will be sole responsibility of Contractor. Contractor will be responsible for testing and inspections, coordination, start-up, operational checkout, and commissioning of all items of the Work included in Project. All costs for these services will be included in Contractor's cost of the Work.
- B. Contractor will assign one (1) employee to be responsible for Quality Control. This individual may have other responsibilities and may be Contractor's Project superintendent or Contractor's Project Manager.
- C. Notify results of all Testing and Inspection performed by Contractor's independent Testing Agencies to Architect and Owner's Representative within twenty four (24) hours of test or inspection having been performed.
 - 1. Testing and Inspection Reports will be distributed as follows:
 - a. 1 copy to Owner's Representative.
 - b. 1 copy to Architect.
 - c. 1 copy to Consulting Engineer(s) (Engineer of Record).
 - d. 1 copy to Authorities Having Jurisdiction (if required).
- D. Contractor's Responsibility:
 - 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.
 - 2. Tests and inspections that are not explicitly assigned to Owner are responsibility of Contractor.
 - 3. Cooperate with Testing Agency(s) performing required inspections, tests, and similar services and provide reasonable auxiliary services as requested. Notify Testing Agency before operations to allow assignment of personnel. Auxiliary services required include but are not limited to:
 - a. Providing access to the Work and furnishing incidental labor, equipment, and facilities deemed necessary by Testing Agency to facilitate inspections and tests at no additional cost to Owner.
 - b. Taking adequate quantities of representative samples of materials that require testing or helping Testing Agency in taking samples.
 - c. Providing facilities for storage and curing of test samples, and delivery of samples to testing laboratories.
 - d. Providing Testing Agency with preliminary design mix proposed for use for materials mixes that require control by Testing Agency.
 - 4. Contractor will integrate Owner's independent Testing Agency services within Baseline Project Schedule and with other Project activities.
 - 5. For any requested inspection, Contractor will complete prior inspections to ensure that items are ready for inspection.
 - 6. All Work is subject to testing and inspection and verification of correct operation prior to 100% payment to Contractor of line item(s) pertaining to that aspect of the Work.
 - 7. For Mechanical Equipment, inspection and documented approval of individual equipment and/or system(s) must be accomplished prior to requesting Substantial Completion Inspection for any area affected by said equipment and/or system:
 - a. Contractor will perform thorough checkout of operations with manufacturer's representatives prior to requesting formal inspection by Owner.
 - b. Contractor must notify Owner's Representative, in advance, as to when manufacturer's representative is scheduled to arrive at Site.
 - 8. Comply:
 - a. Upon completion of Testing Agency's inspection, testing, sample-taking, and similar services, repair damaged construction and restore substrates and finishes to eliminate deficiencies, including deficiencies in visual qualities of exposed finishes.
 - b. Comply with Contract Documents in making such repairs.
 - 9. Data: Furnish records, drawings, certificates, and similar data as may be required by testing and inspection personnel to assure compliance with Contract Documents.
 - 10. Defective Work (Non-Conforming Work): Non-conforming Work as covered in General Conditions applies, but is not limited to following requirements:

- a. Where results of inspections, tests, or similar services show that the Work does not comply with Contract Document requirements, correct deficiencies in the Work promptly to avoid Work delays.
 - b. Where testing personnel take cores or cut-outs to verify compliance, repair prior to acceptance.
 - c. Contractor responsible for any and all costs incurred resulting from inspection that was scheduled prematurely or retesting due to failed tests.
 - d. Remove and replace any Work found defective or not complying with contract document requirements at no additional cost to Owner.
 - e. Should test return unacceptable results, Contractor will bear all costs of retesting and re-inspection as well as cost of all material consumed by testing, and replacement of unsatisfactory material and/or workmanship.
11. Protection:
- a. Protect construction exposed by or for quality assurance and quality control service activities, and protect repaired construction.
12. Scheduling: Contractor is responsible for scheduling times for inspections, tests, taking samples, and similar activities:
- a. Schedule testing and inspections in advance so as not to delay the Work and to eliminate any need to uncover Work for testing or inspection.
 - b. Notify Testing Agency and Architect as noted in Sections in Division 01 through Division 50 prior to any time required for such services.
 - c. Incorporate adequate time for performance of all inspections and correction of noted deficiencies.
 - d. Schedule sequence of activities to accommodate required services with minimum of delay.
 - e. Schedule sequence of activities to avoid necessity of removing and replacing construction to accommodate testing and inspections
13. Test and Inspection Log:
- a. Provide system of tracking all field reports, describing items noted, and resolution of each item. Prepare record of tests and inspections. Include following:
 - 1) Date test or inspection was conducted.
 - 2) Description of the Work tested or inspected.
 - 3) Date test or inspection results were transmitted to Architect.
 - 4) Identification of Testing Agency or inspector conducting test or inspection.
 - b. Maintain log at Project site:
 - 1) Post changes and modifications as they occur.
 - 2) Provide access to test and inspection log for Architect's reference during normal working hours.

1.7 TESTING AND INSPECTIONS - GENERAL

- A. Testing specifically identified to be conducted by Owner, will be performed by an independent entity and will be arranged and paid for by Owner.
- B. Individual Sections in Division 01 through Division 49 indicate if Owner will provide testing and inspection of the Work of that Section.
- C. Tests include but not limited to those described in detail in 'Field Quality Control' in Part 3 of Individual Sections in Divisions 01 through Division 49.
- D. Owner may engage additional consultants for testing, air balancing, commissioning, or other special services:
 1. Activities of any such Owner consultants are in addition to Contractor testing of materials or systems necessary to prove that performance is in compliance with Contract requirements.
 2. Contractor must cooperate with persons and firms engaged in these activities.
- E. Taking Specimens:
 1. Except as may be specifically otherwise approved by Architect, only testing laboratory shall secure, handle, transport, or store any samples and specimens for testing.

- F. Scheduling Testing Agency:
 - 1. Contractor will coordinate the Work and facilitate timeliness of such testing and inspecting services so as not to delay the Work.
 - 2. Contractor will notify Testing Agency and Architect to schedule tests and / or inspections.
- G. For 'building-wide' and/or life safety systems, such as emergency lighting, emergency power uninterruptible power supply systems, fire alarm, fire sprinkler systems, smoke evacuation systems, toxic gas monitoring, capturer exhaust systems, etc. formal start-up inspection will be completed prior to requesting Substantial Completion Inspection for any area of Project:
 - 1. Manufacturer's representatives and installing contractor will demonstrate both operation and compliance to Owner's agents and consultants. If coordinated and scheduled appropriately by Contractor, these equipment and/or systems inspections may also serve to provide required Owner training, if approved in advance by Owner.
 - 2. Contractor responsible for requesting that Architect arrange for inspection of materials, equipment, and work prior to assembly or enclosure that would make materials, equipment, or work inaccessible for inspection and at other times as may be required.

1.8 TESTING AGENCY SERVICES AND RESPONSIBILITIES

- A. Testing Agency, including independent testing laboratories, will be licensed and authorized to operate in jurisdiction in which Project is located.
 - 1. Approved Testing Agency Qualifications: Requirements of Section 01 4301 apply.
- B. Testing and Inspection Services:
 - 1. Testing Agency will not release, revoke, alter, or increase Contract Document requirements or approve or accept any portion of the Work.
 - 2. Testing Agency will not give direction or instruction to Contractor.
 - 3. Testing Agency will have full authority to see that the Work is performed in strict accordance with requirements of Contract Documents and directions of Owner's Representative and/or Architect.
 - 4. Testing Agency will not provide additional testing and inspection services beyond scope of Work without prior approval of Owner's Representative and / or Architect.
- C. Testing Agency Duties:
 - 1. Independent Testing Agency engaged to perform inspections, sampling, and testing of materials and construction specified in individual specification Sections will cooperate with Architect and Contractor in performance of its duties and will provide qualified personnel to perform required inspections and tests.
 - 2. Testing Agency will test or obtain certificates of tests of materials and methods of construction, as described herein or elsewhere in technical specification.
 - 3. Testing Agency will provide management, personnel, equipment, and services necessary to perform testing functions as outlined in this section.
 - 4. Testing Agency must have experience and capability to conduct testing and inspecting indicated by ASTM standards and that specializes in types of tests and inspections to be performed.
 - 5. Testing Agency will comply with requirements of ASTM E329, ASTM E543, ASTM C1021, ASTM C1077, ASTM C1093, ASTM D3666, ASTM D3740, and other relevant ASTM standards.
 - 6. Testing Agency must calibrate all testing equipment at reasonable intervals (minimum yearly) with accuracy traceable to either National Bureau of Standards or accepted values of natural physical constants.
 - 7. Welding Procedure Review: Testing Agency will provide review and approval or rejection of all welding procedures to be used and will verify compliance with all reference standard requirements.
- D. 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.

1.9 ARCHITECT'S RESPONSIBILITIES

- A. Architect Duties:
 1. Notify Owner's Representative before each test and/or inspection.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

- A. Field Tests And Inspections:
 1. Field Tests and Inspections requirements are described in 'Field Quality Control' of individual Sections in Division 01 through Division 49.

END OF SECTION

SECTION 01 4543**FONT WATER ADJUSTING AND BALANCING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Is Not Limited To:
 - 1. Balance and adjust font water system services provided by Owner as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 01 0000: 'General Requirements':
 - a. Section 01 1200: Multiple contracts: 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 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
 - 2. Division 22:
 - a. Completing installation and start-up of plumbing systems, including hot water heater, as required for correct balance.
 - b. Maintaining plumbing system and equipment in full operation during each working day of balancing and adjusting.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Contractor to assisting Testing Agency in balancing of font water system.
- B. Scheduling:
 - 1. Contractor to schedule this work in cooperation with other Sections involved and to comply with completion date for balance and adjust font water system as described in Contract Documents.
 - 2. Contact Testing Agency and coordinate (Owner' Representative to provide 'Testing Agency' contact information):
 - a. One inspection when 90% of plumbing system is installed. Coordinate visit with 90% ductwork and equipment inspection.
 - 3. Contact Testing Agency and coordinate date(s) for adjusting and balancing work when following is completed (Owner' Representative to provide 'Testing Agency' contact information):
 - a. Potable hot and cold water systems including installation of water heaters, specialties, and devices.
 - b. Verification of proper water temperature control calibration and setting of control components and correct operation of water heater.
 - 4. If, in opinion of Testing Agency, the work is not ready for adjusting and balancing, reschedule as required.

1.3 SUBMITTALS

- A. Informational Submittals:
 - 1. Test and Evaluation Reports:
 - a. Preliminary Report(s):
 - 1) Four copies to be given to Owner's Representative.
 - b. Final Report :
 - 1) Four copies to be given to Owner's Representative.
- 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 balancing and adjusting font water system. Bind approved copy of Testing and Evaluation Report in Operations And Maintenance Manual for Division 22.

1.4 QUALITY ASSURANCE

- A. Qualifications:
 1. Approved Testing Agency. Section 01 4301 applies, but is not limited to following:
 - a. Testing Agency shall specialize in testing and balancing of hot water heating systems.
 - b. Testing Agency shall provide proof of having successfully completed at least five years of specialized experience in 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 22 shall be permitted to do this work.

PART 2 - PRODUCTS: Not Used

PART 3 - EXECUTION

3.1 OWNER-FURNISHED TESTING AND INSPECTION

- A. Owner to provide Testing and Inspection for testing, balancing, and adjusting air duct systems:
 1. See Section 01 1200: Multiple contracts for administrative and procedural requirements for Testing and Inspection services.

3.2 PREPARATION

- A. Water heater, building plumbing systems, and font water supply and drain systems shall be in full operation and continue in operation during each working day of adjusting and balancing.

3.3 FIELD QUALITY CONTROL

- A. Field Tests:
 1. Font Water System:
 - a. Testing Agency shall provide testing and inspection for Font Water System:
 - b. Site Tests (Purge balance meter using potable water before balancing font water):
 - 1) Balancing And Adjusting Procedure (140 deg F (60 deg C) water heater discharge temperature):
 - a) Open main font water supply valve. Set hot water balancing device first. Set device for three gpm (13.5 liters per minute) flow. Set cold water balancing device so temperature gauge reads 100 deg F (38 deg C). Close main supply valve.
 - b) Verify settings by opening font supply valve and checking temperature gauge reading and hot water balancing device setting. Adjust as required. Close font supply valve.
 - 2) Balancing And Adjusting Procedure: (110 deg F (43 deg C) water heater discharge temperature):
 - a) Open main font water supply valve. Set hot water balancing device first. Set device to full open. Set cold water balancing device so temperature gauge reads 100 deg F (38 deg C). Close main supply valve.

- b) Verify settings by opening font supply valve and checking temperature gauge reading and hot water balancing device setting. Adjust as required. Close font supply valve.

3.4 CLOSEOUT ACTIVITIES

- A. Post copy of appropriate 'Balancing And Adjusting Procedure' inside Font Valve Box cover.

END OF SECTION

SECTION 01 4546**DUCT TESTING, ADJUSTING, AND BALANCING****PART 1 - GENERAL****1.1 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. Section 01 0000: 'General Requirements':
 - a. Section 01 1200: 'Multiple Contracts 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 4523: 'Testing and Inspecting Services' 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.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Contractor to assist 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' 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.

1.3 SUBMITTALS

- A. Informational Submittals:
 - 1. Test and Evaluation Reports:

- a. Preliminary Report(s):
 - 1) Four copies to be given to Owner's Representative.
 - b. Final Report :
 - 1) Four copies to be given to Owner's Representative.
- 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.

1.4 QUALITY ASSURANCE

- A. Qualifications:
- 1. Approved Testing Agency. Section 01 4301 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

3.1 OWNER-FURNISHED TESTING AND INSPECTION

- A. Owner to provide Testing and Inspection for testing, balancing, and adjusting air duct systems:
- 1. See Section 01 1200: Multiple contracts for administrative and procedural requirements for Testing and Inspection services.

3.2 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.
 - 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, Form P1266, Volume I.
- 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.

3.3 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

SECTION 01 5100**TEMPORARY UTILITIES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
1. Administrative and procedural requirements for Temporary Utilities.

1.2 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.
1. Materials and facilities that make up temporary utilities are property of Contractor.

2. 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.

1.3 TEMPORARY ELECTRIC POWER

- A. Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period.

1.4 TEMPORARY FIRE PROTECTION

- A. 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 on each floor at or near each usable stairwell.
 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.

1.5 HEATING, COOLING, AND VENTILATING:

- A. 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.
- B. 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.
- C. Maintain safe conditions for use of temporary heating, cooling, and ventilating systems including, but not limited to, following requirements:
 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.
- D. Permanent mechanical system may be operated subject to following conditions:
 1. 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.
 2. Operate system at no cost to Owner, including cost of fuel.
 3. Assume all responsibility and risk for operation of system.
 4. Return permanent mechanical equipment to 'like-new' condition for Substantial Completion Inspection.

1.6 TEMPORARY LIGHTING

- A. Install and operate temporary lighting that will provide adequate illumination for construction operations and traffic conditions.

1.7 TEMPORARY WATER SERVICE

- A. Install water service and distribution piping of sizes and pressures adequate for construction until permanent water service is in use.

PART 2 - PRODUCTS Not Used**PART 3 - EXECUTION Not Used**

END OF SECTION

SECTION 01 5200**CONSTRUCTION FACILITIES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
 - 1. Administrative and procedural requirements for Construction Facilities.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Prepare schedule indicating dates for implementation and termination of each temporary facility.
- B. 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.
- C. Maintain facilities in good operating condition until removal.
- D. 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.

1.3 FIELD OFFICES

- A. Provide and maintain insulated, weather tight temporary office of sufficient size to accommodate Contractor's personnel at Project site and for use by Owner, Architect and Subcontractors.
 - 1. Keep office clean and orderly.
 - 2. Heat and cool office as needed.
 - 3. Furnish office with locking door, light(s), table(s), bench(es), rack(s) for drawings.
 - 4. Make office available for progress meetings.
 - 5. Provide an operable fire extinguisher in facility.
 - 6. Provide hardhats for Owner's Representatives for site visits.
- B. 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.

1.4 SANITARY FACILITIES

- A. Provide temporary sanitary toilet. Service and maintain temporary toilet in a clean, sanitary condition.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

END OF SECTION

SECTION 01 5400**CONSTRUCTION AIDS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
 - 1. Administrative and procedural requirements for Construction Aids.

1.2 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.

PART 2 - PRODUCTS Not Used**PART 3 - EXECUTION Not Used****END OF SECTION**

SECTION 01 5600**TEMPORARY BARRIERS AND ENCLOSURES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
 - 1. Administrative and procedural requirements for Temporary Barriers and Enclosures.

1.2 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.

1.3 TEMPORARY BARRICADES

- A. Comply with standards and code requirements in erecting barricades, warning signs, and lights.
- B. Take necessary precautions to protect persons, including members of the public, from injury or harm.

1.4 TEMPORARY FENCING

- A. Before construction begins, install 6 foot high enclosure fence with lockable entrance gates. Locate where shown on Drawings. If not shown on Drawings, enclose entire site or portion sufficient to accommodate construction operations.

1.5 TEMPORARY SECURITY BARRIERS

- A. Install temporary enclosures of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft, and other violations of security.
- B. Secure materials and equipment stored on site.
- C. Secure building at the end of each work day.
- D. Maintain exterior building security until Substantial Completion.

1.6 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 activities.
 - 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: \$1,000.00.
 - 2) Shrubs: \$ 100.00.
 - 3) Vegetation: \$ 50.00.

PART 2 - PRODUCTS Not Used**PART 3 - EXECUTION Not Used**

END OF SECTION

SECTION 01 5700**TEMPORARY CONTROLS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
 - 1. Administrative and procedural requirements for Temporary Controls.

1.2 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.
- B. Develop, install, and maintain an erosion control plan if required by law.
- C. Repair and correct damage caused by erosion.

1.3 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 rain water, 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.

PART 2 - PRODUCTS Not Used**PART 3 - EXECUTION Not Used****END OF SECTION**

SECTION 01 5800

PROJECT IDENTIFICATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes But is Not Limited To:
 - 1. Administrative and procedural requirements for Project Identification.

1.2 TEMPORARY PROJECT SIGNAGE

- A. Contractor may, at its option, erect a temporary project identification sign.
 - 1. Sign may be free-standing or attached to temporary field office or storage shed.
 - 2. No other signs or advertisements are allowed on building site.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

END OF SECTION

SECTION 01 6100**COMMON PRODUCT REQUIREMENTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
1. Administrative and procedural requirements for Common Product Requirements.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Provide products that comply with Contract Documents, that are undamaged, and, unless otherwise indicated, new and unused at time of installation. Provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for complete installation and for intended use and effect.
- B. 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.
- C. Where specifications describe a product or assembly by specifying exact characteristics required, with or without use of brand or trade name, provide product or assembly that provides specified characteristics and otherwise complies with Contract requirements.
- D. 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.
- E. Where specifications only require compliance with an imposed code, standard, or regulation, select product that complies with standards, codes or regulations specified.
- F. 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.
- G. 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.

- H. 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.

PART 2 - PRODUCTS Not Used**PART 3 - EXECUTION Not Used****END OF SECTION**

SECTION 01 6200**PRODUCT OPTIONS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
1. Administrative and procedural requirements for Product Options.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Product Selection:
1. When option of selecting between two or more products is given, product selected will be compatible with products previously selected, even if previously selected products were also options.
 - a. Regional materials.
- B. Non-Conforming Work:
1. Non-conforming work as covered in Article 12.3 of General Conditions applies, but is not limited, to use of non-specified products or manufacturers.
- C. 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. 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.
 - b. Approved Products / Manufacturers / Suppliers / Distributors / Fabricators / Installers:
 - 1) Category One:
 - a) Owner has established 'Relationships' that extend beyond requirements of this Project. No substitutions or equal products will be allowed on this Project.
 - b) Specification Sections specify Owner Furnished and Owner Installed Manufacturers or Products.
 - c) Follow specified procedures to preserve relationships between Owner and specified manufacturers / suppliers and advantages that accrue to Owner from those relationships.
 - 2) Category Two:
 - a) Owner has established 'Relationships' that contain provisions extending beyond requirements of this Project. No substitutions or equal products will be allowed on this Project.
 - b) Specification Sections specify Owner Furnished and Contractor Installed Manufacturers, Suppliers, Distributors or Products.
 - c) Follow specified procedures to preserve relationships between Owner and specified manufacturers / suppliers and advantages that accrue to Owner from those relationships.
 - 3) Category Three:
 - a) Owner has established 'Relationships' that contain provisions extending beyond requirements of this Project. Use these products to preserve advantages that accrue to Owner from those programs. No substitutions or equal products will be allowed on this Project.
 - b) Specification Sections specify Contractor Furnished and Contractor Installed Manufacturers, Suppliers, Distributors, Fabricators or Products.
 - 4) Category Four:

- a) Provide only specified products available from manufacturers listed. No substitutions, private-labeled, or equal products, or mixing of manufacturers' products is allowed on this Project.
- b) In Sections where lists recapitulating Manufacturers previously mentioned in Section are included under heading '*Manufacturers*' or '*Approved Manufacturers*', this is intended as a convenience to Contractor as a listing of contact information only. It is not intended that all manufacturers in list may provide products where specific products and manufacturers are listed elsewhere in Section.
- c. Acceptable Products / Manufacturers / Suppliers / Installers:
 - 1) Type One: Use specified products / manufacturers unless approval to use other products / manufacturers has been obtained from Architect by Addendum.
 - 2) Type Two: Use specified products / manufacturers unless approval to use other products and manufacturers has been obtained from Architect in writing before installing or applying unlisted or private-labeled products.
 - 3) 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.
- d. Quality / Performance Standard Products / Manufacturers:
 - 1) Class One: Use specified product / manufacturer or equal product from specified manufacturers only.
 - 2) Class Two: Use specified product / manufacturer or equal product from any manufacturer.
 - 3) Products / manufacturers used shall conform to Contract Document requirements.

PART 2 - PRODUCTS Not Used**PART 3 - EXECUTION Not Used****END OF SECTION**

SECTION 01 6400**OWNER - FURNISHED PRODUCTS****PART 1 - GENERAL****1.1 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:
1. Fixed Chalkboards. See Section 10 1113.
 2. Fixed Markerboards. See Section 10 1116.
 3. Fixed Tackboards. See Section 10 1123.
 4. Interior Signage. See Section 10 1495.
 5. Network Equipment. See Section 27 1501:
 - a. Internet Firewall.
 - b. ISP Modem.
 - c. Network Switch.
 - d. Wireless Access Port.
 6. Network Streaming Equipment: See Section 27 4117 and Section 27 5117.

1.2 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 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

END OF SECTION

SECTION 01 6600**PRODUCT DELIVERY, STORAGE, AND HANDLING REQUIREMENTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
 - 1. Administrative and procedural requirements for Product Delivery, Storage, and Handling Requirements.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Deliver, store, and handle products according to manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft.

1.3 DELIVERY AND ACCEPTANCE REQUIREMENTS

- A. Schedule delivery to reduce long-term storage at site and to prevent overcrowding of construction spaces.
- B. 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.
- C. Deliver products to site in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
- D. Inspect products upon delivery to ensure compliance with Contract Documents, and to ensure that products are undamaged and properly protected.

1.4 STORAGE AND HANDLING REQUIREMENTS

- A. Store products at site in manner that will simplify inspection and measurement of quantity or counting of units.
- B. Store heavy materials away from Project structure so supporting construction will not be endangered.
- C. Store products subject to damage by elements above ground, under cover in weathertight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

PART 2 - PRODUCTS Not Used**PART 3 - EXECUTION Not Used****END OF SECTION**

SECTION 01 7300**EXECUTION****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
 - 1. Administrative and procedural requirements for governing Execution of the Work.

1.2 COMMON INSTALLATION PROVISIONS

- A. Manufacturer's Instructions: Comply with Manufacturer's installation 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. 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.
- D. 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.
- E. Coordinate temporary enclosures with required inspections and tests, to reduce necessity of uncovering completed construction for that purpose.
- F. 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.

PART 2 - PRODUCTS Not Used**PART 3 - EXECUTION Not Used****END OF SECTION**

SECTION 01 7400**CLEANING AND WASTE MANAGEMENT****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Administrative and procedural requirements for Cleaning and Waste Management as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 01 1200: Coordination of responsibilities for waste management.
 - 2. Section 01 6400: Waste removal of Owner furnished products.
 - 3. In addition to standards described in this section, comply with all requirements for cleaning-up as described in various other Sections of these Specifications.

1.2 REFERENCES

- A. Definitions:
 - 1. 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 waster or debris.
 - 2. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
 - 3. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
 - 4. 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.
 - 5. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
 - 6. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
 - 7. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

PART 2 - PRODUCTS: Not Used**PART 3 - EXECUTION****3.1 PROGRESS CLEANING**

- A. Comply with regulations of authorities having jurisdiction and safety standards for cleaning.
- B. Keep premises broom clean during progress of the Work.
- C. Keep site and adjoining streets reasonably clean. If necessary, sprinkle rubbish and debris with water to suppress dust.
- D. 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.

- E. 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.
- F. 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.
- G. 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.
- H. Clean exposed surfaces and protect as necessary to avoid damage and deterioration.
- I. Place extra materials of value remaining after completion of associated work have become Owner's property as directed by Owner or Architect.
- J. Construction Waste Management And Disposal:
 - 1. Remove waste materials and rubbish caused by employees, Subcontractors, and contractors under separate contract with Owner and dispose of legally. Remove unsuitable or damaged materials and debris from building and from property.
 - a. Provide adequate waste receptacles and dispose of materials when full.
 - b. Properly store volatile waste and remove daily.
 - c. Do not deposit waste into storm drains, sanitary sewers, streams, or waterways. Do not discharge volatile, harmful, or dangerous materials into drainage systems.
 - 2. Do not burn waste materials or build fires on site. Do not bury debris or excess materials on Owner's property.

3.2 FINAL CLEANING

- A. Immediately before Substantial Completion, thoroughly clean building and area where The Work was performed. Remove all rubbish from under and about building, landscaped areas and parking lot and leave building and Project Site ready for occupancy by Owner.
- B. Comply with individual manufacturer's cleaning instructions.
- C. 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. Clean inside glazing, exercising care not to scratch glass.
 - b. Remove marks, stains, fingerprints and dirt.
 - c. Clean and polish woodwork and finish hardware.
 - d. Remove labels that are not permanent labels.
 - e. Clean plumbing fixtures and tile work. Remove spots, soil or paint.
 - f. Clean surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean light fixtures and lamps.
 - g. Clean other fixtures and equipment and remove stains, paint, dirt, and dust.
 - h. Remove temporary floor protection and clean floors.
 - 2. Exterior Cleaning:
 - a. Clean outside glazing, 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, sidewalks, and gutters.
 - f. Clean drop inlets, through-curb drains, and other drainage structures.
 - g. Remove trash, debris, and foreign material from landscaped areas.

END OF SECTION

SECTION 01 7700**CLOSEOUT PROCEDURES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
 - 1. Administrative and procedural requirements for Closeout Procedures.

1.2 GENERAL

- 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.

1.3 PRELIMINARY CLOSEOUT REVIEW

- A. 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.
- B. 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.
- C. 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.
 - 1. Punch list of items requiring completion and correction will be created.
 - 2. Time frame for completion of punch list items will be established, and date for Substantial Completion Inspection shall be set.

1.4 SUBSTANTIAL COMPLETION INSPECTION

- A. 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.
- B. 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.
- C. 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:
 - 1. Date of Substantial Completion.
 - 2. Punch List Work not yet completed, including seasonal and long lead items.

3. Amount to be withheld for completion of Punch List Work.
 4. Time period for completion of Punch List Work.
 5. 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.
- D. 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.

1.5 FINAL ACCEPTANCE MEETING

- A. 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.
- B. Owner, Architect and Contractor execute Owner's Project Closeout - Final Acceptance form, and verify:
1. 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.
 2. Owner's maintenance personnel have been instructed on all system operation and maintenance as required by the Contract Documents.
 3. Final cleaning requirements have been completed.
- C. 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.
- D. When Owner and Architect confirm that The Work is satisfactorily completed, Architect will authorize final payment.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

END OF SECTION

SECTION 01 7800**CLOSEOUT SUBMITTALS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
 - 1. Administrative and procedural requirements for Closeout Submittals.
- B. Related Requirements:
 - 1. Section 01 3300: 'Submittal Procedures' for administrative and procedural requirements for submittal procedures.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Project Record Documents:
 - 1. Do not use record documents for construction purposes:
 - a. Protect from deterioration and loss in secure, fire-resistive location.
 - b. Provide access to record documents for Architect's reference during normal working hours.
 - 2. Maintain clean, undamaged set of Drawings:
 - a. Mark set to show actual installation where installation varies from the Work as originally shown.
 - b. Give particular attention to concealed elements that would be difficult to measure and record at a later date.
 - c. Mark record sets with red erasable pencil. Use other colors to distinguish between variations in separate categories of the Work.
 - d. Mark new information that is important to Owner, but was not shown on Drawings.
 - e. Note related Change Order numbers where applicable.

1.3 CLOSEOUT SUBMITTALS

- A. Operations And Maintenance Manual:
 - 1. General:
 - a. Include closeout submittal documentation as required by Contract Documentation.
 - b. Include workmanship bonds, final certifications, equipment check-out sheets, and similar documents.
 - c. Releases enabling Owner unrestricted use of The Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - d. Include Project photographs, damage or settlement survey, and similar record information required by Contract Documents.
 - e. Submittal Format:
 - 1) Digital copies unless otherwise noted, required for each individual specification section that include 'Closeout Submittals'.
 - 2) Include only closeout submittals as defined in individual specification section as required in Contract Documents.
 - 2. Project Manual:
 - a. Copy of complete Project Manual including Addenda, Modifications as defined in General Conditions, and other interpretations issued during construction:
 - 1) Mark these documents to show variations in actual Work performed in comparison with text of specifications and Modifications.
 - 2) Show substitutions, selection of options, and similar information, particularly on elements that are concealed or cannot otherwise be readily discerned later by direct observation.

3. Maintenance Contracts:
 - a. Digital format only.
4. Operations and Maintenance Data:
 - a. Digital format only:
 - 1) Cleaning instructions.
 - 2) Maintenance instructions.
 - 3) Operations instructions.
 - 4) Equipment list.
 - 5) Parts list.
5. Warranty Documentation:
 - a. Digital format of final, executed warranties.
6. Record Documentation:
 - a. Digital format only.
 - 1) Certifications.
 - 2) Color and pattern selections.
 - 3) Design Data.
 - 4) Geotechnical Evaluation Reports (soils reports).
 - 5) Manufacture Reports.
 - 6) Manufacturer's literature or cut sheets.
 - 7) Shop Drawings.
 - 8) Source Quality Control.
 - 9) Special Procedures.
 - 10) Testing and Inspection Agency Reports.
 - 11) Testing and Inspection Reports.
7. Software:
 - a. Audio and Video System software, programming and set-files.
8. Irrigation Plan.
 - a. Laminated and un-laminated reduced sized hard copies.
9. Landscape Management Plan (LMP):
 - a. Irrigation Section:
 - 1) Submittal Format: Digital format and hard copy of each.
 - 2) Documentation required by sections under 32 8000 Heading: 'Irrigation'.
 - b. Landscaping Section:
 - 1) Submittal Format: Digital format and hard copy of each.
 - 2) Documentation required by sections under 32 9000 Heading: 'Planting'.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Submit item(s) required by Section 01 3300 'Submittal Procedures' and as defined in individual specification section if required in Contract Documents. Items may be provided at completion of Work or with Closeout Submittals.

1.5 WARRANTIES

- A. When written guarantees beyond one (1) year after substantial completion are required by Contract Documents, secure such guarantees and warranties properly addressed and signed in favor of Owner. Include these documents in Operations & Maintenance Manual(s) specified above.
- B. Delivery of guarantees and warranties will not relieve Contractor from obligations assumed under other provisions of Contract Documents.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

END OF SECTION

SECTION 02 4113**SELECTIVE SITE DEMOLITION****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Demolish and remove portions of existing site facilities as described in Contract Documents.
- B. Related Requirements:
 - 1. New and replacement work specified in appropriate specification Sections.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Scheduling:
 - 1. Include on Construction Schedule specified in Section 01 3200 detailed sequence of individual site demolition operations.

1.3 SUBMITTALS

- A. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Record Documentation:
 - 1) Identify abandoned utility and service lines and capping locations on record drawings.

PART 2 - PRODUCTS: Not Used**PART 3 - EXECUTION****3.1 PREPARATION**

- A. Notify corporations, companies, individuals, and local authorities owning conduits running to property.
 - 1. Protect and maintain conduits, drains, sewers, pipes, and wires that are to remain on the property.
 - 2. Arrange for removal of wires running to and on property. Remove pipes and sewers in accordance with instructions of above owners.

3.2 PERFORMANCE

- A. Execute work in orderly and careful manner, with due consideration for neighbors and the public.
- B. Carefully remove, disassemble, or dismantle as required, and store in approved location on site, existing items to be reused in completed work. Coordinate with Owner for equipment and materials to be removed by Owner.
- C. Concrete And Paving Removal:
 - 1. Saw cut joints between material to be removed and material to remain to full depth.

2. Hand-excavate trench **12 inches (300 mm)** wide and **16 inches (400 mm)** deep along concrete or paving to be removed. Cut roots encountered with saw, axe, or pruner. Do not cut roots with excavating equipment. Remove roots under concrete and paving to be replaced down to **12 inches (300 mm)** below finish grade.

3.3 CLEANING

- A. Keep streets and roads reasonably clean, and sweep daily.
- B. Sprinkle demolition rubbish and debris as necessary to lay dust.
- C. Promptly remove demolition materials, rubbish, and debris from property.

END OF SECTION

SECTION 02 4119**SELECTIVE STRUCTURE DEMOLITION****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Demolition and removal of selected portions of building or structure.
 - 2. Salvage of existing items to be reused or recycled.
- B. Related Requirements:
 - 1. Section 26 0501: 'Common Electrical Requirements' for salvage of existing electrical items to be reused or recycled removed by Owner.

1.2 REFERENCES

- A. Reference Standards:
 - 1. National Fire Protection Association / American National Standards Institute:
 - a. NFPA 241, 'Standard for Safeguarding Construction, Alteration, and Demolition Operations', 2013 Edition.
 - 2. American Society of Safety Engineers:
 - a. ASSE A10.6-2006, 'Safety Requirements for Demolition Operations'.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Storage or sale of removed items or materials will not be permitted on-site.
- B. Pre-Installation Conference:
 - 1. Before beginning Selective Demolition work, in addition to requirements of Section 01 3100, meet on site to confirm work to be demolished, items to be salvaged or reused, and coordination with Owner.
- C. Scheduling:
 - 1. Indicate detailed sequence of selective demolition and removal work, with starting and ending dates for each activity, on Schedule specified in Section 01 3200.

1.4 SUBMITTALS

- A. Informational Submittals:
 - 1. Special Procedure Submittals:
 - a. Inventory:
 - 1) After selective demolition is complete, submit list of items that have been removed and salvaged.

1.5 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Comply with governing EPA notification regulations before beginning selective demolition.
 - 2. Comply with hauling and disposal regulations of authorities having jurisdiction.

3. Standards: Comply with ANSI A10.6 and NFPA 241.

1.6 FIELD CONDITIONS

- A. Existing Conditions:
 1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

PART 2 - PRODUCTS: Not Used

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification Of Conditions:
 1. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
 - a. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- B. Evaluation And Assessment:
 1. Hazardous Materials:
 - a. It is not expected that hazardous materials will be encountered in the Work. Identified hazardous materials will be removed by Owner before start of the Work.
 - b. If materials suspected of containing hazardous materials are encountered, do not disturb and immediately notify Architect.
 2. Inventory and record condition of items to be removed and reinstalled and items to be removed and salvaged.
 3. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure nature and extent of conflict. Promptly submit written report to Architect.
 4. Engage a professional engineer to survey condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.
 5. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 PREPARATION

- A. Temporary Facilities:
 1. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 2. Maintain fire-protection facilities in service during selective demolition operations.
- B. Temporary Shoring:
 1. Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
 2. Strengthen or add new supports when required during progress of selective demolition.
- C. Utility Services:
 1. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.

2. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
 - a. Arrange to shut off indicated utilities with utility companies.
 - b. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.

3.3 SELECTIVE DEMOLITION

A. General:

1. Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
2. Demolish and remove existing construction only to extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - a. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
 - b. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 - c. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
 - d. Maintain adequate ventilation when using cutting torches.
 - e. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 - f. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 - g. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 - h. Dispose of demolished items and materials promptly.

B. Selective Demolition Procedures For Specific Materials:

1. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals, using power-driven saw, then remove concrete between saw cuts.
2. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.
3. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

C. Removed and Salvaged Items:

1. Relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered during selective demolition remain Owner's property. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to Owner.
 - a. Clean salvaged items as directed by Owner.
 - b. Pack or crate items after cleaning. Identify contents of containers.
 - c. Store items in a secure area until delivery to Owner.
 - d. Transport items to Owner's storage area designated by Owner.
 - e. Protect items from damage during transport and storage.

D. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.

4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- E. Existing Items to Remain:
1. Protect construction indicated to remain against damage and soiling during selective demolition.
 2. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.4 CLEANING

- A. General:
1. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations.
 2. Return adjacent areas to condition existing before selective demolition operations began.
- B. Waste Management:
1. Disposal of Demolished Materials:
 - a. Remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill. Do not burn demolished materials.
 - 1) Do not allow demolished materials to accumulate on-site.
 - 2) Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 3) Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

END OF SECTION

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, , thrust blocks, and manholes.
- G. Concrete curing.

1.02 RELATED REQUIREMENTS

- A. Section 07 9200 - Joint Sealants: Products and installation for sealants and joint fillers for saw cut joints and isolation joints in slabs.
- B. Section 31 0500 for field applied termiticide and mildewcide for concrete surfaces.
- C. Section 32 1313-Concrete Paving: Concrete paving, sidewalks, curbs and gutters.

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

- 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.

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- 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 Contractor'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:

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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.

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. Reinforcing Bars:
 - a. Composed of deformed carbon steel meeting requirements of ASTM A615/A615M, Grade 60 (field bent bars may be Grade 40)
- 5. 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.
- 6. 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.
- 7. 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 V - 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 A:
 - a. Exterior footings, interior footings, font foundation wall.
 - b. 4500 psi (31.03 MPa) minimum at twenty-eight (28) days. (3150 psi minimum at seven (7) days)
 - c. Water / Cementitious Material: 0.45 maximum.
 2. Mix Type B:
 - a. Interior concrete slabs on grade.
 - b. 3000 psi (31.03 MPa) minimum at twenty-eight (28) days. (2700 psi minimum at seven (7) days)
 - c. Water / Cementitious Material: 0.5 maximum.

- d. Shrinkage Reducing Admixture: ECLIPSE Floor 200 admixture at dosage rate of 1.0 gal/yd³ at all interior concrete slabs on grade
- 3. Mix Type D:
 - a. Interior Foundation walls.
 - b. 3000 psi (31.03 MPa) minimum at twenty-eight (28) days. (2700 psi minimum at seven (7) days)
 - c. Water / Cementitious Material: 0.5 maximum.
 - d. Air Entrainment: Six (6) percent, plus or minus 1-1/2 percent.
- 4. Mix Type E:
 - a. Sidewalks, curbs, gutters, mechanical pad, mow strips.
 - b. 4500 psi (31.03 MPa) minimum at twenty-eight (28) days. (3150 psi minimum at seven (7) days)
 - c. Water / Cementitious Material: 0.40 maximum.
 - d. Use twenty-five (25) percent Class F fly ash as part of cementitious material.
 - e. Air Entrainment: Six (6) percent, plus or minus 1-1/2 percent.
- 5. 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. Use on polished concrete finishing surfaces in areas as shown on Contract Drawings.
 - b. Used on all interior concrete floor surfaces including offices that receive carpet.
 - c. Used on concrete surfaces in Process Area, Process Area Custodial Room, and Yard Sales Area only.
 - d. Used on concrete surfaces in areas as shown in Contract Documents.
- 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.

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. Equipment Bases: Coordinate with appropriate Sections for locations and dimensions.
 - 2. 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.
 - 3. 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.
- 4. Sidewalks:
 - 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. 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.
- F. Concrete Polishing: See Section 03 3511.

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.
 1. For testing purposes, following concrete strengths are required:
 - a. At 7 days: 70 percent minimum of 28 day strengths.
 - 1) If any concrete compression tests do not meet this requirement, then all concrete poured in the location tested shall be promptly removed and replaced at no additional cost to the owner.
 - b. At 28 days: 100 percent minimum of 28 day strengths.
 - 1) If any concrete compression tests do not meet this requirement, then all concrete poured in the location tested shall be promptly removed and replaced at no additional cost to the owner.
- C. 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 03 4500
PRECAST ARCHITECTURAL CONCRETE**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Architectural precast concrete accessories.
- B. Supports, anchors, and attachments.
- C. Grouting under panels.

1.02 REFERENCE STANDARDS

- A. ACI 301 - Specifications for Structural Concrete 2016.
- B. ACI 318 - Building Code Requirements for Structural Concrete and Commentary 2014 (Errata 2018).
- C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2019.
- D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.
- E. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.
- 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 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 A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement 2020.
- J. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete 2018a.
- K. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete 2012.
- L. ASTM C33/C33M - Standard Specification for Concrete Aggregates 2018.
- M. ASTM C150/C150M - Standard Specification for Portland Cement 2020.
- N. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete 2010a (Reapproved 2016).
- O. AWS D1.1/D1.1M - Structural Welding Code - Steel 2020.
- P. PCI MNL-117 - Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products 2013.
- Q. PCI MNL-120 - PCI Design Handbook - Precast and Prestressed Concrete 2017.
- R. PCI MNL-122 - Architectural Precast Concrete 2007.
- S. PCI MNL-123 - Design and Typical Details of Connections for Precast and Prestressed Concrete 1988.
- T. PCI MNL-135 - Tolerance Manual for Precast and Prestressed Concrete Construction 2000.

1.03 SUBMITTALS

- A. Product Data: Manufacturer's information on accessory products, including pigments, admixtures, inserts, plates, etc.
- B. Shop Drawings: Indicate layout, unit locations, configuration, unit identification marks, reinforcement, integral insulation, insulated panel system connectors, connection details,

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support items, location of lifting devices, dimensions, openings, and relationship to adjacent materials. Provide erection drawings.

1. Include details of mix designs.
2. Include structural design calculations.

C. Samples: Submit two, 8 by 8 inch in size, illustrating surface finish, color and texture.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Handling: Lift and support precast units only from support points.
- B. Blocking and Lateral Support During Transport and Storage: Use materials that are clean, non-staining, and non-harmful to exposed surfaces. Provide temporary lateral support to prevent bowing and warping.
- C. Protect units to prevent staining, chipping, or spalling of concrete.
- D. Mark units with date of production in location that will be concealed after installation.

PART 2 PRODUCTS

2.01 PRECAST UNITS, GENERAL

- A. Precast Architectural Concrete Units: Comply with PCI MNL-120, PCI MNL-122, PCI MNL-123, PCI MNL-135, and ACI 318.
 1. Concrete Face Mix: Minimum 5000 psi, 28 day strength, air entrained to 5 to 7 percent; comply with ACI 301.
 2. Design Loads: Static loads, anticipated dynamic loading, including positive and negative wind loads, thermal movement loads, and erection forces as defined by applicable code.
 3. Calculate structural properties of units in accordance with ACI 318.
 4. Accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.
 5. Provide connections that accommodate building movement and thermal movement and adjust to misalignment of structure without unit distortion or damage.
- B. Finish Type A: Ensure exposed-to-view finish surfaces of precast units are uniform in color and appearance.

2.02 REINFORCEMENT

- A. Reinforcing Steel: ASTM A615/A615M, Grade 40 (40,000 psi).
 1. Deformed billet-steel bars.
- B. Steel Welded Wire Reinforcement (WWR): Plain type, ASTM A1064/A1064M.

2.03 CONCRETE MATERIALS

- A. Cement: ASTM C150/C150M, Type I - Normal Portland type.
- B. Other Cementitious Materials:
- C. Fine and Coarse Structural Aggregates: ASTM C33/C33M.
- D. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.
- E. Air Entrainment Admixture: ASTM C260/C260M.
- F. Grout:
 1. Non-shrink, non-metallic, minimum 10,000 psi, 28 day strength.

2.04 SUPPORT DEVICES

- A. Connecting and Support Devices; Anchors and Inserts: ASTM A36/A36M steel; hot-dip galvanized in accordance with ASTM A153/A153M.
 1. Clean surfaces of rust, scale, grease, and foreign matter.
 2. Prime paint in one coat, except surfaces in direct contact with concrete or requiring field welding.
 3. Galvanize after fabrication in accordance with requirements of ASTM A123/A123M.

- B. Bolts, Nuts, and Washers: ASTM A307 heavy hex bolts, Type A, hot-dip galvanized, with matching ASTM A563 (ASTM A563M) nuts and matching washers.

2.05 FABRICATION

- A. Fabricate in compliance with PCI MNL-117 and PCI MNL-135.
- B. Maintain plant records and quality control program during production of precast units. Make records available upon request.
- C. Use rigid molds, constructed to maintain precast unit uniform in shape, size, and finish.
- D. Maintain consistent quality during manufacture.
- E. Fabricate connecting devices, plates, angles, items fit to steel framing members, inserts, bolts, and accessories. Fabricate to permit initial placement and final attachment.
- F. Embed reinforcing steel, anchors, inserts plates, angles, and other cast-in items.
- G. Install window units in place while fabricating precast units. Protect assembly from damage.
- H. Cure units to develop concrete quality, and to minimize appearance blemishes such as non-uniformity, staining, or surface cracking.
- I. Minor patching in plant is acceptable, providing structural adequacy and appearance of units is not impaired.
- J. Remove protective coating from thin brick using method recommended by manufacturer. Do not damage brick or concrete material in joints.

2.06 FABRICATION TOLERANCES

- A. Comply with PCI MNL-117 and PCI MNL-135, except as specifically amended below.
 - 1. Maximum Variation From Nominal Face Dimensions: Plus or minus 3/32 in.
 - 2. Maximum Variation From Square or Designated Skew: Plus or minus 1/8 inch in 10 feet.
 - 3. Maximum Variation from Thickness: Plus or minus 1/8 in.
 - 4. Maximum Misalignment of Anchors, Inserts, Openings: Plus or minus 1/8 inch.
 - 5. Maximum Bowing of Members: Plus or minus length/360.

2.07 ACCESSORIES

- A. General:
 - 1. Chamfered edges.
 - 2. Smooth finish free from pits and rock pockets.
- B. Concrete Amortizement.
 - 1. Color: Similar to brick.
 - 2. Provide cast-in drip edge as shown on Contract Documents.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that building structure, anchors, devices, and openings are ready to receive work of this section.

3.02 PREPARATION

- A. Provide for erection procedures and induced loads during erection. Maintain temporary bracing in place until final support is provided.

3.03 ERECTION

- A. Erect units without damage to shape or finish. Replace or repair damaged panels.
- B. Erect units level and plumb within allowable tolerances.
- C. Align and maintain uniform horizontal and vertical joints as erection progresses.
- D. When units require adjustment beyond design or tolerance criteria, discontinue affected work; advise Architect.

- E. Fasten units in place with mechanical connections.
- F. Weld units in place. Perform welding in accordance with AWS D1.1/D1.1M.
- G. Provide non-combustible shields during welding operations.
- H. Touch-up field welds and scratched or damaged primed painted surfaces.
- I. Set vertical units dry, without grout, attaining joint dimension with lead or plastic spacers. Pack grout to base of unit.
- J. Exposed Joint Dimension: 1/2 inch. Adjust units so that joint dimensions are within tolerances.

3.04 TOLERANCES

- A. Erect members level and plumb within allowable tolerances. Comply with PCI MNL-135, except as specifically amended below.
 - 1. Plan Location from Building Grid Datum: Plus or minus 3/8 in.
 - 2. Top Elevation from Nominal Top Elevation: Plus or minus 3/8 inch.
 - 3. Maximum Plumb Variation Over Height of Structure or 100 ft (whichever is less): Plus or minus 1/2 inch.
 - 4. Exposed Joint Dimension: Plus or minus 3/16 inch.
 - 5. Maximum Jog in Alignment of Matching Faces or Edges: Plus or minus 3/16 inch.
 - 6. Differential Bowing or Camber as Erected Between Similar Adjacent Members: Plus or minus 3/16 inch.

3.05 CLEANING

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

3.06 PROTECTION

- A. Protect installed components from subsequent construction operations.
- B. Do not permit traffic over unprotected floor surface.

END OF SECTION

**SECTION 04 2613
MASONRY VENEER**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Clay facing brick.
- B. Mortar
- C. Reinforcement and anchorage.
- D. Flashings.
- E. Installation of lintels.
- F. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 07 9200 - Joint Sealants: Sealing control and expansion joints.

1.03 REFERENCE STANDARDS

- A. 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.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.
- C. ASTM B370 - Standard Specification for Copper Sheet and Strip for Building Construction 2012 (Reapproved 2019).
- D. ASTM C67/C67M - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile 2020.
- E. ASTM C91/C91M - Standard Specification for Masonry Cement 2018.
- F. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar 2018.
- G. ASTM C150/C150M - Standard Specification for Portland Cement 2020.
- H. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes 2018.
- I. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale) 2019.
- J. ASTM C404 - Standard Specification for Aggregates for Masonry Grout 2018.
- K. ASTM C989/C989M - Standard Specification for Slag Cement for Use in Concrete and Mortars 2018a.
- L. ASTM D903 - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds 1998 (Reapproved 2017).
- M. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing 2017.
- N. BIA Technical Notes No. 28B - Brick Veneer/Steel Stud Walls 2005.
- O. BIA Technical Notes No. 46 - Maintenance of Brick Masonry 2017.
- P. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures 2016.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene 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 Section 01-4523 for Testing and Inspection administrative requirements and responsibilities and Field Quality Control tests and inspections.
 - 1) Review requirements and frequency of testing and inspections.
 - 2) Review specific testing and inspections and field test requirements.

1.05 SUBMITTALS

- A. Product Data: Provide data for masonry units, fabricated wire reinforcement, and mortar.
- B. Samples: Submit four samples of facing brick units to illustrate color, texture, and extremes of color range.
 - 1. Provide sample of type of veneer tie used.
- C. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.
- D. Closeout Submittals:
 - 1. Include following in Operations and Maintenance Manual specified in Section 01 7800:
 - a. Record Documentation:
 - 1) Manufacturers Documentation:
 - (a) Brick Manufacturer's literature or cut sheet.
 - (b) Brick color and type selection.
 - 2) Testing and Inspection Reports:
 - (a) Testing Agency Testing and Inspecting Reports.

1.06 QUALITY ASSURANCE

- A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.
- B. Scheduling:
 - 1. Brick Veneer Unit Masonry:
 - a. Structural Mortar:
 - 1) Notify Testing Agency and Architect twenty-four (24) hours minimum before placing masonry units, reinforcing and mortar.

1.07 MOCK-UP

- A. Construct a masonry wall as a mock-up panel sized 4 feet long by 3 feet high; include mortar and accessories, structural backup, anchor and tie systems, any specialty details, such as reveals, soldier courses, window details, etc., brick expansion joints if required on Project, flexible flashing and required components at foundation, and seismic reinforcing in mock-up.
 - 1. Sample panels(s) shall be constructed using 'production run' material to be used on Project unless otherwise approved in writing by Architect and/or Owner.
 - 2. Sample panel(s) are to be used as standard of comparison for masonry work built of same materials.
 - 3. Sample panel(s) shall remain at jobsite until all masonry is completed.
 - 4. Do not start work until Architect has accepted sample panel(s).
 - 5. At Architect's direction, demolish mock-ups and remove debris.
- B. Locate where directed.
- C. Mock-up may remain as part of the Work.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.
- B. Storage and Handling Requirements:
 - 1. 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.
- 2. 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 has become unsuitable for good construction.
- 3. 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.
- 4. 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.
- 5. Masonry Reinforcement:
 - a. Protect reinforcement, ties, and metal accessories from permanent distortions, elements and store off ground.
- C. Store materials protected from exposure to harmful weather conditions and as directed by manufacturer.

PART 2 PRODUCTS

2.01 BRICK UNITS

- A. Facing Brick: ASTM C216, Type FBX, Grade SW.
 - 1. Color and Texture: MATCH EXISTING
 - 2. Nominal Size: 3-5/8 inches wide by 2-1/4 inches high by 7-5/8 inches long modular brick.
 - a. Brick shall be true to size and shape. No warped brick permitted. Brick for Project shall be fired in same run.
 - 3. Efflorescence:
 - a. Provide brick that has been tested according to ASTM C67/C67M and is rated 'Not Effloresced'.
 - 4. Initial rate of absorption: Less than 30 sq. in (30 g) per minute when tested per ASTM C67/C67M.

2.02 MORTAR MATERIALS

- A. Masonry Cement: ASTM C91/C91M Type N or Type S if over three stories.
- B. Portland Cement: ASTM C150/C150M, Type I; color as required to produce approved color sample.
- C. Hydrated Lime: ASTM C207, Type S.
- D. Mortar Aggregate: ASTM C144.

- E. Grout Aggregate: ASTM C404.
- F. Water: Clean and potable, free of acids, alkalis, and organic materials.
- G. Admixtures:
 - 1. Use no admixtures, except for color pigments, without Architect's written permission. Use of any admixture to meet cold weather requirements and admixtures that increase air entrainment are expressly forbidden under all circumstances.
 - 2. Colored Mortar: Proportion selected pigments and other ingredients to match Architect's sample, without exceeding manufacturer's recommended pigment-to-cement ratio.
- H. Antifreeze Compounds:
 - 1. No antifreeze liquids, salts or other substances shall be used in grout to lower freezing point.
- I. Integral Water Repellent Admixture for Mortar: Polymeric liquid admixture added to mortar at the time of manufacture.
 - 1. Use only in combination with masonry units manufactured with integral water repellent admixture.
 - 2. Use only water repellent admixture for mortar from the same manufacturer as water repellent admixture in masonry units.
 - 3. Meet or exceed performance specified for water repellent admixture used in masonry units.
- J. Packaged Dry Material for Mortar for Unit Masonry: Premixed Portland cement, hydrated lime, and sand; complying with ASTM C1714/C1714M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.
 - 1. Color: Standard gray.
 - 2. Mixing: Use mechanical batch mixer and comply with referenced standards.

2.03 REINFORCEMENT

- A. Cold-drawn steel conforming to ASTM A1064/A1064M.
 - 1. Continuous Joint Reinforcing:
 - a. Conform to ASTM A1064/A1064M. Exterior wall reinforcing shall be galvanized to meet requirements of ASTM A153/A153M, Class B-2. Interior wall reinforcing shall be galvanized to meet requirements of ASTM A1064/A1064M, Class A.
 - b. Size: 2 inches less than nominal thickness of wall.
 - c. Rod Size:
 - 1) Side rods: 9 gauge (1.48 inch) or 3/16 inch diameter.
 - 2) Cross rods: 9 gauge or 3/16 inch diameter.
 - d. Cross rods that serve as metal ties in exterior cavity and other multi-wythe walls shall be drip crimped.
 - e. Corners and Tee Sections: Prefabricated of material and design similar to main reinforcement.
 - 2. Finish: Hot-dipped galvanized as per ASTM A153/A153M (1.5 oz/ft² after fabrication).
 - 3. Space joint reinforcing consisting of a single #9 rod at 16" on center beginning at 8" above the foundation.
- B. Masonry Veneer Anchors: 2-piece anchors that permit differential movement between masonry veneer and structural backup, hot dip galvanized to ASTM A 153/A 153M, Class B.
 - 1. Anchor plates: Not less than 0.075 inch thick, designed for fastening to structural backup through sheathing by two fasteners; provide design with legs that penetrate sheathing and insulation to provide positive anchorage.
 - 2. Wire ties: Manufacturer's standard shape, 0.1875 inch thick.
 - 3. Vertical adjustment: Not less than 3-1/2 inches.
 - 4. Seismic Feature: Provide lip, hook, or clip on end of wire ties to engage or enclose not less than one continuous horizontal joint reinforcement wire of 0.1483 inch diameter.
 - 5. Space anchors at 16 inches horizontally and no more than 16 inches on center vertically.

6. Brick Veneer Unit Masonry Attached to Framing:
 - a. Brick Ties:
 - 1) Design Criteria:
 - (a) Sheet Metal (Carbon Steel):
 - (b) Meet requirements of ASTM A1008/A1008M.
 - (c) Provide seismic notch to accommodate 9 ga (3.8 mm) or 3/16 inch (4.8 mm) diameter continuous wire c) Thickness: 14 ga (1.9939 mm).
 - (d) Finish: Hot dipped galvanized (ASTM A153/A153M, Class B-2).
 - (e) Tie Length: Length includes cavity air space and 1-1/2 inches (38 mm) brick overlap as per code.
 - 2) Acceptable Products:
 - (a) 360 L-Type Seismic Anchor by Heckmann.
 - (b) 345 SV Seismic-Notch Veneer Anchor by Hohmann & Barnard.
 - (c) 2522 Seismic Veneer Anchor by Wire-Bond.
7. Brick Veneer Unit Masonry With Exterior Rigid Insulation Attached to Framing:
 - a. Brick Ties:
 - 1) Design Criteria:
 - (a) Finish: Hot dipped galvanized (ASTM A153/A153M, Class B-2).
 - (b) Length: Total length includes cavity air space, exterior rigid insulation and 1-1/2 inches (38 mm) brick overlap as per code.
 - 2) Acceptable Products:
 - (a) HB-213-2X w/300-C Seismic Clip by Hohmann & Barnard.
 - (b) Concrete 2-Seal Tie Veneer Anchor by Hohmann & Barnard.
 - (c) Concrete Thermal 2-Seal Tie Veneer Anchor by Hohmann & Barnard.
 - (d) Equals meeting Design Criteria as approved by Architect before installation. See Section 016200.
 - b. Fasteners:
 - 1) Quality Standards. See Section 016200:
 - (a) Wood Framing: Non-corrosive wood screws of length, type, and quantity recommended by Manufacturer.
 - (b) Steel Framing: Non-corrosive screws of length, type, and quantity recommended by Manufacturer.
8. Dovetail Anchor And Slot:
 - a. Design Criteria:
 - 1) Finish:
 - (a) Hot-dipped galvanized as per ASTM A153/A153M (1.5 oz/ft² (458 g/m²)).
 - b. Dovetail Anchor:
 - 1) Acceptable Products. See Section 016200:
 - (a) 303-SV Corrugated Notch by Hohmann & Barnard.
 - (b) 2222 Dovetail Anchor Seismic by Wire-Bond.
 - (c) Equals meeting Design Criteria as approved by Architect before installation. See Section 016200.
 - c. Dovetail Slot:
 - 1) Acceptable Products. See Section 016200:
 - (a) 305 Dovetail Slot by Hohmann & Barnard.
 - (b) 1304 Dovetail Slot by Wire-Bond.
 - (c) Equals meeting Design Criteria as approved by Architect before installation. See Section 016200.

2.04 FLASHINGS

- A. Design Criteria:
 1. General:
 - a. Compatible with sealants and other building components.
 - b. Do not use as an exposed flashing.

- c. Drool: Membrane shall not 'drool' when exposed to UV or heat.
- 2. Required Components:
 - a. Drip Edge/Plate: Install with stainless steel drip edge/plate.
 - b. Mortar Guard: Install with mortar guard.
 - c. Termination Bar: Install termination bar.
 - d. Weep Vents: Requires weep vents.
- 3. Self-adhering and self-sealing membranes:
 - a. Ambient Conditions: Follow Manufacturer recommendations for storage and application.
 - b. Do not apply to moist or damp surfaces.
 - c. Meet testing requirements of ASTM D903 for peel or stripping strength of adhesive bonds.
- B. Metal Flashing Materials:
 - 1. Copper Flashing: ASTM B370, 060 soft annealed; 20 oz/sq ft thick; natural finish.
- C. Combination Non-Asphaltic Flashing Materials - Copper:
 - 1. Copper/Polymer Film or Fabric Flashing: 5 oz/sq ft copper sheet laminated between two sheets of polymer or fiberglass fiber-reinforced film.
 - a. Manufacturers:
 - 1) York Manufacturing, Inc; Multi-Flash 500 Series: www.yorkmfg.com/#sle.
 - 2) Cop-R-Kraft Duplex by Advanced Building Products.
 - 3) Copper-Tuff by Hohmann & Barnard.
 - 4) Cop-R-Tex Duplex (for coping, door and window heads, roof flashing, curtain wall and flashing between new and old walls) by York.
- D. Membrane Non-Asphaltic Flashing Materials:
 - 1. Asphalt-Free Non-Copper Flashing:
 - a. Description:
 - 1) Self-adhering and self-sealing composite non-asphaltic waterproof polyethylene membrane.
 - b. Design Criteria:
 - 1) Self-adhering and self-sealing.
 - 2) Width: Provide 18 inches (450 mm) minimum width.
 - c. Type One Acceptable Products:
 - 1) Aquaflash Premium by Wire-Bond.
 - 2) Flex-Flash Flashing by Hohmann & Barnard.
 - 3) Textroflash Flashing by Hohmann & Barnard.
- E. Preassembled Systems:
 - 1. Description:
 - a. Pre-assembled panels consist of flashing membrane, drainage mat with integrated weep tabs, termination bar, drip edge, inside/outside corner boots, and end dams for a complete system.
 - 2. Acceptable Product:
 - a. Total Flash by Mortar Net.
 - b. Flash-Vent by York.
- F. Termination Bars: Stainless steel; compatible with membrane and adhesives.
- G. Drip Edge/Plate:
 - 1. Design Criteria:
 - a. 26 ga (0.019) (0.4826 mm) stainless steel AISI Type 304 drip edge/plate flashing with drip edge hemmed back.
 - 2. Type One Acceptable Products:
 - a. No. 1007 Hemmed Drip-Edge Flashing by Heckmann.
 - b. Drip Plate by Hohmann & Barnard.

- c. Sandell's Drip Edge by Sandell Construction Solutions.
- d. No. 4156 Drip Edge Flashing by Wire-Bond.

H. Lap Sealants and Tapes: As recommended by flashing manufacturer; compatible with membrane and adhesives.

2.05 ACCESSORIES

A. Weeps:

1. Description:
 - a. Allows passage of moisture from cavity to building exterior while restricting ingress of insects and other debris.
 - b. Dimensions:
 - 1) 3/8 inch (9.5 mm) wide x 2-1/2 inch (64 mm) deep x 3-3/8 inch (86 mm) long.
2. Design Criteria:
 - a. Polypropylene tested to conform to ASTM standards.
 - b. Suitable for top of wall venting.
 - c. Acceptable Products:
 - 1) Cell Vent:
 - (a) QV - Quadro-Vent by Hohmann & Barnard.
 - (b) No. 3601 Cell Vent by Wire-Bond.

B. Vents (Open Head Joints):

1. Description:
 - a. Vent inserted in weep hole at top of drainage air space in full height masonry veneer walls (not required in veneer wainscot walls or if air space vents into structure/roof above wall).
 - b. Vent allows passage of moisture from cavity to building exterior while restricting ingress of insects and other debris.
2. Dimensions:
 - a. 3/8 inch (9.5 mm) wide x 2-1/2 inch (64 mm) deep x 3-3/8 inch (86 mm) long.
3. Design Criteria:
 - a. Polypropylene tested to conform to ASTM standards.
 - b. Suitable for top of wall venting.
4. Acceptable Products:
 - a. Cell Vent:
 - 1) QV - Quadro-Vent by Hohmann & Barnard.
 - 2) No. 3601 Cell Vent by Wire-Bond.

C. Cavity Vents:

1. Type: Polyester mesh.
2. Color(s): As indicated on drawings.

D. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.

1. Mortar Diverter: Panels installed at flashing locations.
 - a. Manufacturers:
 - 1) Mortar Trap by Hohmann & Barnard.
 - 2) Mortar Net by Mortar Net.

E. Precast Concrete Amortizement:

1. Flashing:
 - a. Description:
 - 1) Prevent entry of water into masonry cavity under precast concrete amortizement.
 - b. Design Criteria:

- 1) 26 ga (0.019) (0.4826 mm) stainless steel AISI Type 304 drip edge/plate flashing with drip edge hemmed back.
- 2) Apply sealant and backing rod.
- c. Acceptable Products:
 - 1) No. 1007 Hemmed Drip-Edge Flashing by Heckmann.
 - 2) Drip Plate by Hohmann & Barnard.
 - 3) Sandell's Drip Edge by Sandell Construction Solutions.
 - 4) No. 4156 Drip Edge Flashing by Wire-Bond.
 - 5) Equal meeting Design Criteria as approved by Architect.
2. Cast in Place Anchor Strap:
 - a. Design Criteria:
 - 1) Provide three (3) straps, one (1) at each end and at midpoint with four (4) #8 noncorrosive screws per strap as shown on Contract Drawings.
 - b. Acceptable Products:
 - 1) Simpson LSTA18.
 - 2) Equal meeting Design Criteria as approved by Architect.
- F. Cleaning Compounds:
 1. Use type of compound recommended by Brick Manufacturer based on minerals present in masonry units.
 2. Acceptable Products:
 - a. 202 or 202V by Diedrich Technologies, Oak Creek, WI
www.diedrichtechnologies.com.
 - b. Surekleen No. 600 or Vana-Trol by ProSoCo Inc, Kansas City, KS
www.prosoco.com.
- G. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive masonry.
- B. Verify that related items provided under other sections are properly sized and located.
- C. Verify that built-in items are in proper location, and ready for roughing into masonry work.
- D. Coordinate placement of reinforcement, anchors, ties and accessories, flashings and weep holes and weep vents, and other moisture control products.

3.02 COURSING

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- C. Brick Units:
 1. Bond: Running.
 2. Coursing: Three units and three mortar joints to equal 8 inches.
 3. Mortar Joints: Concave.

3.03 PLACING AND BONDING

- A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
 1. Except at foundations, which may vary in thickness, joints are to be 3/8 inch thick.
- B. Lay hollow masonry units with face shell bedding on head and bed joints.
- C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.
- D. Remove excess mortar as work progresses.
- E. Interlock intersections and external corners, except for units laid in stack bond.

- F. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- G. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
- H. Isolate top joint of masonry veneer from horizontal structural framing members or support angles with compressible joint filler.

3.04 WEEPS/CAVITY VENTS

- A. Install weeps in veneer walls at 24 inches on center horizontally on top of through-wall flashing above shelf angles and lintels and at bottom of walls.
- B. Install cavity vents in veneer walls at 32 inches on center horizontally below shelf angles and lintels and at top of walls.

3.05 CAVITY MORTAR CONTROL

- A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.

3.06 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

- A. Install horizontal joint reinforcement 16 inches on center.
- B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
- C. Place continuous joint reinforcement in first and second joint below top of walls.
- D. Embed longitudinal wires of joint reinforcement in mortar joint with at least 5/8 inch mortar cover on each side.
- E. Lap joint reinforcement ends minimum 6 inches.
- F. Stud Back-Up: Secure veneer anchors to stud framed back-up and embed into masonry veneer at maximum 1.77 sq ft of wall surface per anchor. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center.
- G. Seismic Reinforcement: Connect veneer anchors with continuous horizontal wire reinforcement before embedding anchors in mortar.

3.07 MASONRY FLASHINGS

- A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
 - 1. Extend flashings full width at such interruptions and at least 6 inches, minimum, into adjacent masonry or turn up at least 1 inch, minimum, to form watertight pan at non-masonry construction.
 - 2. Remove or cover protrusions or sharp edges that could puncture flashings.
 - 3. Seal lapped ends and penetrations of flashing before covering with mortar.
- B. Terminate flashing up 8 inches minimum on vertical surface of backing:
 - 1. Install vertical leg of flashing behind water-resistive barrier sheet over backing.
 - 2. Install vertical leg of flashing over fluid-applied or self-adhered air/vapor barriers over backing or per manufacturer's directions.
 - 3. Terminate vertical leg of flashing into bed joint in masonry or reglet in concrete.
 - 4. Anchor vertical leg of flashing into backing with a termination bar and sealant.
 - 5. Apply cap bead of sealant on top edge of self-adhered flashing.
- C. Install flashing in accordance with manufacturer's instructions and BIA Technical Notes No. 7.
- D. Extend metal flashings through exterior face of masonry and terminate in an angled drip with hemmed edge. Install joint sealer below drip edge to prevent moisture migration under flashing.
- E. Support flexible flashings across gaps and openings.
- F. Lap end joints of flashings at least 6 inches, minimum, and seal watertight with flashing sealant/adhesive.

3.08 LINTELS

- A. Install loose steel lintels over openings.
- B. Provide 1" of bearing for each foot of span, 6 inch minimum bearing on each side of opening.

3.09 VENTS (OPEN HEAD JOINTS)

- A. Place vents at top of cavity air space of full height masonry walls.
- B. Install weep vents in weep holes at 33 inches on center maximum and should be centered between weep holes at base of masonry walls.

3.10 MORTAR GUARD

- A. Place mortar guard continuously between brick and sheathing at bottom masonry course at foundation and above windows, and doors.

3.11 EXPANSION JOINTS

- A. Do not continue horizontal joint reinforcement through control or expansion joints.
- B. Size expansion joints as indicated on drawings; if not indicated, 3/4 inch wide and deep.
- C. Form expansion joint as detailed on drawings.

3.12 FIELD QUALITY CONTROL

- A. Field Tests and Inspections (Required Level 1 masonry inspection for non-essential facilities):
 - 1. Civil and structural field tests, laboratory testing, and inspections are provided by Owner's independent Testing Agency as specified in 01 4000 - Quality Requirements :
 - a. 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.
 - 2. Masonry (Masonry Prisms, Masonry Units, Reinforcement, Mortar and Grout):
 - a. Testing and Inspections shall conform to IBC Section 17 'Special Inspections and Tests' and in accordance with Chapter 3 'Quality And Construction' of TMS 402/ACI 530.1/ASCE 5 (Building Code Requirements for Masonry Structures) and TMS 602/ACI 530.1/ASCE 6 (Specification for Masonry Structures):
 - 1) Quality assurance program shall comply with requirements of Chapter 3, for Level A 'Quality Assurance' for Risk Category I, II, or III structures or Level B 'Quality Assurance' for Risk Category IV structures and as defined in ASCE 7 or latest approved adopted building code. See Structural Design Criteria as shown on Contract Documents.
- B. Non-Conforming Work:
 - 1. Remove and replace defective material at Architect's direction and at no additional cost to Owner.

3.13 TOLERANCES

- A. Install masonry within the site tolerances found in TMS 402/602.
- B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.
- C. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.
- D. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
- E. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.
- F. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch.
- G. Maintain 3/8 inch mortar joints throughout.

3.14 CUTTING AND FITTING

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- A. Cut and fit for pipes and conduit. Coordinate with other sections of work to provide correct size, shape, and location.
- B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.15 CLEANING

- A. Remove excess mortar and mortar smears as work progresses.
- B. Replace defective mortar. Match adjacent work.
- C. Clean soiled surfaces with cleaning solution.
- D. Use non-metallic tools in cleaning operations.

3.16 PROTECTION

- A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION

**SSECTION 05 1200
STRUCTURAL STEEL FRAMING**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Structural steel framing members.

1.02 RELATED REQUIREMENTS

- A. Section 09 9123 - Interior Painting

1.03 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.

1.04 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.
- 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.

1.05 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 B.
- E. Pipe: ASTM A53/A53M, Grade B, Finish black.
- F. Structural Bolts and Nuts: Carbon steel, ASTM A307, Grade A and galvanized in compliance with ASTM A153/A153M Class C.
- 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.
- I. Shop and Touch-Up Primer: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.
- J. Touch-Up Primer for Galvanized Surfaces: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.
- K. Steeple Base Support:
 1. Finish:
 - a. Corlar 2.1-ST satin high solids epoxy mastic by Dupont Industrial Coatings:
 - 1) Thickness: Apply 10 mils thick.
 - b. Manufacturers:
 - 1) Dupont Industrial Coatings, Wilmington, DE www.dupont.com.
 - 2) Equal as approved by Architect before bidding.

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. Prepare structural component surfaces in accordance with SSPC-SP 3.
- B. Shop prime structural steel members. Do not prime surfaces that will be fireproofed, field welded, in contact with concrete, or high strength bolted.

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. Field weld components and shear studs indicated on shop drawings.
- 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. Use carbon steel bolts only for temporary bracing during construction, unless otherwise specifically permitted on drawings. Install high-strength bolts in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts".
- F. Do not field cut or alter structural members without approval of Architect.
- G. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.
- H. Do not overload or exceed carrying capacity of any structural steel element during construction period.
- I. Bridging installation shall proceed concurrently with truss erection and be completed before trusses are subjected to construction loads.
 - 1. Do not remove bridging after construction is complete.
- J. Plates or Channels Embedded in Concrete:
 - 1. Tack weld bolts to plates or channels to prevent bolts from turning when nuts are tightened.
- K. Immediately after erection, clean completed field connections and damaged surfaces with solvents and hand or power tools. After cleaning, apply corrosion-resistant primer compatible with factory-applied primer.
- L. Grout solidly between column plates and bearing surfaces, complying with manufacturer's instructions for nonshrink grout. Trowel grouted surfaces smooth, splaying neatly to 45 degrees.
- M. Interface With Other Work:
 - 1. Furnish items to be embedded in concrete or masonry to Division 03 or 04 respectively in time to be securely tied in place before placing concrete and grout.

3.03 TOLERANCES

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

3.04 FIELD QUALITY CONTROL

- A. Field Tests and Inspections:
 - 1. Civil and structural field tests, laboratory testing, and inspections are provided by Owner's independent Testing Agency as specified in Section 01 4523 'Testing and Inspection Services':
 - a. 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.

2. General Requirements:
 - a. Furnish items to be embedded in concrete or masonry to Division 03 or 04 respectively in time to be securely tied in place before placing concrete and grout.
3. Structural Steel - General:
 - a. Testing Agency shall provide testing and inspection of structural steel including following:
 - 1) Mill Certificates:
 - (a) Mill certificates or affidavits and manufacturer's certification shall be supplied to inspector for verification of steel materials.
 - (b) Testing laboratory shall be notified at least three (3) weeks in advance of fabrication and supplied with reports so that shop inspection may be performed.
 - 2) General Inspection:
 - (a) Testing Agency shall be at fabricator's plant to verify that materials used match mill tests or affidavits of test reports; that fabrication, welding procedures, surface preparation, and shop painting meet specifications; and that work in progress conforms to project requirements.
 - (b) Testing Agency shall visually check fabricated steel delivered to job to confirm that work is in compliance with approved shop drawings and shall make any physical tests, measurements, etc., believed to be necessary.
 - (c) Testing Agency shall witness and report all corrections performed by steel fabricator occurring on fabricators own initiative.
 - 3) Bolting Requirements: All inspection shall conform to requirements of current edition of AISC 340, 'Specification for Structural Joints using High-Strength Bolts' using ASTM F3125/F3125M Grade A325 and Grade A490 Bolts:
 - (a) Miscellaneous Metal: Where miscellaneous angles, channels, studs, and similar shapes are detailed for support of major components of work, welds, bolts, and material are subject to same testing requirement as other structural supporting members.
 - (b) Inspections shall include required verification and inspection of steel construction as referenced in IBC Section 17 'Special Inspections And Tests' and in accordance with ANSI/AISC 360 and applicable ASTM material standards, and ANSI/AISC 360, Section M2.5. Periodic and continuous inspections include:
 - (c) Material verification of high-strength bolts, nuts and washers:
 - (d) Identification markings to conform to AWS designation listed in WPS (periodic).
 - (e) Manufacturer's certificated of compliance required (periodic).
 - (f) Inspection of high-strength bolting:
 - (g) Snug-tight joints.
 - (h) Pretensioned and slip-criteria joints using turn-of-nut with match marking, twist-off bolt or direct tension indicator methods of installation (periodic).
 - (i) Pretension and slip-critical joints using turn-of-nut without match marking or calibrated wrench methods of installation (continuous).
 - 4) Welding Requirements: Inspection shall be provided by Testing Agency for all welding in accordance with Building Code:
 - (a) Nondestructive testing shall be performed as required by Building Code and ANSI/AWS D1.1/D1.1M as specified herein for all shop and field welds.
 - (b) Ultrasonically test 100 percent of all complete penetration welds and 100 percent of all partial-penetration column splice welds.
 - (c) Ultrasonically test all joints where base metal is thicker than 1-1/2 inches (38 mm), when subjected to through-thickness weld shrinkage strains. Joint shall be ultrasonically inspected for discontinuities directly behind such welds after joint completion.

- (d) When ultrasonic indications arising from weld root cannot be interpreted as either weld defect or backing strip itself, backing strip shall be removed at expense of Contractor, and if no root defect is visible, weld shall be re-tested. If no defect is indicated on this re-test, and no significant amount of weld metal has been removed, no further repair of welding is necessary. If defect is indicated, it shall be repaired at no expense to Owner.
- (e) Perform Magnetic Particle (MP) tests of fillet welds larger than 5/16 inch (8 mm).
- (f) Exceptions:
 - (1) When approved by Owner's Representative and/or Architect/Engineer, rate of testing for ultrasonic testing of complete-penetration welds may be reduced in accordance with following:
 - (2) Nondestructive testing rate for individual welder or welding operator may be reduced to 25 percent, provided reject rate is demonstrated to be 5 percent or less of welds tested for welder or welding operator. Sampling of at least 40 completed welds for job shall be made for such reduction evaluation. Reject rate is defined as number of welds containing rejectable defects divided by number of welds completed).
 - (3) For complete penetration groove welds on materials less than 5/16 inch (8 mm) thick, nondestructive testing is not required provided continuous inspection is provided.
 - (4) When approved by building official, nondestructive ultrasonic testing may be performed in shop of AISC approved fabricator utilizing qualified test techniques in employment of fabricator.
 - (5) Other ultrasonic or magnetic particle testing may be reduced by approval of Owner's Representative and/or Architect/Engineer upon presentation of satisfactory documentation submitted by Contractor.
 - (6) There shall be no exceptions to testing requirements for SFRS.
- (g) Inspections shall include required verification and inspection of steel construction as referenced in IBC Section 17 'Special Inspections and Tests' and in accordance with ANSI/AISC 360, Section A3.5 and applicable ANSI/AWS A5 documents, ANSI/AWS D1.1/D1.1M, ANSI/AWS D1.3/D1.3M, ANSI/AWS D1.4/D1.4M, and ACI 318 or ACI 318M, Section 3.5.2. Periodic and continuous inspections include:
 - (1) Material verification of weld filler materials:
 - (2) Identification markings to conform to AWS designation listed in WPS (periodic).
 - (3) Manufacturer's certificated of compliance required (periodic).
 - (4) Inspection of welding:
 - (5) Structural steel and cold-formed steel deck:
 - (6) Complete and partial joint penetration groove welds (continuous).
 - (7) Multipass fillet welds (continuous).
 - (8) Single-pass fillet welds > 5/16 inch (8 mm) (continuous).
 - (9) Plug and slot welds (continuous).
 - (10) Single-pass fillet welds less than or equal to 5/16 inch (8 mm) (periodic).
- 5) Steel Frame Requirements:
 - (a) Inspections shall include required verification and inspection of steel frame as referenced in IBC Section 17 'Special Inspections And Tests' and in accordance with ANSI/AISC 360 and Applicable ASTM material standards. Periodic inspections include:
 - (b) Inspection of steel frame joint details compliance with approved construction documents:

- (c) Details such as bracing and stiffening (periodic).
- (d) Member locations (periodic).
- (e) Applications of joint details at each connection (periodic).

END OF SECTION

SECTION 05 5215**STAINLESS STEEL HANDRAILS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install stainless steel pipe handrails and guardrails as described in Contract Documents.
 - a. Handrails to Font.
- B. Products Furnished But Not Installed Under This Section:
 - 1. Anchoring sleeves in concrete for stainless steel pipe handrails.
- C. Related Requirements:
 - 1. Section 03 3111: 'Cast-In-Place Structural Concrete' for installation of anchoring sleeves cast into concrete.
 - 2. Section 05 0523: 'Metal Fastening' for quality of welding.
 - 3. Section 06 1100: 'Wood Framing' for blocking for pipe handrail brackets.
 - 4. Section 10 2813: 'Commercial Toilet Accessories' for grab bars in Rest Rooms.

1.2 REFERENCES

- A. Definitions:
 - 1. Non-shrink Grout: Structural grout used for filling voids between elements that is formulated with cement, fine aggregates and admixtures. Admixtures are used to provide expansive properties of the material during curing. This expansion counteracts the natural tendency of cement grouts to shrink during curing.
 - 2. Peened: Nonslip textured gripping surface that is much easier to hold on to.
 - 3. Stainless Steel Alloys:
 - a. Type 304 (UNS S30400): Austenitic stainless steel with non-magnetic properties in annealed condition that provide good corrosion resistance to both chemical and atmospheric exposures, with high resistance to oxidations. Most common and widely used stainless steel.
- B. Reference Standards:
 - 1. ASTM International:
 - a. ASTM C1107/C1107M-17, 'Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)'.

1.3 SUBMITTALS

- A. Action Submittals:
 - 1. Shop Drawings: Show fabrication and installation of handrails and railings including floor plans, elevations, sections, details of components, and attachments to other elements of The Work.

PART 2 - PRODUCTS**2.1 ASSEMBLIES**

- A. Materials:

1. Handrails And Railings:
 - a. 1-1/2 inch (38 mm) outside diameter non-magnetic satin finish 16 gauge (0.063) (1.6002 mm) type 304 stainless tubing.
 - b. Sizes and configurations as indicated on Contract Drawings.
 - c. Font handrail: Provide peened nonslip textured gripping surface.
 2. Pipe Sleeves: 2 inch (50 mm) diameter by 6 to 9 inch (150 to 225 mm) long non-magnetic stainless steel.
 - a. Handrails to Font.
 - 1) Brackets, Flanges, Fittings, And Anchors:
 - a) Provide standard wall brackets, flanges, miscellaneous fittings, and anchors for connection of handrails and railings to other construction.
 - b) Provide inserts and other anchorage devices for connecting handrails and railing systems to concrete or masonry work.
- B. Fabrication:
1. Preassemble railing systems in shop to greatest extent possible to minimize field splicing and assembly.
 2. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
 3. Grind smooth welded joints and buff welds to same appearance as remainder of railing.
 4. Form curves by bending pipe in jigs to produce uniform curvature for each configuration required. Maintain cylindrical cross-section of pipe throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of pipe.
 5. Return pipe ends of wall mounted handrails into wall.
 6. Welded Connections:
 - a. Fabricate railing system and handrail connections by welding.
 - b. Weld corners and seams continuously to comply with following:
 - 1) Use materials and methods that minimize distortion and develop of metals.
 - 2) At tee and cross intersections, notch ends of intersecting members to fit contour of pipe to which end is joined and weld all around.
 - 3) At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and so contours of welded surfaces match adjacent surfaces.

2.2 ACCESSORIES

- A. Rail Setting Grout:
1. Commercial non-shrink grout conforming to requirements of ASTM C1107, Type B or Type C.
 2. Type Two Acceptable Manufacturers:
 - 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
 - d. 5 Star Special Grout 110 by Five Star Products Inc, Fairfield, CT www.fivestarprouducts.com.
 - e. Duragrout by L&M Construction Chemicals Inc, Omaha, NE www.lmcc.com.
 - f. Sonneborn / BASF Building Systems, Shakopee, MN www.chemrex.com.
 - g. Tamms Grout 621 by TAMMS Industries, Mentor, OH www.tamms.com.
 - h. U S Spec MP Grout by U S Mix Products Co, Denver, CO www.usspec.com.
 - i. CG-86 Grout by W R Meadows, Hampshire, IL www.wrmeadows.com.
 - j. Equal as approved by Architect before use. See Section 01 6200.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Touch up field welds to match finished material.

END OF SECTION

SECTION 05 5871**METAL BRACKETS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Supplied But Not Installed Under This Section:
 - 1. Metal Brackets:
 - a. Metal brackets necessary to support Clerk's Office Desk.
 - b. Metal brackets necessary to support Baptismal Font Mirror.
 - c. Metal brackets necessary to support Dressing Room benches.
- B. Related Requirements:
 - 1. Metal Brackets:
 - a. Section 05 0503: 'Shop-Applied Metal Coatings' for quality of priming.
 - b. Section 05 0523: 'Metal Fastening' for quality of welding.
 - c. Section 06 2001: 'Common Finish Carpentry Requirements' for installation of metal brackets.
 - d. Section 09 9124: 'Interior Painted Metal' for finish painting.
 - e. Section 11 9116: 'Baptismal Font Mirror' for brackets for font mirror.

1.2 REFERENCES

- A. Reference Standards (Metal Brackets):
 - 1. ASTM International:
 - a. ASTM A36/A36M-14, 'Standard Specification for Carbon Structural Steel'.

PART 2 - PRODUCTS**2.1 FABRICATED UNITS**

- A. Materials:
 - 1. Metal Brackets:
 - a. Steel: Meet requirements of ASTM A36/A36M.
 - b. Fabrication:
 - 1) Fabricate as detailed.
 - 2) Grind exposed welds smooth and polish to match non-welded metal finish.
 - 3) After fabrication and drilling of mounting holes, shop prime.

PART 3 - EXECUTION: Not Used**END OF SECTION**

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.
- C. Fire-retardant 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 SUBMITTALS

- A. Fire Retardant Treatment:
 - 1. If pressure treated: Certificate of pressure treatment showing compliance with specification requirements and including information required under IBC Section 2303.1.8.1, 'Identification'.
 - 2. If site applied: Testing Agency report showing compliance with specification requirements.

1.05 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.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.
- 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 SITE APPLIED FIRE RETARDANT WOOD TREATMENT

- A. Materials:
 - 1. Lumber grade and species shall be as specified for particular use.
 - 2. Identify treated lumber as to name of treater, preservative used, and retention in lbs/cu ft.
 - 3. Season after treatment to moisture content required for non-treated material.
- B. Surface-Applied Fire-Retardant:
 - 1. Description:
 - a. Water-based, post-treatment, interior/exterior fire retardant, and wood preservative that penetrates wood products and bonds with cellular structure. Protects by developing self-extinguishing reaction when treated wood comes in contact with an open flame.
 - b. Post-treatment must be used with OSB wood sheathing and structural composite lumber (LSL, LVL, PSL).
 - c. Post-treatment may be used with plywood or lumber materials.
 - 2. Design Criteria:
 - a. Prior to treatment, wood is to be kiln-dried to maximum moisture content of nineteen (19) percent for lumber and fifteen (15) percent for sheathing (plywood).
 - b. Meet requirements as defined in UCFA of American Wood Protection Association Standard U1 for interior Type A (HT) fire-retardant use and AWWPA Standards P50.
 - c. Meet Regulatory Agency Sustainability Approvals.
 - d. Meet requirements of NFPA 255.
 - e. Provide dye for easy visual identification.
 - f. Treat lumber and plywood for new work in accordance with AWWPA Standards.
 - 3. Acceptable Manufacturers:
 - a. Quality Standard: Flame Stop IM (color white) by Flame Stop by, Ft. Worth, TX www.flamestop.com.
 - b. Equal meeting design criteria as approved by Architect before bidding. See Section 016000.

2.02 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 AWPA approved.
 - (2) Provide retention rate required to provide 40 year minimum protection using the AWPA 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.
- C. Factory Applied Fire Retardant Wood Treatment:
- 1. Penetration-Impregnated:
 - a. Description:
 - 1) Pressure-impregnated, fire-retardant treated application for wood products that may be used with plywood and lumber materials.
 - b. Design Criteria:
 - 1) Prior to treatment, wood is to be kiln-dried to maximum moisture content of nineteen (19) percent for lumber and fifteen (15) percent for plywood.
 - 2) Meet requirements as defined in UCFA of American Wood Protection Association Standard U1 for interior Type A (HT) fire-retardant use and AWPAs Standards P50.
 - 3) Meet Regulatory Agency Sustainability Approvals.
 - 4) Structural performance of fire retardant treated wood shall be evaluated in accordance with ASTM D5664 for lumber and ASTM D5516 for plywood. Evaluation of plywood data shall be in accordance with ASTM D6305.
 - 5) Interior fire retardant treated lumber and plywood shall have equilibrium moisture content of not over twenty-eight (28) percent when tested in accordance with ASTM D3201/D3201M at ninety-two (92) percent relative humidity.
 - 6) Formulation shall be free of halogens, sulfates, chlorides, ammonium phosphate, halides, formaldehyde, and urea formaldehyde.
 - 7) SBX-DOT formulation is acceptable.
 - 8) Provide lumber of appropriate grade and species as specified by design criteria of intended application after consideration of design value adjustments.
 - 9) Provide plywood of appropriate size, grade and species as specified by design criteria of intended application after consideration of span rating adjustments.
 - 10) Provide dye for easy visual identification.
 - 11) Treat lumber and plywood for new work in accordance with AWPAs Standards and dried after treatment.
 - 12) Provide labeling on each piece of wood indicating compliance.
 - c. Acceptable Manufacturers:
 - 1) Design Criteria:

- (a) Fire retardant formulations shall contain no halides, sulfates or ammonium phosphates.
 - (b) SBX-DOT formulation is acceptable.
- 2) Quality Standard:
 - (a) Pyro-Guard by Hoover Treated Wood Products, Inc., Thomson, GA www.frtw.com.
 - (b) D-Blaze FRT by Viance, Charlotte, NC www.treatedwood.com.
- 3) Equal meeting design criteria as approved by Architect before bidding. See Section 016000.

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 AC308 - Acceptance Criteria for Water-Resistive Barriers 2016.
- J. ICC-ES AC308 - 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.
4. Alternate Supplier:
 - a.
 - b.

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 unless noted otherwise by Contract Drawings.

D. Lumber Ledgers:

1. Design Criteria:

- a. No. 1 Douglas Fir-Larch, 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. Basketball Standards:
 1. See Basketball Equipment Specification for installation instructions and template.
 - a. Use Basketball Manufacturer's template for location of basketball hanger brackets.
 - b. Verify field dimension of brackets.
- B. 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.
- C. 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.
- D. 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.
- E. 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.
- F. 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.
- G. 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.
- H. 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.
- I. 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.
- J. 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.
- K. 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.
- L. Posts And Columns:
1. Unless shown otherwise, nail members of multiple member columns together with 16d at 6 inches on center from each side.
- M. 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.
- N. 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.
- O. 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.

- P. 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.
- Q. Install structural members full length without splices unless otherwise specifically detailed.
- R. 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.
- S. Install horizontal spanning members with crown edge up and not less than 1-1/2 inches of bearing at each end.
- T. 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.
- U. Provide bridging at joists in excess of 8 feet span as detailed. Fit solid blocking at ends of members.
- V. 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. Chalkboards and marker 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. Floor Sheathing: 1 Layer Sheathing (floors accessible to public): Glue and nail to framing.
 - 1. Apply bead of glue to structural supports. Lay face grain / strength axis across supports and with panel continuous over two supports minimum.
 - 2. Allow expansion gap of at least 1/2 inch at walls.

3. Tongue and Groove.
 4. Nail Spacing.
 - a. As indicated on Contract Drawings.
 5. Thickness:
 - a. As indicated on Contract Drawings.
 6. Do not install any piece of bottom layer floor sheathing with shortest dimension of less than 24 inches.
- B. Subflooring: 2 Layers Sheathing:
1. Bottom layer:
 - a. Tongue and Groove.
 - b. Glue subflooring layers together along lines of structural supports.
 - c. Leave 1/32 inch gap at side and end joints.
 - d. Thickness and Nailing: As indicated on Contract Drawings.
 - e. Do not install any piece of single layer floor sheathing with shortest dimension of less than 24 inches (600 mm).
 2. Top layer:
 - a. Tongue and Groove.
 - b. Stagger joints of second layer subflooring so they do not line up with joints of first layer subflooring, but do align with intermediate structural member (for example, align with field nailing of bottom subflooring layer).
 - c. Glue subflooring layers together along lines of structural supports.
 - d. Leave 1/32 inch gap at side and end joints.
 - e. Nail at 6 inch centers on ends and 12 inch centers on intermediate structural members.
 - f. Thickness and Nailing: As indicated on Contract Drawings.
 - g. Do not install any piece of single layer floor sheathing with shortest dimension of less than 24 inches.
- C. 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.
- D. 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.
- E. 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, installed horizontally at ceiling height.
 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 1753.01 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.

**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 Utah 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.

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- 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.

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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 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. WWP A 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.
- C. 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.

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- 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. Alternate Supplier:
 - 1)
 2. 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 following values, unless noted otherwise on Contract Drawings:
1. Bending (Fb): as indicated in structural drawings.
 2. Compression Parallel to Grain (Fc): as indicated in structural drawings.
 3. Compression Perpendicular to Grain (Fc1): as indicated in structural drawings.
 4. Horizontal Shear (Fv): as indicated in structural drawings.
 5. Modulus of Elasticity (E): as indicated in structural 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: by approved submittal.
- 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 AWWA 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: AWWA 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 AWWA 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 2001**COMMON FINISH CARPENTRY REQUIREMENTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install sealants required for items installed under this Section, as described in Contract Documents.
- B. Products Installed But Not Furnished Under This Section:
 - 1. Architectural Woodwork.
 - 2. Chair Rails.
 - 3. Factory Manufactured Access Doors.
 - 4. Hardwood Trim at light coves, speaker cabinets, etc.
 - 5. Hardwood Trim for wall covering.
 - 6. Miscellaneous Wood Trim.
 - 7. Plastic Laminate Countertops.
 - 8. Selected Building Specialties.
 - 9. Selected Equipment.
 - 10. Windows.
 - 11. Window Stools and Dressing Room Benches.
 - 12. Wood Trim at ceilings.
 - 13. Wood-Veneer-Faced Architectural Cabinets.
 - 14. Miscellaneous as specified elsewhere.
- C. Related Requirements:
 - 1. Section 06 1100: 'Wood Framing' for furring and blocking.
 - 2. Section 06 1636: 'Wood Panel Product Sheathing'.
 - 3. Section 06 2210: 'Miscellaneous Wood Trim'.
 - a. Wood Trim.
 - 4. Section 06 2221: 'Speaker Enclosures'.
 - 5. Sections under 06 4000 Heading: Furnishing of Architectural Woodwork.
 - a. Section 06 4001: 'Common Architectural Woodwork Requirements':
 - 1) Approved Fabricators.
 - 2) Quality of wood materials to be used in Finish Carpentry.
 - b. Section 06 4005: 'Plastic Laminate' for countertops.
 - c. Section 06 4114: 'Wood-Veneer-Faced Architectural Cabinets'.
 - 1) Custom Casework:
 - d. Section 06 4512: 'Architectural Woodwork Wood Trim'.
 - 6. Section 06 6001: 'Miscellaneous Plastic Fabrications' for quality of Window Stools and Dressing Room benches.
 - 7. Section 07 9213: 'Elastomeric Joint Sealants' for quality of sealants, submittal and installation requirements.
 - 8. Section 08 3110: 'Access Doors And Panels' for furnishing of Factory Manufactured Access Doors.
 - 9. Section 08 5313: 'Vinyl Windows' for furnishing of Windows.
 - 10. Sections under 09 9000 heading: Back priming of work to be installed against concrete or masonry or subjected to moisture, and finishing of finish carpentry and architectural woodwork.
 - 11. Sections in Division 10: Furnishing of Specialties.
 - 12. Sections in Division 11: Furnishing of Equipment.

1.2 REFERENCES

- A. Association Publications:
 - 1. Architectural Woodwork Institute / Architectural Woodwork Manufacturers Association of Canada / Woodwork Institute, 46179 Westlake Drive, Suite 120, Potomac Falls, VA www.awinet.org.
 - a. Architectural Woodwork Standards (AWS), 2nd Edition, 2014.
- B. Definitions:
 - 1. Grade: Unless otherwise noted, this term means Grade rules for Economy, Custom, and/or Premium Grade:
 - a. Economy Grade: The lowest acceptable grade in both material and workmanship requirements, and is for work where price outweighs quality considerations.
 - b. 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.
 - c. Premium Grade: The highest Grade available in both material and workmanship where the highest level of quality, materials, workmanship, and installation is required.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Blum Inc, Stanley, NC www.blum.com.
 - b. Bommer Industries, Landrum, SC www.bommer.com.
 - c. CompX National, Mauldin, SC www.nclnet.com.
 - d. Dow Chemical, Midland, MI www.dow.com.
 - e. Flynn & Enslow, San Francisco, CA www.flynnenslow.com.
 - f. Grass America Inc, Kernersville, NC www.grassusa.com.
 - g. Hafele America Co., Archdale, NC hafele.com.
 - h. Hillside Wire Cloth Co., Inc., Bloomfield, NJ www.hillsidewirecloth.com.
 - i. Ives, Indianapolis, IN www.iveshardware.com.
 - j. Knappe & Vogt, Grand Rapids, MI www.knappeandvogt.com or Knappe & Vogt Canada, Mississauga, ON (905) 676-8972.
 - k. Olympus Lock Co, Seattle, WA www.olympus-lock.com.
 - l. Owens Corning, Toledo, OH www.owens-corning.com.
 - m. Salice America Inc, Charlotte, NC www.saliceamerica.com.
 - n. SOSS Door Hardware (Division of Universal Industrial Products Company) Pioneer OH www.soss.com.
 - o. Stanley, New Britain, CT www.stanleyhardware.com or Oakville, ON (800) 441-1759.
 - p. TWP Inc., Berkley, CA www.twpinc.com.
 - q. Wire Cloth Manufacturers Inc., Mine Hill, NJ www.wireclothman.com.
- B. Glue: Waterproof and of best quality.
- C. Coat and Hat Hooks (mounted in accessible stall in Restroom in projects with Baptismal Fonts).
 - 1. Type Two Acceptable Manufacturers:
 - a. 571 by Ives.
 - b. Equal as approved by Architect before installation. See Section 01 6200.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Verification Of Conditions:
 - 1. Verify walls, ceilings, floors, and openings are plumb, straight, in-line, and square before installing Architectural Woodwork.
 - 2. Report conditions that are not in compliance to Architect before starting installation.

3.2 PREPARATION

- A. Surface Preparation:
 - 1. Install Architectural Woodwork after wall and ceiling painting is completed in areas where Architectural Woodwork is to be installed.

3.3 INSTALLATION

- A. Special Techniques:
 - 1. AWS Custom Grade is minimum acceptable standard, except where explicitly specified otherwise, for installation of architectural woodwork.
- B. General Architectural Woodwork Installation:
 - 1. Fabricate work in accordance with measurements taken on Project site.
 - 2. Scribe, miter, and join accurately and neatly to conform to details.
 - 3. Exposed surfaces shall be machine sanded, ready for finishing.
 - 4. Allow for free movement of panels.
 - 5. Countersink nails. Countersink screws and plug those exposed to view.
 - 6. Attach custom casework as specified in Sections under 06 4000 Heading: 'Furnishing of Architectural Woodwork' to wall blocking with #10 x 3 inch (76 mm) minimum Cabinet Screws. Attach wall cabinets with screws equally spaced horizontally not to exceed 12 inches (305 mm) O.C. with 3 inch (76 mm) maximum spacing at cabinet edges.
- C. Hooks (mounted in accessible stall in Restroom in projects with Baptismal Fonts).
 - 1. Type Two Acceptable Manufacturers:
 - a. As shown in Contract Drawings.
- D. Items Installed But Not Furnished Under This Section: Install in accordance with requirements specified in Section furnishing item.
 - 1. Window Stool:
 - a. Install window stool to structure with silicone sealant as specified in Section 07 9213 'Elastomeric Joint Sealant'.

END OF SECTION

SECTION 06 2024**DOOR, FRAME, AND FINISH HARDWARE INSTALLATION****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install sealants for caulking door frames as described in Contract Documents.
 - 2. Furnish and install insulation in doorframes as described in Contract Documents.
- B. Products Installed But Not Furnished Under This Section:
 - 1. Flush wood doors.
 - 2. Hollow metal door frames.
 - 3. Finish hardware.
- C. Related Requirements:
 - 1. Sections under 04 2000 heading: Grouting of frames installed in masonry walls.
 - 2. Section 08 1416: 'Flush Wood Doors'.
 - 3. Section 07 2116: 'Blanket Insulation' for quality of fiberglass insulation.
 - 4. Section 07 9213: 'Elastomeric Joint Sealants' for quality of sealants.
 - 5. Sections under 08 1000 heading: Furnishing of doors and metal frames.
 - 6. Sections under 08 7000 heading: Furnishing of finish hardware.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference.
 - 1. Participate in pre-installation conference.
 - 2. In addition to agenda items specified in Section 01 3100, 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 08 7101.
 - d. Review use of crowbar or other prying devices are not permitted to be used to set door frame into wall opening.

1.3 SUBMITTALS

- A. Informational Submittals:
 - 1. Installer Report:
 - a. Report verifying correct operation and adjustment of installed hardware.
 - 2. Special Procedure Submittals:
 - a. Copy of 'Installation Guide for Doors & Hardware' by Door & Hardware Institute. Guide may be obtained from Door and Hardware Institute (DHI).

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
 - 1. Wood Doors:

- a. Do not have doors delivered to building site until after plaster, cement, and taping compound are dry.
 - b. If doors are to be stored at job-site for more than one week, seal top and bottom edges if not factory sealed.
 2. Metal Frames:
 - a. Examine door frames and note damage upon acceptance.
- B. Storage And Handling Requirements:
 1. Wood Doors:
 - a. Store flat on a level surface in a dry, well ventilated building.
 - 1) Cover to keep clean but allow air circulation
 - b. Handle with clean gloves and do not drag doors across one another or across other surfaces.
 - c. Do not subject doors to abnormal heat, dryness, or humidity or sudden changes therein
 - 1) Condition doors to average prevailing humidity of locality before hanging.
 2. Metal Frames:
 - a. Protect metal frames from damage before and during installation.

PART 2 - PRODUCTS: Not Used

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Hollow Metal Frames:
 1. Site Tolerances:
 - a. Squareness: **1/16 inch (1.6 mm)** from top edge to opposite top edge.
 - b. Plumbness: **1/16 inch (1.6 mm)** from top of jamb to bottom of jamb.
 - c. Alignment: **1/16 inch (1.6 mm)** from plane of left side face of jamb to right side face of jamb.
 - d. Twist: **1/16 inch (1.6 mm)** across throat of jamb plane measured across each face to plane of opposite jamb throat.
 - e. Finished Clearance Between Door And Frame:
 - 1) **1/16 inch (1.6 mm)** at head and hinge jamb plus **1/16 inch (1.6 mm)** maximum
 - 2) **1/8 inch (3 mm)** at strike jamb plus or minus **1/16 inch (1.6 mm)** maximum.
 - 3) **1/2 inch (12.7 mm)** to top of finished floor surface or **1/4 inch (6 mm)** to top of threshold, plus or minus **1/16 inch (1.6 mm)** maximum.
 2. Set frame in location and level head.
 - a. 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.
 3. Equalize with adjustable floor anchor.
 4. Set spreaders and fasten jambs to floor and wall.
 - a. 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.
 - b. Cut notches for frame stops.
 - c. Do not remove spreaders until frames are permanently anchored in wall.
 - d. Use one spreader at base of frame and another at strike level.
 - e. Do not use temporary spreaders welded to base of jambs during installation of frame.
 5. 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.
 6. Caulking:
 - a. Caulk around both sides of frames of doors receiving acoustical seals with specified sealant.
- B. Doors:
 1. When Project is completed, doors shall not bind, stick, or be mounted so as to cause future hardware difficulties.

2. 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.

C. Hardware:

1. General:

- a. Install using set of Manufacturer's installation, adjustment, and maintenance instructions submitted with hardware under Section 08 7101. Follow as closely as possible.
- b. Mount closers on jamb stop side of door in parallel arm configuration where it is physically possible to do so and not damage or hinder operation of door or closer.

2. Hardware for Wood Doors:

- a. If doors are not factory-machined, use hardware templates furnished by Hardware Manufacturer when mounting hardware.
- b. Set hinges flush with edge surface. Be sure that hinges are set in a straight line to prevent distortion.
- c. Mount door latches high in strike plate opening so when door later settles, latch will not bind.

3.2 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.

3.3 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 existing key cabinet.

END OF SECTION

SECTION 06 2210**MISCELLANEOUS WOOD TRIM****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install wood trim not specified elsewhere as described in Contract Documents.
 - 2. Section 06 4512: 'Architectural Woodwork Wood Trim'.
 - 3. Section 09 9324: 'Interior Clear-Finished Hardwood'.

1.2 REFERENCES

- A. Association Publications:
 - 1. Architectural Woodwork Institute / Architectural Woodwork Manufacturers Association of Canada / Woodwork Institute, 46179 Westlake Drive, Suite 120, Potomac Falls, VA www.awinet.org.
 - a. Architectural Woodwork Standards (AWS), 2nd Edition, 2014.
- B. Definitions:
 - 1. 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.
 - 2. Plain-Sawn: A hardwood figure developed by sawing a log lengthwise at a tangent to the annual growth rings. It appears as U-shaped or straight markings in the board's face.

1.3 SUBMITTALS

- A. Action Submittals:
 - 1. Samples:
 - a. Interior Hardwood for Transparent 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) Design Criteria:
 - a) Provide 8 inch by 10 inch (200 mm by 255 mm) sample of Red Oak to match Owner provided stain color selected for Project.
 - b) Control Sample will be used as performance standard for evaluating finish provided.
- B. Informational Submittals:
 - 1. Source Quality Control Submittals:
 - a. Samples:
 - 1) Interior Hardwood for Transparent Finish:
 - a) Owner will provide Control Sample for finish.

1.4 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

2.1 MATERIALS

- A. Design Criteria:
 1. General:
 - a. Meet requirements of Section 06 4001 for general standards for materials and fabrication of Architectural Woodwork.
 2. Clear Finished Hardwood:
 - a. Match materials specified in Section 06 4512.
 - b. Match finish specified in Section 06 4512 and match Owner selected sample as specified in Section 09 9324.
 3. Opaque Finished Hardwood: Hardwood allowed by AWS Custom Grade.
 4. Opaque Finished Softwood: Solid stock Pine, C or better, S4S.

2.2 SOURCE QUALITY CONTROL

- A. Inspections:
 1. Clear Finished Hardwood:
 - a. Color matches Owner provided sample specified in Section 09 9324.

PART 3 - EXECUTION: Not Used

END OF SECTION

SECTION 06 4001**COMMON ARCHITECTURAL WOODWORK REQUIREMENTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. General standards for materials and fabrication of Architectural Woodwork and for hardware associated with Architectural Woodwork.
- B. Related Requirements:
 - 1. Section 06 1100: 'Wood Framing' for furring and blocking.
 - 2. Section 06 2001: 'Common Finish Carpentry Requirements' for Installation.
 - 3. Section 06 2210: 'Miscellaneous Wood Trim'.
 - 4. Section 06 4005: 'Plastic Laminate'.
 - 5. Section 06 4114: 'Wood-Veneer-Faced Architectural Cabinets'.
 - 6. Section 06 4512: 'Architectural Woodwork Wood Trim'.
 - 7. Section 06 6001: 'Miscellaneous Plastic Fabrications'.
 - 8. Section 09 9324: 'Interior Clear-Finished Hardwood' for filling of nail holes and finishing.

1.2 REFERENCES

- A. Association Publications:
 - 1. Architectural Woodwork Institute / Architectural Woodwork Manufacturers Association of Canada / Woodwork Institute, 46179 Westlake Drive, Suite 120, Potomac Falls, VA www.awinet.org.
 - a. Architectural Woodwork Standards (AWS), 2nd Edition, 2014.
- B. Definitions:
 - 1. 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.

1.3 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Manufacturer's literature for specialty items and hardware not manufactured by Architectural Woodwork fabricator.
 - 2. Shop Drawings:
 - a. Category Three Approved Fabricator:
 - 1) 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.
 - 2) 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.
- B. Informational Submittals:

1. Field Quality Control Submittals:
 - a. Contractor First Submittal:
 - 1) Provide verification field dimensions and updated Contract Drawings of all areas requested from Fabricator First Submittal from Category Three Approved Fabricator including but limited to the following:
 - a) Field dimensions (finish wall dimensions) of all walls with casework.
 - 2) Submit First Submittal to Category Three Approved Fabricator within three (3) days of completion of gypsum board installation but before gypsum board finishing to allow Category Three Approved Fabricator necessary time to complete casework.
2. Qualification Statement:
 - a. Fabricator:
 - 1) Category Three Approved Fabricators:
 - a) Provide Qualification documentation as part of agreement process.

1.4 QUALITY ASSURANCE

- A. Qualifications: Requirements of Section 01 4301 applies, but not limited to following:
 1. Fabricator:
 - a. Category Three Approved Fabricators:
 - 1) Approval subject to agreement process approval.

1.5 DELIVERY, HANDLING, AND STORAGE

- A. 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.
- B. 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.

1.6 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

2.1 FABRICATORS

- A. Approved Fabricators. See Section 01 4301 for Qualification Requirements.
 1. Category Three Approved Fabricators. See Section 01 6200 for definitions of Categories and Section 01 4301 for Qualification Requirements:
 - a. Advanced Cabinets, 6860 South Cottonwood Street, Midvale, UT 84047.
 - 1) Contact Information: Scott Hermansen, (801) 251-0155
 - b. Anderson Cabinet and Millwork, 198 North 4700 East, Rigby, ID 83442.
 - 1) Contact Information: Matt Miller phone (208) 538-7415 cell (208) 317-7412 e-mail matt@andersoncabinet.com.

- c. Artistic Mill, 6202 South Stratler Street, Murray, UT 84107.
 - 1) Contact Information: (801) 262-8851, bids@artisticmill.com.
- d. Inter West Wood Design, 728 Grangeville Salmon Road, Grangeville, ID 83530
 - 1) Contact Information: Kelly Newson, (208) 983-3850.
- e. Michael Seiter & Co., Inc., P.O. Box 315 Heber City, UT 84032.
 - 1) Contact Information: Mark Seiter phone (435) 654-0601 fax (435) 654-0613 e-mail mark@msandcoinc.com.
- f. Thompson and Sons Cabinets, 11834 N. 3400 West, Deweyville, UT 84309.
 - 1) Contact Information: David Thompson cell (435) 230-0876 office (435) 257-7152 e-mail zcabinets@comcast.net.
- g. Alternate Fabricator:
 - 1) An alternative fabricator can be approved by Architect prior to bidding.
- 2. Same Approved Fabricator shall furnish following Specification Sections:
 - a. Section 06 2210: 'Miscellaneous Wood Trim'.
 - b. Section 06 4005: 'Plastic Laminate'.
 - c. Section 06 4114: 'Wood-Veneer-Faced Architectural Cabinets'.
 - d. Section 06 4512: 'Architectural Woodwork Wood Trim'.
 - e. Section 06 6001: 'Miscellaneous Plastic Fabrications'.

2.2 ASSEMBLIES

A. Design Criteria:

- 1. General:
 - a. AWS Custom Grade is minimum acceptable standard, except where explicitly specified otherwise, for materials, construction, and installation of architectural woodwork.
- 2. Materials:
 - a. Lumber:
 - 1) Grade:
 - a) No defects in boards smaller than 600 sq in (3 871 sq cm).
 - b) One defect per additional 150 sq inches (968 sq cm) in larger boards.
 - c) Select pieces for uniformity of grain and color on exposed faces and edges.
 - d) No mineral grains accepted.
 - 2) Allowable Defects:
 - a) Tight knots not exceeding 1/8 inch (3 mm) in diameter. No loose knots permitted.
 - b) Patches (dutchmen) not apparent after finishing when viewed beyond 18 inches (450 mm).
 - c) Checks or splits not exceeding 1/32 inch by 3 inches (1 mm by 75 mm) and not visible after finishing when viewed beyond 18 inches (450 mm).
 - d) Stains, pitch pockets, streaks, worm holes, and other defects not mentioned are not permitted.
 - e) Normal grain variations, such as cats eye, bird's eye, burl, curl, and cross grain are not considered defects.
 - 3) Use maximum lengths possible, but not required to exceed 10 feet (3 meters) without joints. No joints shall occur closer than 72 inches (1 800 mm) in straight runs exceeding 18 feet (3 600 mm). Runs between 18 feet (3 600 mm) and 10 feet (3 meters) may have no more than one joint. No joints shall occur within 72 inches (1 800 mm) of outside corners nor within 18 inches (450 mm) of inside corners.
 - 4) Moisture content shall be six (6) percent maximum at fabrication. No opening of joints due to shrinkage is acceptable.

B. Fabrication:

- 1. Follow Architectural Woodwork Standards (AWS) for fabrication of Architectural Woodwork.
- 2. Tolerances:
 - a. No planer marks (KCPI) allowed. Sand wood members and surfaces with 100 grit or finer.
 - b. Maximum Gap: None allowed.
 - c. Flushness Variation: 0.015 inch (0.4 mm) maximum.
 - d. Sanding Cross Scratches: 1/4 inch (6 mm) maximum.
 - e. Plug screw holes. Screw locations not to be visible beyond 18 inches (450 mm).
- 3. Fabricate work in accordance with measurements taken on job site.

4. 'Ease' sharp corners and edges of exposed members to promote finishing and protect users from splinters. Radius of 'easing' shall be uniform throughout Project and between ~~1/32 and 1/16 of an inch~~ (0.8 and 1.6 of a millimeter).
5. Fabricate so veneer grain is vertical.
6. Joints:
 - a. Use lumber pieces with similar grain pattern when joining end to end.
 - b. Compatibility of grain and color from lumber to panel products is required.
7. Install hardware in accordance with Manufacturer's directions. Leave operating hardware operating smoothly and quietly.
8. Remove or repair damaged surface of or defects in exposed finished surfaces of architectural woodwork to match adjacent similar undamaged surface.

PART 3 - EXECUTION: Not Used

END OF SECTION

SECTION 06 4005**PLASTIC LAMINATE****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
 - 1. Wall-hung counters.
 - 2. Countertops for custom casework.
- B. Related Requirements:
 - 1. Section 06 2001: 'Common Finish Carpentry Requirements':
 - a. Installation of wall-hung counters.
 - b. Installation of countertops for custom casework.
 - 2. Section 06 4001: 'Common Architectural Woodwork Requirements':
 - a. Approved Fabricators.
 - b. General standards for materials and fabrication of Architectural Woodwork.

1.2 REFERENCES

- A. Association Publications:
 - 1. Architectural Woodwork Institute / Architectural Woodwork Manufacturers Association of Canada / Woodwork Institute, 46179 Westlake Drive, Suite 120, Potomac Falls, VA www.awinet.org.
 - a. Architectural Woodwork Standards (AWS), 2nd Edition, 2014.
- B. Definitions:
 - 1. Flame Spread: The propagation of flame over a surface.
 - a. Flame Spread Index: The numerical value assigned to a material tested in accordance with ASTM E84 or UL 723.
 - 2. Grade: Unless otherwise noted, this term means Grade rules for Economy, Custom, and/or Premium Grade.
 - a. Premium Grade: Highest Grade available in both material and workmanship where highest level of quality, materials, workmanship, and installation is required.
 - 3. High-Pressure Decorative Laminate (HPDL): Laminated thermosetting decorative sheets intended for decorative purposes. Also known as Plastic Laminate.
 - 4. Smoke-Developed Index: The numerical value assigned to a material tested in accordance with ASTM E84 or UL 723.
- C. Reference Standards:
 - 1. ASTM International:
 - a. ASTM E84-18, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
 - b. ASTM E162-15a, 'Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source'.
 - 2. Kitchen Cabinet Manufacturers Association:
 - a. ASTM/KCMA A161.1-2012, 'Performance And Construction Standards For Kitchen And Vanity Cabinets'.
 - 3. National Electrical Manufacturer's Association / American National Standards Institute:
 - a. ANSI/NEMA LD-3-2005, 'High Pressure Decorative Laminates'.
 - 4. Underwriters Laboratories, Inc.:
 - a. UL 723: 'Standard for Safety Test for Surface Burning Characteristics of Building Materials'; (10th Edition).

1.3 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Color selections.
 - b. Manufacturer's technical data sheet.
- B. Informational Submittals:
 - 1. Certificates:
 - a. Provide Manufacturer's certification of compliance to ANSI/NEMA LD 3.
 - 2. Test And Evaluation Reports:
 - a. Test reports: Certified test reports showing compliance with specified performance characteristics and physical properties for Quality Assurance if requested by Owner or Architect.
- 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 for plastic laminate.
 - b) Color selections.

1.4 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:
 - 1) 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.

1.5 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

2.1 MATERIALS

- A. Fabricators:
 - 1. Approved Fabricators. See Section 06 4001 for Category Three Approved Fabricators.
- B. Manufacturers:
 - 1. Type Two Acceptable Manufacturers:
 - a. Formica, Cincinnati, OH www.formica.com or Formica Canada Inc, St Jean sur Richelieu, PQ (450) 347-7541, all matte finish.
 - b. Nevamar, Odenton, MD www.nevamar.com.
 - c. Pionite Decorative Surfaces, Auburn, ME www.pionite.com.
 - d. WilsonArt, Temple, TX www.wilsonart.com or WilsonArt International Inc, Mississauga, ON (905) 565-1255.
 - e. Equal as approved by Architect before bidding. See Section 01 6200.

- C. Plastic Laminates:
 - 1. Design Criteria:
 - a. Countertops:
 - 1) Post-formed front edge and backsplash, except where detailed otherwise, with plastic laminate meeting requirements of ANSI/NEMA LD 3: PF 42.
 - a) Vertical Applications: GP 28.
 - b) Horizontal (other than countertops): GP 38.
 - 2) No raised lip on front edge.
 - b. Balancing Material: BK 20.
 - c. AWS Quality Grade: Premium.
 - 2. Assemblies:
 - a. Countertops shall meet requirements of KCMA A161.1.
 - b. Adhesives for other than post-formed types shall be spray grade, high heat resistant, neoprene contact adhesive.
 - 3. Color:
 - a. Match existing.

PART 3 - EXECUTION: Not Used

END OF SECTION

SECTION 06 4114**WOOD-VENEER-FACED ARCHITECTURAL CABINETS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
 - 1. Custom casework.
- B. Related Requirements:
 - 1. Section 06 1100: 'Wood Framing' for wall blocking required for Custom Casework.
 - 2. Section 06 2001: 'Common Finish Carpentry Requirements' for installation of Custom casework.
 - 3. Section 06 4001: 'Common Architectural Woodwork Requirements' for:
 - a. Approved Fabricators.
 - b. General standards for materials and fabrication of Architectural Woodwork and for hardware associated with Architectural Woodwork.
 - 4. Section 09 9324: 'Interior Clear-Finished Hardwood' for wood finishes.

1.2 REFERENCES

- A. Association Publications:
 - 1. Architectural Woodwork Institute / Architectural Woodwork Manufacturers Association of Canada / Woodwork Institute, 46179 Westlake Drive, Suite 120, Potomac Falls, VA www.awinet.org.
 - a. Architectural Woodwork Standards (AWS), 2nd Edition, 2014.
 - b. HPVA, NWWDA, or APA.
 - 2. Hardwood Plywood & Veneer Association (HPVA), Reston, VA www.hpva@hpva.org.
 - 3. The Engineered Wood Association (APA), Tacoma, WA www.apawood.org.
 - 4. Window & Door Manufacturers Association (WDMA) Chicago, IL www.wdma@wdma.com.
- B. 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. Face Veneer: The outermost exposed wood veneer surface of a veneered wood door, panel, or other component exposed to view when the project is completed.
 - 3. 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.
 - 4. High-Pressure Decorative Laminate (HPDL): Laminated thermosetting decorative sheets intended for decorative purposes. Also known as Plastic Laminate.
 - 5. Medium Density Fiberboard (MDF): Generic name for a panel or core manufactured from lignocellulosic fibers combined with synthetic resin or other suitable binder and bonded together under heat and pressure in hot press by process in which added binder creates entire bond.
 - 6. Panel Product: Panels manufactured with differences in core materials, adhesives or binders which affect characteristics of the panels. These include wood veneers and many prefinished wood panels and decorative overlays with aesthetic and performance characteristics.
 - 7. Plain-Sawn: A hardwood figure developed by sawing a log lengthwise at a tangent to the annual growth rings. It appears as U-shaped or straight markings in the board's face.
 - 8. 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.

9. Veneer: A thin sheet or layer of wood, usually rotary cut, sliced or sawn from a log or flitch. Thickness may vary from 1/100 inch (0.3 mm) to 1/4 inch (6.4 mm).

C. Reference Standards:

1. American National Standards Institute / Builders Hardware Manufacturers Association:
 - a. ANSI/BHMA A156.11-2014, 'Cabinet Locks'.
2. American National Standards Institute / Hardwood Plywood & Veneer Association:
 - a. ANSI/HPVA HP-1-2009, 'Standard for Hardwood and Decorative Plywood'.
3. American National Standards Institute / Window & Door Manufacturers Association (WDMA):
 - a. ANSI/WDMA I.S. 6A-13, 'Industry Standard for Architectural Stile and Rails Doors'.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the efforts of the various trades affected by the Work of this Section.
2. Coordinate completion of 2x6 (50mm x 100mm) wall blocking for custom casework.
3. Coordinate completion of custom casework.

1.4 SUBMITTALS

A. Action Submittals:

1. Product Data:
 - a. Manufacturer's literature or cut sheets for hardware.
2. Shop Drawings:
 - a. Confirm compliance with Contract Document requirements as to configuration and dimensions of custom casework.
 - b. Include plan and elevation views, materials used, standing and running trim profiles, assembly methods, joint details, fastening methods, accessories, and hardware.
3. Samples:
 - a. Interior Hardwood for Transparent 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) Design Criteria:
 - a) 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.
 - b) Control Sample will be used as performance standard for evaluating finish provided.

B. Informational Submittals:

1. Source Quality Control Submittals:
 - a. Samples:
 - 1) Interior Hardwood for Transparent Finish:
 - a) Owner will provide Control Sample for finish.

1.5 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 period of five (5) years from date of substantial completion.

PART 2 - PRODUCTS

2.1 ASSEMBLIES

A. Components:

1. Design Criteria:

a. General:

- 1) Except as noted otherwise, fabricate the work of this section according to AWS 'Custom Grade'.
- a) Cabinet door wood grain direction shall run vertically and all doors shall be set matched.
- b) Cabinet drawer front wood grain direction may run vertically or horizontally, with same direction maintained on all cabinet or elevation of cabinets.
- 2) Casework Construction Type:
 - a) Type B: Face-frame construction where front edge of cabinet body components are overlaid with frame.
- 3) Door interface style:
 - a) Type B Construction: Flush Overlay.

b. Solid Stock:

- 1) Exposed: Plain sawn Red Oak.
- 2) Semi-exposed And Concealed: Species as acceptable for AWS 'Custom Grade'.

c. Panel Product:

- 1) Glues (adhesives) used in manufacture and fabrication of panel products shall be Type I or II.
- 2) Moisture content shall be same as specified for lumber.
- 3) Cores:
 - a) Cabinet Doors: Medium density fiberboard (MDF) with minimum density of **48 lbs per cu ft (769 kg per cu meter)**.
 - b) All Other: Industrial grade particle board with minimum density of **45 lbs per cu ft (721 kg per cu meter)**.
- 4) Facings:
 - a) Hardwood veneer facings shall be plain sliced Red Oak AWS Grade A, or equal by HPVA, WDMA, or APA.
 - b) All other facings shall be Melamine or Kortron.
- 5) Edgings:
 - a) Cabinet Doors And Drawer Fronts Higher Than **8 Inches (200 mm)**:
 - (1) **3/4 inch by 1/8 to 1/4 inch (19 mm by 3 to 6 mm)** edge-band of wood species matching hardwood face veneer.

d. Casework Doors:

- 1) Face Veneer:
 - a) Design Criteria:
 - (1) Plain sliced Red Oak meeting requirements of AWS Grade A, **1/50 inch (0.5 mm)** thick minimum immediately before finishing.
 - (2) Face veneers shall be running book matched.
- 2) Doors under **1-3/8 inch (35 mm)** thick: Panel Product.
- 3) Doors **1-3/8 inch (35 mm)** or more thick:
 - a) Door Grade: AWS Custom hollow-core.
 - b) Stiles:
 - (1) **1-1/4 inches (32 mm)** deep minimum before fitting.
 - (2) **1/4 inch (6 mm)** minimum of stile face to be hardwood matching face veneer material.
 - c) Rails:
 - (1) **1-1/8 inches (28.5 mm)**.
 - (2) Mill option material.

e. Wood Lateral File Dividers:

- 1) Description:
 - a) **3/4 inch (19 mm)** by width of drawer Panel Product.
 - b) Attached at center of lateral file drawers as shown on Contract Documents.
 - c) Notch top corners to support metal file hanging rods.

B. Fabrication:

1. Fabricators:
 - a. Approved Fabricators. See Section 06 4001 for Category Three Approved Fabricators.
2. Cabinet Body:
 - a. Use AWS Flush Overlay construction on cabinet bodies.
 - b. If used, install Rail System adjustable shelf supports recessed.
3. Drawers:
 - a. Fabricate with separate, screw-attached drawer front.
 - b. Joints shall be dowel and pressure-glued, or lock shoulder, glued, and pin nailed.
 - c. 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.
 - d. Every drawer shall have specified drawer guides and pull installed. Install drawer guides with 'Euroscrews', and pulls with through-bolts passing through both front and sub-front.
4. Cabinet Doors:
 - a. 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.
 - b. Hinges: Install hinges using plastic insertion dowels for hinges and 'Euroscrews' for baseplates.
 - c. Every cabinet door shall have specified pull installed.
5. Cabinet Component Thickness And Material:
 - a. Use hardwood veneer facing on panel product, except on following surfaces:
 - 1) Where Kortron or Melamine shall be used.
 - 2) Cabinet exposed interiors surfaces (not including cabinet doors) and shelving faces behind cabinet doors in all rooms.
 - 3) Cabinet semi-exposed surfaces.
 - 4) Cabinet concealed surfaces.
 - 5) Cabinet exposed exteriors permanently concealed (not exposed to view).
 - 6) Drawer sides, backs, bottoms, and subfronts.
 - b. Ends, Divisions, Bottoms, Tops: **3/4 inch (19 mm)** thick panel product.
 - c. Rails: **3/4 inch (19 mm)** thick panel product.
 - d. Shelves:
 - 1) Panel product.
 - 2) Thickness:
 - a) **30 Inch (750 mm)** Span And Less: **3/4 inch (19 mm)** thick.
 - b) Spans Over **30 Inches (750 mm)** To **42 Inches (1 050 mm)**: **One inch (25 mm)** thick.
 - c) Spans Over **42 inches (1 050 mm)**: **One inch (25 mm)** thick and provide Hafele or equal center supports.
 - e. Backs: **1/4 inch (6 mm)** thick panel product.
 - f. Doors: **3/4 inch (19 mm)** thick panel product.
 - g. Drawer Sides, Backs, And Subfronts: **1/2 inch (12.7 mm)** thick minimum panel product.
 - h. Drawer Bottoms: **1/4 inch (6 mm)** thick panel product.
 - i. Separate Drawer Front:
 - 1) **8 Inches (200 mm)** High And Less: **3/4 inch (19 mm)** thick solid hardwood.
 - 2) More Than **8 Inches (200 mm)** High: **3/4 inch (19 mm)** panel product.
 - j. Hardboard Dividers: **1/4 inch (6 mm)** thick panel product.
 - k. Hardboard Shelves: **1/8 inch (3 mm)** thick hardboard, smooth both sides.
6. Cabinet and Drawer Locks:
 - a. Install only on cabinets and drawers as shown on Contract Documents.
7. Install plastic grommets in cable access holes in countertops located as located on Contract Documents.

C. Finishes:

1. Factory Finishing:
 - a. Design Criteria:
 - 1) Applied before leaving factory.
 - 2) Factory-finish to match Owner selected sample as specified in Section 09 9324.
 - b. Match existing.

2.2 ASSESSORIES

A. Manufacturers:

1. Manufacturer Contact List for Assessories:
 - a. Accuride, Santa Fe Springs, CA www accuride.com.
 - b. Anybumper, Amite, LA www Anybumper.com.
 - c. Blum Inc, Stanley, NC www blum.com.
 - d. CompX National, Mauldin, SC www nclnet.com.
 - e. Glynn Johnson, Chicago, IL www glynn-johnson.com.
 - f. Grass America Inc, Kernerville, NC www grassusa.com.
 - g. Hafele America Co., Archdale, NC hafele.com.
 - h. Hager Companies, St Louis, MO www hagerhinge.com or Hager Hinge (Canada) Ltd, Kitchener, ON (519) 893-7580.
 - i. Ives, Indianapolis, IN www iveshardware.com.
 - j. Knappe & Vogt, Grand Rapids, MI www knapeandvogt.com or Knappe & Vogt Canada, Mississauga, ON (905) 676-8972.
 - k. Mark Eaton LLC, American Fork, UT www markeatonllc.com.
 - 1) Contact Information: Mark Eaton (801) 756-5639.
 - l. McKinney, Scranton, PA www mckinneyhinge.com or Markham, ON (905) 940-2040.
 - m. Olympus Lock Co, Seattle, WA www olympus-lock.com.
 - n. Salice America Inc, Charlotte, NC www saliceamerica.com.
 - o. Stanley, New Britain, CT www stanleyhardware.com.
 - p. Techna-Base Inc, Pleasant Grove, UT (801) 361-2289 or dlundahl@earthlink.net.
 - 1) Contact Information: Dewey Lundahl (801) 785-6477 or (801) 361-2289 (cell).
 - q. Trimco, Los Angeles, CA www trimcobbw.com.
 - r. 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. Type Two Acceptable Products:
 - 1) 4484 by Stanley.
 - 2) Equal as approved by Architect before installation. See Section 01 6200.
2. Cabinet And Drawer Locks:
 - a. General:
 - 1) Pin tumbler type suitable for location.
 - 2) Keying: Key each cabinet and drawer individually as shown on Contract Documents except as follows:
 - a) Key each cabinet and drawer within each Office alike.
 - 3) Stamp keys with Room number and cabinet designation as shown on Signage Plan of Contract Drawings.
 - 4) 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. Type Two 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. 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) Class Two Quality Standards: 255 and 256 by Knappe & Vogt.
4. Cabinet Hinges:
 - a. Description:
 - 1) Cup Hinge (Concealed Hinge or European style).
 - 2) Steel, nickel-plated, full overlay, self closing with dowel, Mod 17.

- 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.
 - 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.
5. Cabinet Inactive Leaf Catches:
- a. 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. Keyboard / Pencil Drawers:
 - 1) Steel ball bearings, **45 lb (20 kg)** load rating minimum.
 - 2) 3/4 extension, top mounting.
 - 3) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) Series 2006 by Accuride.
 - b) Article 422.14.345 by Hafele.
 - c) Series KV8200 by Knappe & Vogt.
 - b. Standard Drawers:
 - 1) Full extension, steel ball bearings, **100 lb (45 kg)** load rating.
 - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) Series 3832-Classic by Accuride.
 - b) Article 422.04.552 by Hafele.
 - c) Series KV8400 by Knappe & Vogt.
 - c. Lateral Files Drawers:
 - 1) Files/Drawers **30 inches (762 mm)** wide and under:
 - a) Full extension, steel ball bearings, **150 lb (68 kg)** load rating.
 - b) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (1) Series 4034 by Accuride.
 - (2) Article 422.17.550 by Hafele.
 - (3) Series KV8505 by Knappe & Vogt.
 - 2) Files/Drawers over **30 inches (762 mm)** wide:
 - a) Duty, full extension, steel ball bearings, **200 lbs (90 kg)** load rating.
 - b) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (1) Series 3640-A by Accuride.
 - (2) Article 422.07.554 by Hafele.
 - (3) Series KV8800 by Knappe & Vogt.
- 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. Type Two Acceptable Products:
 - a. WS-34 Cylindrical Soft Durometer Cabinet Bumper by Anybumper.
 - b. Equal as approved by Architect before installation. See Section 01 6200.

2.3 SOURCE QUALITY CONTROL**A. Inspections:****1. Clear Finished Hardwood:**

- a. Color matches Owner provided sample specified in Section 09 9324.

PART 3 - EXECUTION: Not Used**END OF SECTION**

SECTION 06 4512**ARCHITECTURAL WOODWORK WOOD TRIM****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
 - 1. Chair rails.
 - 2. Hardwood trim at light coves, speaker cabinets, etc,
 - 3. Hardwood trim for wall covering.
 - 4. Wood trim at ceiling trim.
- B. Related Requirements:
 - 1. Section 06 1100: 'Wood Framing' for wall blocking required for Wood Trim.
 - 2. Section 06 2001: 'Common Finish Carpentry Requirements':
 - a. Installation of Wood Trim.
 - b. Coat hats and hooks.
 - 3. Section 06 2210: Remaining Wood Trim.
 - 4. Section 06 4001: 'Common Architectural Woodwork Requirements':
 - a. Approved Fabricators.
 - b. General standards for materials and fabrication of Architectural Woodwork.
 - 5. Section 08 1429: Interior Flush Wood Doors.
 - 6. Section 09 9324: 'Interior Clear-Finished Hardwood'.

1.2 REFERENCES

- A. Association Publications:
 - 1. Architectural Woodwork Institute / Architectural Woodwork Manufacturers Association of Canada / Woodwork Institute, 46179 Westlake Drive, Suite 120, Potomac Falls, VA www.awinet.org.
 - a. Architectural Woodwork Standards (AWS), 2nd Edition, 2014.
- B. Definitions:
 - 1. 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.
 - 2. Plain-Sawn: A hardwood figure developed by sawing a log lengthwise at a tangent to the annual growth rings. It appears as U-shaped or straight markings in the board's face.
 - 3. Running Trim: Generally combined in the term "standing and running trim" and refers to random, longer length trims delivered to the jobsite (e.g., baseboard, chair rail, crown molding).

1.3 SUBMITTALS

- A. Action Submittals:
 - 1. Shop Drawings:
 - a. Include materials used, standing and running trim profiles, joint details, and hardware.
 - 2. Samples:
 - a. Interior Hardwood for Transparent 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) Design Criteria:
 - a) Provide 8 inch by 10 inch (200 mm by 255 mm) sample of Red Oak to match Owner provided stain color selected for Project.
 - b) Control Sample will be used as performance standard for evaluating finish provided.
- B. Informational Submittals:
 - 1. Source Quality Control Submittals:
 - a. Samples:
 - 1) Interior Hardwood for Transparent Finish:
 - a) Owner will provide Control Sample for finish.

1.4 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

2.1 MATERIALS

- A. Manufacturers:
 - 1. Approved Fabricators. See Section 06 4001 for Approved Fabricators.
- B. Performance / Design Criteria: Conform to requirements of Section 06 4001 'Common Architectural Woodwork Requirements'.
 - 1. Glue: Waterproof and of best quality.
 - 2. Factory-finish to match Owner selected sample as specified in Section 09 9324.
- C. Architectural Woodwork Wood Trim:
 - 1. Interior Hardwood For Transparent Finish:
 - a. Design Criteria:
 - 1) Solid wood shall be plain sawn Red Oak.
 - 2) Paneling shall be panel product with plain sliced Red Oak veneer.
 - 3) Finish to match Owner selected sample as specified in Section 09 9324.
 - b. Match existing Project Color Scheme:
 - 1) Control Sample provided by Owner:
 - a) Control Sample will be existing wood item from Project.
 - 2. Interior Wood For Opaque, Painted Finish:
 - a. Applies to ceiling trim only.
 - b. Solid wood shall be any species allowed by AWS Custom grade.
- D. Shelves:
 - 1. Conform to applicable requirements of Sections 06 4001 and 06 4114.
 - 2. Use 3/4 inch (19 mm) Kortron or Melamine faced Panel Product with hot glued 3 mm thick PVC edge banding with eased edges. Apply banding on exposed edges with one inch (25 mm) return onto unexposed edges. Edge banding color to match Panel Product.

2.2 SOURCE QUALITY CONTROL

- A. Inspections:
 - 1. Clear Finished Hardwood:
 - a. Color matches Owner provided sample specified in Section 09 9324.

PART 3 - EXECUTION Not Used

END OF SECTION

SECTION 06 6001**MISCELLANEOUS PLASTIC FABRICATIONS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But not Installed Under This Section:
 - 1. Furnish window stools as described in Contract Documents.
 - 2. Furnish Dressing Room benches as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 06 2001: 'Common Finish Carpentry Requirements' for:
 - a. Installation of Window Stools.
 - b. Installation of Dressing Room Benches.
 - 2. Section 06 4001: 'Common Architectural Woodwork Requirements' for Approved Fabricators.

1.2 REFERENCES

- A. Definitions:
 - 1. High Density Polyethylene (HDPE): A strong, relatively opaque form of polyethylene having a dense structure with few side branches off the main carbon backbone. Polyethylene is a member of the important family of polyolefin resins.
 - 2. Solid Surface: Solid surface materials are manufactured from polymeric materials. Granules may also be added to enhance the color effects. Solid surface materials are non-porous and homogeneous, with the same composition throughout the thickness of the solid surface material. They are capable of being repaired, renewed to the original finish and fabricated into continuous surfaces with inconspicuous seams.
- B. Reference Standards:
 - 1. American National Standards Institute/International Cast Polymer Alliance:
 - a. ANSI/ICPA SS-1-2001, 'Performance Standard for Solid Surface Materials'.

1.3 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Manufacturer's literature.
 - b. Color selections.

1.4 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**2.1 ASSEMBLIES****A. Manufacturers:**

1. Acrylic Solid Surface:
 - a. Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories.
 - 1) Corian by DuPont Co, Wilmington, DE. Contact Steve Finch at (314) 941-5179 or email stephen.m.finch@dupont.com.
 - 2) Staron Solid Surfacing by Cheil Industries / Samsung Chemical USA, La Mirada, CA www.staron.com.
 - 3) Hanex Solid Surfaces by Hanwha L&C Surfaces US HQ, Atlanta, GA www.hanwhasurfaces.com.
 - 4) LG Hi-Macs Solid Surfacing by LG Solid Source LLC, Peoria, AZ www.lgcreate.com.
 - 5) 'Gibraltar Solid Surface' by Wilsonart International Inc, Temple, TX www.wilsonart.com.
2. High Density Polyethylene (HDPE):
 - a. Type Two Acceptable Products:
 - 1) Comtec Industries, Moosic, PA www.comtecindustries.com.
 - 2) PSiSC, Columbia, SC www.psisc.com.
 - 3) Equal as approved by Architect before installation. See Section 01 6200.

B. Materials:

1. Acrylic Solid Surface Window Stools:
 - a. Design Criteria:
 - 1) Meet requirements of ANSI/ICPS SS-1.
 - b. General:
 - 1) **1/2 inch (12.7 mm)** thick 100 percent acrylic polymer.
 - c. Approved Colors: As selected by Architect from Manufacturer's standard solid (white or off-white only) colors.
 - 1) Glacier White by Corian.
 - 2) Bisque by Corian.
 - 3) Cameo White by Corian.
 - 4) Vanilla by Corian.
2. High Density Polyethylene (HDPE) Bench Seat:
 - a. **1-1/2 inches (38 mm)** thick.
 - b. Color selected to closely match color of toilet partitions.

PART 3 - EXECUTION: Not Used**END OF SECTION**

SECTION 07 1113**BITUMINOUS DAMPPROOFING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and apply bituminous dampproofing to exterior of font foundation walls and top of associated footings as described in Contract Documents.

1.2 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Manufacturer's product literature or cut sheet products provided.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Storage And Handling Requirements:
 - 1. Maintain dampproofing at 40 deg F (4 deg C) or above before application.

1.4 FIELD CONDITIONS

- A. Ambient Conditions:
 - 1. Do not apply when ambient temperature is below 40 deg F (4 deg C), surface temperature is below 33 deg F (one deg C), or when rain is expected before applied dampproofing will dry.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Bituminous Dampproofing:
 - 1. Type Two Acceptable Products:
 - a. Ecomul-11 by Epro Waterproofing Systems, Derby, KS www.eproserv.com.
 - b. Henry 788 by Henry Company, El Segundo, CA www.henry.com.
 - c. Karnak 100 by Karnak Chemical Corp, Clark, NJ www.karnakcorp.com.
 - d. Sealmastic Asphalt Emulsion Dampproofing Type I by W R Meadows, Hampshire, IL www.wrmeadows.com.
 - e. Equal as approved by Architect before application. See Section 01 6200.

PART 3 - EXECUTION**3.1 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. Apply dampproofing to cover area from 6 inches (150 mm) below finish grade line down to and including top of footings.
- D. Do not backfill against bituminous dampproofing for twenty-four (24) hours after application.

END OF SECTION

SECTION 07 2113**BOARD INSULATION****PART 1 - GENERAL****1.1 SUMMARY****A. Includes But Not Limited To:**

1. Furnish and install board insulation on interior side of perimeter foundation walls and under floor slabs as described in Contract Documents.

1.2 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 C518-17, 'Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus'.
 - b. ASTM C578-18, 'Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation'.
 - c. ASTM C1289-18a, 'Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board'.
 - d. ASTM E84-18b, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
 - e. ASTM E96/E96M-16, 'Standard Test Methods for Water Vapor Transmission of 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. Insulation shall be manufactured to be in compliance with International Code Council (IBC) or other applicable building codes.
2. Fire-Test-Response Characteristics: As determined by test method indicated below by qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Surface-Burning Characteristics:
 - 1) Insulation shall have Class A flame spread rating in accordance with ASTM E84 or UL 723.
 - a) Class A (Flame spread index 0-25; Smoke-developed index 0-450).
 - b) Flash point: None.
3. Qualifications:
 - a. Installer: Firm which has at least three (3) years experience in work of type required by this specification.

1.4 DELIVERY, STORAGE, AND HANDLING**A. Delivery And Acceptance Requirements:**

1. Materials shall be delivered in original, unopened packages with labels intact. Exercise care to avoid damage during unloading.
2. Deliver materials in sufficient quantities to allow continuity of work.

B. Storage And Handling Requirements:

1. Store, protect and handle materials in accordance with Manufacturer's recommendations to prevent damage, contamination and deterioration. Keep material free of dirt and other foreign matter.
2. Store in cool, dry area away from sources of heat, flame, ignition and strong oxidizing agents.
3. Following Manufacturer's instructions for protection when handling and cutting insulation.

1.5 WARRANTY

A. Manufacturer Warranty:

1. Manufacturer's Insulation Warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERES

A. Manufacturer Contact List:

1. Owens Corning, Toledo, OH www.owens-corning.com.
2. Dow Chemical, Midland, MI www.dow.com or Dow Canada, Sarnia, ON www.dow.com.

2.2 MATERIALS

A. Board Insulation:

1. Description:
 - a. Extruded polystyrene foam insulation for use above and below grade.
2. Design Criteria:
 - a. Meet requirements of ASTM C578, Type IV.
 - b. Close-cell foam insulation.
 - c. Meet requirements of ASTM E84 or UL 723 for 'surface burning characteristics of building materials'.
3. Type One Acceptable Products:
 - a. Foamular 250 by Owens Corning.
 - b. Styrofoam Scoreboard Extruded Polystyrene Foam Insulation by Dow Chemical.
 - c. Equal as approved by Architect before bidding. See Section 01 6200.

2.3 ACCESSORIES

A. Fasteners:

1. Tapping screws with washers.
 - a. As recommended by Manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification Of Conditions:

1. Prior to all work of this section, carefully inspect installed work of all other trades and verify that all such work is complete to point where installation may properly commence.

2. Verify insulation may be installed in accordance with original design and manufacturer's recommendations
3. Discrepancies:
 - a. In event of discrepancy, immediately notify Architect.
 - b. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.2 INSTALLATION

- A. General: Install insulation in compliance with International Code Council (IBC) or other applicable building codes and in accordance with Manufacturer's current recommendations.
- B. Type 1 Insulation (Below Grade):
 1. Remove ties and concrete protrusions that would keep insulation from fully contacting foundation wall face.
 2. Install against interior side of perimeter foundation walls extending downward from top of slab **48 inches (1 200 mm)** or to top of footing, whichever is less. Install using **3/8 inch (9.5 mm)** beads of adhesive at **12 inches (300 mm)** on center vertically and at each vertical and horizontal joint to completely seal insulation.

3.3 FIELD QUALITY CONTROL

- A. Field Tests And Inspections:
 1. Upon completion of installation, visually inspect each insulated area and verify that all insulation is complete and properly installed.
- 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 not complying with contract document requirements at no additional cost to the Owner.

3.4 CLEANING

- A. Waste Management:
 1. Remove from site debris resulting from work of this Section.

END OF SECTION

SECTION 07 2116**BLANKET INSULATION****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install faced thermal and acoustic batt insulation as described in Contract Documents.
 - 2. Quality of insulation used in speaker enclosures.
 - 3. Furnish and install unfaced thermal insulation in ceilings as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 06 2024: 'Door, Frame, And Finish Hardware Installation' for furnishing and installing of insulation in hollow metal door frames.

1.2 REFERENCES

- A. Reference Standards:
 - 1. ASTM International:
 - a. ASTM C665-17, 'Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing'.

1.3 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Insulation shall be manufactured and installed in compliance with International Building Code (IBC) or other applicable building codes.

PART 2 - PRODUCTS**2.1 SYSTEMS**

- A. Manufacturers:
 - 1. Insulation:
 - a. Type One Acceptable Manufacturers:
 - 1) Certaineed 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.
 - b. Equal as approved by Architect before bidding. See Section 01 6200.
- B. Materials:
 - 1. Thermal And Acoustic Insulation:
 - a. Order insulation by 'R' value rather than 'U' value, rating, or thickness, either 16 or 24 inches (400 or 600 mm) wide according to framing spacing.
 - b. Faced Insulation:
 - 1) Kraft faced meeting requirements of ASTM C665, Type II, Class C.

- 2) Foil faced meeting requirements of ASTM C665, Type III.
 - a) Class A: Exposed insulation.
 - b) Class B: Enclosed insulation.
- c. Unfaced Insulation: Meet requirements of ASTM C665, Type I.
 - 1) Support at trussed rafters:
 - a) Provide support at trussed rafters where insulation is not enclosed by structure or drywall.
 - b) Provide stings/wires which run perpendicular to framing and attach at each trussed rafter and to framing at **32 inches (800 mm)** O.C. minimum and where batt ends adjoin each other.
 - or
 - c) Class Two Quality Standard: Simpson Strong Tie IS Insulation Supports with **14 gauge (1.89 mm)** carbon steel, spring wire and mitered tips for **16 inch (400 mm)** O.C. and **24 inch (610 mm)** O.C. spacing.
- d. 'R' Value Required:
 - 1) Acoustically Insulated Ceilings:
 - a) Enclosed Spaces: Fill framed cavity with batt of appropriate thickness.
 - b) Unenclosed Spaces: R-19.
 - c) Unenclosed Spaces above Offices and Restrooms: R-30.
 - 2) Thermally Insulated Ceilings / Roof:
 - a) R-49C Cathedral / High Density: At 2x12 **(50x300 mm)** Overbuild Framing.
 - b) R-49 Standard: All Other.
 - 3) Wood Wall Stud Framing:

R-11	3-1/2 inches deep	89 mm deep
R-19	5-1/2 inches deep	140 mm deep
R-25	7-1/4 inches deep	184 mm deep
R-30	9-1/4 inches deep	235 mm deep
R-38	11-1/4 inches deep	286 mm deep

- 4) Structural Composite Lumber (SCL) Wall Framing:

R-11	3-1/2 inches deep	89 mm deep
R-19	5-1/2 inches deep	140 mm deep
R-25	7-1/4 inches deep	184 mm deep
R-30	9-1/2 inches deep	241 mm deep
R-38	11-7/8 inches deep	302 mm deep

2.2 ACCESSORIES SYSTEMS

- A. Attic Baffles:
 1. Design Criteria:
 - a. Baffle can be used with spray foam, loose-fill, fiberglass, or other insulation materials.
 2. Type One Acceptable Manufacturers:
 - a. SB24 SmartBaffle by DCI Products, Inc., Clifton Heights, PA www.dciproducts.com.
 - b. Equal as approved by Architect before bidding. See Section 01 6200.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General:
 1. Leave no gaps in insulation envelope.
 2. If two layers of insulation are used to attain required 'R' value, only layer towards interior of building shall have facing.

3. Provide minimum clearance around recessed lighting fixtures as approved by local code.

B. In Framing:

1. Install insulation behind plumbing and wiring, around duct and vent line penetrations, and in similar places.
2. Fit ends of batts snug against top and bottom plates.
3. Fit batts snug against stud framing at each side.
4. Where insulation is not enclosed by structure or drywall, support in place with wire or other suitable material as approved by Architect before bid.

C. Attic Baffles:

1. Install in accordance with manufacturer's instructions.
2. Install baffles between trusses and rafters at ventilation spaces to prevent insulation from blocking airflow from soffit.
3. Install baffles to prevent insulation from blocking ventilation airflow from soffit.

END OF SECTION

SECTION 07 2613**ABOVE-GRADE VAPOR RETARDERS****PART 1 - GENERAL****1.1 SUMMARY****A. Includes But Not Limited To:**

1. Furnish and install polyimide film vapor retarder on framed walls and ceilings as described in Contract Documents.

1.2 REFERENCES**A. Definitions:**

1. Fire Hazard Classification:
 - a. Flame Spread: The propagation of flame over a surface.
 - b. Flame Spread Index: The numerical value assigned to a material tested in accordance with ASTM E84.
 - c. Smoke-Developed Index: The numerical value assigned to a material tested in accordance with ASTM E84.
2. General Classification of Building Materials with Respect to Water Vapor Permeance:
 - a. Vapor Barrier Materials: 0.1 perm or less (rubber membranes, polyethylene film, glass, aluminum foil, sheet metal, foil-faced insulating sheathings)
 - b. Vapor Retarder Materials: 0.1-1 perm (asphalt-backed kraft paper, vapor retarding paint, oil-based paints, vinyl wall coverings, extruded polystyrene, plywood, OSB).
 - c. Semi-Vapor Permeable Materials: 1-10 perms (unfaced expanded polystyrene, fiberfaced isocyanurate, heavy asphalt impregnated building papers, some latex-based paints).
 - d. Vapor Permeable Materials: 10+ perms (unpainted gypsum board and plaster, unfaced fiber glass insulation, cellulose insulation, unpainted stucco, cement sheathings, spun bonded polyolefin or some polymer-based exterior air barrier films).
3. Perm: Unit of measurement typically used in characterizing water vapor permeance of materials. Measures flow of water vapor through material.

B. Reference Standards:

1. ASTM International:
 - a. ASTM C665-17, 'Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing' (Section 7.4, Water-Vapor).
 - b. ASTM C755-10(2015), 'Standard Practice for Selection of Water Vapor Retarders for Thermal Insulation'.
 - c. ASTM C834-17, 'Standard Specification for Latex Sealants'.
 - d. ASTM C920-18, 'Standard Specification for Elastomeric Joint Sealants'.
 - e. ASTM C1338-14, 'Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings'.
 - f. ASTM E84-18b, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
 - g. ASTM E96/E96M-16, 'Standard Test Methods for Water Vapor Transmission of Materials'.
2. Underwriters Laboratories, Inc.:
 - a. UL 723: 'Standard for Safety Test for Surface Burning Characteristics of Building Materials'; (11th edition - 2018).

1.3 SUBMITTALS**A. 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.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Acceptance Requirements:
 - 1. Deliver and keep in original containers until ready for use.
- B. Storage and Handling Requirements:
 - 1. Handle to prevent damage to material.
 - 2. Store sealants in a cool dry location, but never under 40 deg F (4 deg C).
 - 3. Special care should be taken when working with open flame.

1.5 FIELD CONDITIONS

- A. Ambient Conditions:
 - 1. Vapor retarder:
 - a. Limitations:
 - 1) For use in heating and mixed climates.
 - 2) Not suited for cooling climates with high outdoor humidities.
 - b. Installation:
 - 1) Follow Manufacturer's recommendations for installation of vapor retarder.
 - 2. Sealants:
 - a. Follow Manufacturer's temperature recommendations for installing sealants.

1.6 WARRANTY

- A. Manufacturer's Warranty:
 - 1. Provide Manufacturer's limited one-year warranty against Manufacturer's defects.

PART 2 - PRODUCTS

2.1 MATERIAL

- A. Sheet Retarder:
 - 1. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a. Certaineed MemBrain, The SMART Vapor Retarder.

2.2 DESIGN CRITERIA

- A. Material Standard:
 - 1. 2 mil (0.05 mm) 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.
- B. Physical / Chemical Properties:
 - 1. Water Vapor Permeance:

- a. Equal to or less than **1.0 perm** (**57ng/Pa*s*m2**), as per ASTM E96/E96M desiccant method, or dry cup method and increases to greater than **10.0 perms** (**1144ng/Pa*s*m2**) using wet cup method as per ASTM E96/E96M.
 2. Fungi Resistance:
 - a. No growth as per ASTM C1338.
 3. Corrosivity:
 - a. No unusual aspect of corrosion such as pitting, cracking and adhesive cure inhibition as per ASTM C665).
- C. Fire Hazard Classification:
 1. Material surface burning characteristics shall have flame spread rating in accordance with ASTM E84:
 - a. Flame spread index 20.
 - b. Smoke-developed index 55.
- D. Air Barrier:
 1. To be used as air barrier when installed with recommended tapes and sealants.
 - a. See CCMC Evaluation Report 13278-R (Vapour Barrier with RH-Dependent Water Vapour Permeance).

2.3 ACCESSORIES

- A. Lap Sealant:
 1. Type Two 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. Tape:
 1. Type Two Acceptable Products:
 - a. As approved by Manufacturer before use. See Section 01 6200.
- C. Window/Door Openings:
 1. Sealant:
 2. Type Two Acceptable Products:
 - a. As approved by Manufacturer before use. See Section 01 6200.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General:
 1. Do not use damaged or deteriorated materials.
 2. Do not apply caulking at temperatures below **40 deg F** (**4 deg C**).
 3. Do not use low permeance interior finishes such as vinyl wallpaper or vapor retarding paints.
 4. Do not use with wet spray insulation systems.
 5. Installation:
 - a. Install in accordance with Manufacturer's written instructions.
 - b. Install in most areas, on warm-in-winter side of insulation (toward interior). For some warm and humid areas, vapor retarder should be installed towards exterior of building envelope.
 - c. Installation in wood framing: Same as polyethylene sheeting.
- B. Installation as Air Barrier System:
 1. Roof/Attic/Ceiling Applications:
 - a. Staple to bottom of ceiling joists 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.
 2. 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.
 3. Acoustical and Sealant Application at Sheet Terminations:
 - a. Install sealants as recommended by Manufacturer to ensure an air-tight assembly.
 4. Lapped Joint Treatment:
 - a. Apply recommended sealant to wood stud surface.
 - b. Overlap and as recommended by Manufacturer.
 - c. Seal overlapped joint using recommended sheathing tape.
 - d. All vertical and horizontal seams should be treated as described above.
 5. Penetrations:
 - a. Building envelope penetrations include windows, doors, electrical outlets, gas lines, plumbing, etc:
 - 1) Cut and fit sheathing tightly around penetrations as recommended by Manufacturer.
 - 2) Seal retarder around all electrical, HVAC and plumbing penetrations with recommended sealants or sheathing tapes.
 6. 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.
 7. 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.
 8. Electrical Outlets:
 - a. Wrap and seal electrical boxes using recommended sheathing tapes and sealants.
 - b. Airtight plastic boxes are recommended.
 9. 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.
 10. 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.
- C. Fasteners:
 1. Fasteners as approved by Manufacturer:
 - a. Following recommendations for type, size, spacing and installation methods.
 - b. To resist wind forces, fastened to supporting structure and supported by gypsum wallboard on one side and insulation on other.
- D. Seal penetrations through vapor retarder immediately before installation of gypsum board.

3.2 FIELD QUALITY CONTROL

- A. Field Inspection:
 1. Vapor retarder is to be air tight and free from holes, tears, and punctures.
 - a. Immediately before installation of gypsum board, inspect vapor retarder for holes, tears, and punctures and repair damaged areas.
 - b. Immediately before completion of Project, inspect exposed vapor retarder for holes, tears, and punctures and repair damaged areas.

END OF SECTION

SECTION 07 2616**BELOW-GRADE VAPOR RETARDER****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
 - 1. Vapor retarder, seam tape, and penetration accessories for installation under interior slabs-on-grade.
- B. Related Requirements:
 - 1. Section 31 1123: 'Aggregate Base' for installation of vapor retarder over aggregate base under concrete slab.

1.2 REFERENCE

- A. Association Publications:
 - 1. American Concrete Institute:
 - a. ACI 302.1R-15, 'Guide for Concrete Floor and Slab Construction'.
 - 1) Section 3.2.3, 'Vapor Retarder'.
 - b. ACI 302.2R-06, 'Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials'.
- B. Definitions:
 - 1. Vapor Barrier: Material that has permeance of 0.1 perm or less. Vapor barrier is a material that is essentially vapor impermeable. Vapor barrier is a Class I vapor control layer. Test procedure for classifying vapor retarders is ASTM E96 Test Method A—the desiccant or dry cup method.
 - 2. Vapor Retarder: Vapor retarder is a material that has permeance of 1.0 perm or less and greater than 0.1 perm. Vapor retarder is a material that is vapor semi-impermeable. Vapor retarder is a Class II vapor control layer. The test procedure for classifying vapor retarders is ASTM E96 Test Method A—the desiccant or dry cup method.
 - 3. Vapor Retarder Classes and Permeance Descriptions:
 - a. Classes of Vapor Retarders:
 - 1) Class I Vapor Retarder: 0.1 perm or less.
 - 2) Class II Vapor Retarder: 1.0 perm or less and greater than 0.1 perm.
 - 3) Class III Vapor Retarder: 10 perm or less and greater than 1.0 perm.
 - b. Four general classes based on permeance):
 - 1) Vapor Impermeable: 0.1 perm or less.
 - 2) Vapor semi-impermeable: 1.0 perm or less and greater than 0.1 perm.
 - 3) Vapor semi-permeable: 10 perm or less and greater than 1.0 perm.
 - 4) Vapor permeable: greater than 10 perms.
- C. Reference Standards:
 - 1. ASTM International:
 - a. ASTM D1709-16a, 'Standard Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method'.
 - b. ASTM E96/E96M-16, 'Standard Test Methods for Water Vapor Transmission of Materials'.
 - c. ASTM E1745-17, 'Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs'.

1.3 SUBMITTALS

- A. Action Submittals:

1. Product Data:
 - a. Manufacturer's literature or cut-sheets.
 2. Samples:
 - a. Vapor Retarder:
 - 1) Submit sample of specified vapor retarder.
- B. Informational Submittals:
1. Test And Evaluation Reports:
 - a. Independent laboratory test results showing compliance with ASTM C1745 Standard.
 2. Source Quality Control Submittals:
 - a. Vapor Retarder:
 - 1) Installation, seaming, and penetration boot instructions.
- 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:
 - b. Record Documentation:
 - 1) Manufacturers documentation:
 - a) Manufacturer's documentation showing compliance to Contract Documents.

1.4 WARRANTY

- A. Manufacturer Warranty:
1. Manufacturer standard warranty to be free of defects and installed without damage.

PART 2 - PRODUCTS

2.1 ASSEMBLIES

- A. Manufacturers:
1. Manufacturer Contact List:
 - a. Fortifiber, Reno, NV www.fortifiber.com.
 - b. Insulation Solutions, East Peoria, IL www.insulationsolutions.com.
 - c. Inteplast Group, Livingston NJ www.BarrierBac.com.
 - d. Raven Industries, Sioux Falls, SD www.ravenind.com.
 - e. Reef Industries, Houston, TX www.reefindustries.com.
 - f. Stego Industries, San Juan Capistrano, CA www.stegoindustries.com.
 - g. W R Meadows, Hampshire, IL www.wrmeadows.com.
- B. Materials:
1. Vapor Retarder:
 - a. Design Criteria:
 - 1) Meet requirements of ASTM E1745, Class A rating.
 - 2) Thickness: **15 mil (0.38 mm)** minimum.
 - 3) Physical Properties:
 - a) Water Vapor Pemeance ASTM E96, Method A Perm 0.01
 - b) Puncture Resistance ASTM D1709.
 - b. Category Four Approved Products. See Section 01 6200 for definition of Categories.
 - 1) Barrier-Bac VB-350 (16 mil) by Inteplast Group.
 - 2) Griffolyn 15 by Reef Industries.
 - 3) Moistop Ultra 15 Underslab Vapor Retarder by Fortifiber.
 - 4) Perminator (15 mil) by W R Meadows.
 - 5) Stego Wrap by Stego.
 - 6) Vapor Block 15 by Raven Industries.
 - 7) Viper Vaporcheck II (**15 mil**) by Insulation Solutions.

2.2 ACCESSORIES

- A. Vapor Barrier:
 - 1. Seam Tape: As recommended by Membrane Manufacturer for continuous taping of seams and sealing of penetration boots.
 - 2. Penetration Boots at Utility Penetrations:
 - a. Quality Standard: Factory fabricated pipeboots:
 - 1) Moistop: The Boot.
 - 2) Raven: VaporBoot.
 - 3) Reef Industries: VaporBoot.
 - 4) All Others:
 - a) Other Manufacturer's boot system.
 - b) or
 - c) Field fabricated from same material as vapor retarder membrane.

PART 3 - EXECUTION Not Used**END OF SECTION**

SECTION 07 2719**PLASTIC SHEET AIR BARRIERS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install air infiltration barriers on exterior side of exterior wall sheathing as described in Contract Documents.

1.2 REFERENCES

- A. Reference Standards:
 - 1. ASTM International:
 - a. ASTM E1677-11, 'Standard Specification for an Air Barrier (AB) Material or System for Low-Rise Framed Building Walls'.

1.3 SUBMITTALS

- A. Informational Submittals:
 - 1. Test And Evaluation Reports: Copy of test results showing performance characteristics.
- B. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Warranty Documentation:
 - 1) Final, executed copy of Warranty (if available from Manufacturer).

1.4 QUALITY ASSURANCE

- A. 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.

1.5 WARRANTY

- A. Manufacturer Warranty:
 - 1. Manufacturer's limited warranty (if available on product).

PART 2 - PRODUCTS**2.1 ASSEMBLIES**

- A. Manufacturers:
 - 1. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a. Styrofoam Weathermate Plus by Dow, Chemical Co, Midland, MI www.dow.com
 - b. Tyvek HomeWrap by Du Pont Company, Wilmington, DE www.dupont.com
 - c. DriShield Housewrap by Protecto Wrap, Denver, CO www.protectowrap.com
 - d. Fortress Pro by Raven Industries, Sioux Falls, SD www.ravenind.com
 - e. Typar Housewrap by Fiberweb, Old Hickory, TN www.typar.com.

- B. Materials:
1. Air Retarder:
 - a. Non-woven.
 - b. Meet requirements of ASTM E1677, Type I.
 2. Sealing Tape:
 - a. Type Two Acceptable Products:
 - 1) DuPont Contractor Tape.
 - 2) Fortress Pro Seaming Tape.
 - 3) Typar Construction Tape.
 - 4) 3M Contractor Sheathing Tape.
 - 5) Protecto Wrap BT25 XL Window Sealing Tape.
 - 6) As recommended in writing by Air Retarder Manufacturer.
 3. Fasteners:
 - a. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) 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.
 - 2) 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.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install over exterior wall sheathing.
1. Apply specified fasteners along stud lines at **18 inches (450 mm)** maximum on center. Lap horizontal joints **6 inches (150 mm)** minimum, with upper layer placed over lower layer. Lap vertical seams **16 or 24 inches (400 or 600 mm)** as necessary to match framing spacing. Do not fasten at bottom where necessary to allow for installation of flashing behind air infiltration barrier at base of masonry veneer.
 2. Seal joints and penetrations through air infiltration barrier with specified tape before installation of finish material. Air infiltration barrier shall be air tight and free from holes, tears, and punctures.

END OF SECTION

SECTION 07 3113**ASPHALT SHINGLES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install Asphalt Shingle Roofing System as described in Contract Documents.
- B. Related Requirements:
 - 1. Division 22: Plumbing vent piping.
 - 2. Division 23: HVAC flues and air piping.
- C. Products Installed But Not Furnished Under This Section:
 - 1. Miscellaneous flashing and sheet metal:
 - a. Drip metal.
 - b. Valley flashing.
 - c. Wall flashings.
 - 2. Pipe and flue roof jacks.
 - 3. Ridge vent.
- D. Related Requirements:
 - 1. Section 07 6310: 'Steep Slope Roof Flashing: Asphalt Tile' for furnishing of roof flashing, pipe jacks, drip edge and miscellaneous flashing and sheet metal.
 - 2. Section 07 7226: 'Ridge Vent.

1.2 REFERENCES

- A. Definitions:
 - 1. Flame Spread Classification: Categories as per ASTM E84/UL 723 or CAN/ULC-S102:
 - a. Class A: Highest fire-resistance rating for roofing as per ASTM E108. Indicated roofing is able to withstand severe exposure to fire exposure to fire originating from sources outside building.
 - b. Class B: Fire-resistance rating indicating roofing materials are able to withstand moderate exposure to fire originating from sources outside of building.
 - c. Class C: Fire-resistance rating indicating roofing materials are able to withstand light exposure to fire originating from sources outside of building.
 - 2. Wind Uplift: Wind-induced forces on roof system or components in roof system. Wind uplift generally includes negative pressure component caused by wind being deflected around and across surfaces of building and positive pressure component from air flow beneath roof deck.
- B. Reference Standards:
 - 1. ASTM International:
 - a. ASTM D226-09/D226M-17, 'Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing'.
 - b. ASTM D1970/D1970M-18, 'Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection'.
 - c. ASTM D3018/D3018M-11(2017), 'Standard Specification for Class A Asphalt Shingles Surfaced with Mineral Granules'.
 - d. ASTM D3019/D3019M-17, 'Standard, 'Standard Specification for Lap Cement Used with Asphalt Roll Roofing, Non-Fibered, Asbestos-Fibered, and Non-Asbestos-Fibered'.
 - e. ASTM D3161/D3161M-16a, 'Standard Test Method for Wind-Resistance of Asphalt Shingles (Fan-Induced Method)'.

- f. ASTM D3462/D3462M-16, 'Standard Specification for Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules'.
- g. ASTM D4869/D4869M-16a, 'Standard Specification for Asphalt-Saturated Organic Felt Underlayment Used in Steep Slope Roofing'.
- h. ASTM D7158/D7158M-17, 'Standard Test Method for Wind Resistance of Asphalt Shingles (Uplift Force/Uplift Resistance Method)'.
- i. ASTM E84-18b, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
- j. ASTM E108-17, 'Standard Test Methods for Fire Tests of Roof Coverings'.
- k. ASTM F1667-18, 'Standard Specification for Driven Fasteners: Nails, Spikes, and Staples'.
- 2. Canadian Standards Association (CSA Group):
 - a. CSA A123.5-16, 'Asphalt Shingles Made from Organic Felt and Surfaced with Mineral Granules / Asphalt Shingles Made From Glass Felt and Surfaced With Mineral Granules'.
- 3. International Building Code (IBC) (2018 Edition or latest edition adopted by AHJ):
 - a. Chapter 15, 'Roof Assemblies And Rooftop Structures'.
- 4. National Fire Protection Association:
 - a. NFPA 101: 'Life Safety Code' (2015 Edition).
- 5. Standards Council of Canada:
 - a. CAN/ULC-S102:2018, 'Method of Test for Surface Burning Characteristics of Building Materials and Assemblies'.
 - b. CAN/ULC-S107:2010-R2017, 'Methods of Fire Tests of Roof Coverings'.
- 6. 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 Covering Materials' (2nd Edition).

1.3 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conference:

- 1. Participate in MANDATORY pre-installation conference:
 - a. Roofing Installer's Foreman and those responsible for installation of roofing to be in attendance. Include Shingle Manufacturer's Representative if available.
- 2. Schedule pre-installation conference at project site after completion of the installation of roof sheathing but before installation of any roofing system component.
- 3. In addition to agenda items specified in Section 01 3100, review following:
 - a. Review if Project is in high wind area.
 - b. Review if Project could have ice dam problems.
 - c. Review if Project could have fungus-algae resistance problems.
 - d. Review Shingle Manufacturer's ventilation requirements.
 - e. Review Shingle Manufacturer's Ambient Conditions requirements.
 - f. Review existing roof conditions including moisture on deck, protruding deck fasteners, specified gaps between sheathing, and other items affecting issuance of roofing warranty.
 - g. Review proper valley, flashing, penetrations, secondary underlayment, sealants, and nailing requirements.
 - h. Review racking installation method is not permitted.
 - i. Review Cleaning and Disposal requirements.
 - j. Review Special Procedure Submittal for Warranty Information to be given to Manufacturer before Manufacture will issue Roof Warranty by Installer.
 - k. Review safety issues.

B. Sequencing:

- 1. Sequence of Roofing Materials (see valley flashing detail in Contract Drawings):
 - a. Apply continuous **12 inches (300 mm)** wide strip at edge of eaves and rakes of secondary underlayment.
 - b. Metal drip edge.
 - c. Secondary underlayment.

- d. Apply three (3) continuous **36 inch (900 mm)** wide sheets of secondary underlayment in valley.
 - e. Install one (1) continuous **36 inch (300 mm)** wide strip of primary underlayment atop secondary underlayment and centered over valley.
 - f. Install formed valley metal over strip of primary underlayment.
 - g. Apply **12 inches (300 mm)** wide strips of secondary underlayment lapping nailed edge of formed valley metal **3 inches (75 mm)**.
 - h. Primary underlayment.
 - i. Asphalt shingles.
 - j. Counter flashings over step flashing.
2. Coordinate sequencing of products furnished in Section 07 7226: 'Ridge Vents'.

1.4 SUBMITTALS

A. Action Submittals:

1. Product Data:
 - a. Color and style selection.
2. Samples:
 - a. Full size shingle.

B. Informational Submittals:

1. Certificates:
 - a. Installers:
 - 1) Provide current Certification for completion of certified training from Shingle Manufacturer.
 - 2) 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.
2. Tests And Evaluation Reports:
3. Reports:
 - a. Manufacturer's test reports.
 - b. Wind speed coverage for warranted wind speed.
 - c. High wind reports and approvals if required by AHJ.
4. Manufacturers' Instructions:
 - a. Shingle Manufacturer's installation instructions and details for installation of secondary underlayment at penetrations, dormers, eaves, rakes, etc, to fit environmental conditions at Project.
5. Special Procedure Submittals:
 - a. Contact Owner's Representative (FM Group or Project Manager) for following information:
 - 1) Installer to include following mandatory information to be added to 'Roofing Manufacturer System Warranty' submitted with Closing Documents.
 - a) Name of Owner (name of FM Group) _____
 - b) Mailing Address (FM office address) _____
 - c) Building Property ID (unique 7 digit identifier) _____
 - d) Project site address: _____
 - e) Roof Completion Date _____
 - f) Any addition data required from Manufacturer.
 - 2) Installer to include following mandatory information to be added to 'Roof Installer Workmanship Warranty' submitted with Closing Documents:
 - a) Name of Owner (name of FM Group) _____
 - b) Mailing Address (FM office address) _____
 - c) Building Property ID (unique 7 digit identifier) _____
 - d) Project site address: _____
 - e) Roof Completion Date _____
 - f) Any addition data required from Manufacturer.
6. Qualification Statement:
 - a. Installer:
 - 1) Asphalt Shingles:
 - a) Provide Qualification documentation.

C. Closeout Submittals:

1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Warranty Documentation:
 - 1) Asphalt Shingles:
 - a) Final, executed copy of 'Roofing Manufacturer System Warranty' including wind speed coverage and required Owner mandatory information.
 - b) Final, executed copy of 'Roof Installer Workmanship Warranty' including required Owner mandatory information.
 - 2) Verify mandatory information as specified in Special Procedure Submittal has been included in Final Warranty.
 - b. Record Documentation:
 - 1) Manufacturers Documentation:
 - a) Manufacturer's literature.
 - b) Color selections.
 - c) Test and evaluation reports.
 - 2) Roofing Inspection Documentation:
 - a) Include copy of roof inspection report.
 - 3) Certificate: Installer statement of compliance for performance requirements.
 - 4) Certificate: Installer completion of certified training.
 - 5) Test And Evaluation Report: UL fire-resistance rating test report.
 - 6) Test And Evaluation Report: NFPA 101 Class A approval.
 - 7) Test And Evaluation Report: Wind resistance requirements required.

D. Maintenance Material Submittals:

1. Extra Stock Materials:
 - a. Provide one (1) square minimum of bundled shingles.

1.5 QUALITY ASSURANCE**A. Regulatory Agency Sustainability Approvals:**

1. Building Codes:
 - a. Meet requirements for NFPA 101 Class A roof assembly.
 - b. Roof system will meet requirements of all federal, state, and local codes having jurisdiction.
2. Fall Protection: Meet requirement of fall protection as required by federal, state, and local codes having jurisdiction.
3. Fire Characteristics:
 - a. Provide shingles and related roofing materials with fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency:
 - 1) Exterior Fire-Test Exposure: Class A; UL 790, CAN/ULC-S102, or ASTM E108, for application and roof slopes indicated.
 - a) Materials shall be identified with appropriate markings of applicable testing agency.
4. Wind Resistance:
 - a. Meet ASTM D3161/D3161M for wind resistance.
 - 1) Installation shall comply with IBC Table 1507.2.7, 'Attachment'.
5. Wind Speed:
 - a. As required to meet local codes having jurisdiction.
6. Wind Uplift Resistance:
 - a. Meet UL 580 wind uplift of roof assemblies.
 - b. Meet UL 1897 uplift test for roof covering systems.
 - c. Meet ASTM D7158/D7158M for wind resistance for uplift force/uplift resistance.

B. Qualifications:

1. Manufacturer:
 - a. Asphalt Shingles:
 - 1) Asphalt shingles are required to be produced under quality control program administered by inspection agency currently accredited by ICBO ES or recognized by National Evaluation Service, Inc. Quality control manual developed in consultation with

- approved agency, and complying with ICBO ES Acceptance Criteria for Quality Control Manuals (AC10), must be submitted.
- b. Underlayment:
 - 1) Underlayment is required to be manufactured under approved quality control program with inspections by inspection agency accredited by International Accreditation Service (IAS) or otherwise acceptable to ICC-ES.
 - 2) Quality documentation complying with ICC-ES Acceptance Criteria for Quality Documentation (AC10) shall be submitted for roof underlayment.
 2. Roof Installer Foreman Qualifications:
 - a. Requirements of Section 01 4301 applies but not limited to the following:
 - 1) Provide documentation if requested by Architect.
 - a) Approved and authorized by Roofing Manufacturer to install Manufacturer's product and eligible to receive Manufacturer's warranty before bid.
 - b) Completed Shingle Manufacturer's certified trained.
 - c) Have thorough knowledge of installing asphalt shingle roofing and have minimum of five (5) years roofing experience.
 - d) Current license for the city, county, and state where project is located and 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) Flashing installation shall be performed by personnel trained and authorized by Roofing Manufacturer.
 3. Roof Installer:
 - a. Provide 'Roof Installer Workmanship Warranty' as specified in Warranty in Part 1 of this specification.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
 1. Make no deliveries to job site until installation is about to commence, or until approved storage area is provided.
 2. Deliver products job site in Manufacturer's original unopened containers or wrappings with labels intact and legible bearing all seals and approvals.
 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. Storage Requirements:
 - a. Follow Manufacturer's instructions and precautions for storage and protection of materials.
 - b. Protect roof materials from physical damage, moisture, soiling, and other sources in a clean, dry, protected location.
 - c. Stacking:
 - 1) Shingles: Bundles should be stacked flat.
 - 2) Underlayment:
 - a) Do not double-stack pallets.
 - b) Stack rolls upright until installation.
 - d. Temperature:
 - 1) Shingles:
 - a) Store in covered ventilated area at maximum temperature of 110 deg F (43 deg C).
 - b) Use extra care in handling shingles when temperature is below 40 deg F (4.4 deg C).
 - 2) Underlayment: Store in area with temperature between 40 deg F and 100 deg F (4.4 deg C and 38 deg C).
 - 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. Handling Requirements:
 - a. Handle rolled goods to prevent damage to edge or ends.
 3. Roof Top Loading:

- a. Lay shingle bundles flat.
- b. Do not bend over ridge.

1.7 FIELD CONDITIONS

- A. Ambient Conditions:
 - 1. General:
 - a. Proceed with installation only when existing and forecasted weather conditions permit roofing to be performed according to manufacturer's written instructions and warranty requirements.
 - 2. Shingles:
 - a. Do not install shingles at lower temperatures than allowed by Shingle Manufacturer for application.
 - 3. Underlayment:
 - a. Install self-adhering sheet underlayment within range of ambient and substrate temperatures recommended by manufacturer.

1.8 WARRANTY

- A. Special Warranty:
 - 1. Shingle Manufacturer's special forty (40) year minimum labor and material warranty written for The Church of Jesus Christ of Latter-day Saints program, including but not limited to:
 - a. CertainTeed:
 - 1) First ten (10) years minimum of warranty will provide for full replacement cost, including tear-off and disposal, for any failure, including material defects and workmanship. Remaining thirty (30) years of warranty will provide for pro-rated replacement cost.
 - b. GAF:
 - 1) First ten (10) years minimum of warranty will provide for full replacement cost, including tear-off and disposal, for any failure, including material defects and workmanship. Remaining thirty (30) years of warranty will provide for pro-rated replacement cost.
 - c. Malarkey (Alaska or Canada projects only):
 - 1) First ten (10) years minimum of warranty will provide for full replacement cost, including tear-off and disposal, for any failure, including material defects and workmanship. Remaining thirty (30) years of warranty will provide for pro-rated replacement cost.
 - d. Owens Corning:
 - 1) First ten (10) years minimum of warranty will provide for full replacement cost, including tear-off and disposal, for any failure, including material defects and workmanship. Remaining thirty (30) years of warranty will provide for pro-rated replacement cost.
 - 2. Standard Wind Areas:
 - a. Roofing system will resist blow-offs in winds up to 110 mph (177 kph) for ten (10) years when installed as specified below.
 - b. Meet requirements of ASTM D3161/D3161M UL Class D.
 - 3. Roof Installer Workmanship Warranty:
 - a. Provide ten (10) year workmanship warranty on roofing system and related components, including flashings, and responsible for all repairs to roofing system and related components due to roof installer's own negligence or faulty workmanship:
 - 1) In the event that, during ten (10) year period following installation, Roof Installer defaults or fails to fulfill its obligation in relation to workmanship warranty as specified in Manufacturer's Agreement, Manufacturer will assume that obligation for remainder of ten (10) year period following original installation and Owner shall have no obligation to make or pay for repairs to or materials for roofing system that are necessary due to Roof Installer's negligence or faulty installation during that period.

PART 2 - PRODUCTS

2.1 SYSTEM

A. Manufacturers:

1. Manufacturer Contact List:

- a. CertainTeed Roofing Products, Valley Forge, PA www.certainteed.com.
 - 1) Contact Information: Wendy Fox, (800) 404-9880 wfox@dataworksintl.com.
- b. GAF Materials Corp., Wayne, NJ www.gaf.com.
 - 1) Contact Information: John Arellano (office) (210) 896-1041 (fax) (210) 259-8050.
- c. Malarkey Roofing Products, Portland OR:
 - 1) Contact Information: Joe Russo (425) 418-3456 Joe.Malarkey@outlook.com.
- d. Owens Corning, Toledo, OH www.owenscorning.com.
 - 1) Duration Premium shingles are available in all areas of the USA and Canada including all Duration Premium colors under Church contract. Request shingles through local distribution. Any distribution questions, contact Area Sales Manager.
 - 2) For all other questions, Contact: Sam Baroudi (419) 248-7754 sam.baroudi@owenscorning.com. or Robert Hill (801) 553-2417 Robert.Hill@owenscorning.com.

B. Components:

1. Shingles And Underlayment:

- a. Fiberglass mat shingles meeting or exceeding requirements of:
 - 1) UL Class A Fire Resistance.
 - 2) ASTM D3018/D3018M, Type I (self sealing).
 - 3) Standard Wind Areas: ASTM D3161/D3161M UL Class D.
 - 4) ASTM E108 Class A.
 - 5) CSA A123.1/A123.5 (Canada).
 - 6) ASTM D3462/D3462M where required by local codes.
 - 7) Impact Resistant Shingles: Meet requirements of UL 2218 Class 4 Impact, ASTM E108 Class A Fire Resistance, ASTM D3161/D3161M Class F Wind, ASTM D7158/D7158M Class H Wind, ASTM D3018/D3018M Type 1, ASTM D3462/D3462M, and UL 790 Class A Fire Resistance.
 - 8) Secondary Underlayment: Meet requirements of ASTM D1970/D1970M and UL 790 Class A Fire Resistance.
 - 9) Primary (Synthetic) Underlayment: Meet requirements of ASTM D226/D226M and ASTM D4869/D4869M (physical properties only) or ASTM D1970/D1970M and ASTM E108 Class A Fire.
 - 10) Color to match existing.
- b. Category Three Approved Manufactures and Products. See Section 01 6200 for definitions of Categories:
 - 1) CertainTeed:
 - a) Shingles:
 - (1) Standard Wind: Hatteras / Landmark Premium.
 - (2) Hip And Ridge Shingles: Shadow Ridge or Laminate Accessory for shingle used.
 - b) Primary Underlayment Under Shingles:
 - (1) Synthetic Underlayment: Diamond Deck.
 - c) Secondary Underlayment Under Shingles:
 - (1) WinterGuard Granular.
 - or
 - (2) WinterGuard Sand.
 - or
 - (3) WinterGuard High Tack/High Temperature.
 - d) Secondary Underlayment Under Shingles over Unheated Buildings:
 - (1) Not required over unheated buildings such as Storage Shed and Stake Pavilions.
 - 2) GAF:
 - a) Shingles:

- (1) Standard Wind: Timberline Ultra HD.
 - (2) Hip And Ridge Shingles: TimberTex or Ridglass.
- b) Primary Underlayment Under Shingles:
 - (1) Synthetic Underlayment: Tiger Paw.
- c) Secondary Underlayment Under Shingles:
 - (1) Weatherwatch.
 - or
 - (2) StormGuard.
- d) Secondary Underlayment Under Shingles over Unheated Buildings:
 - (1) Not required over unheated buildings such as Storage Shed and Stake Pavilions.
- 3) Malarkey (Alaska or Canada projects):
 - a) Shingles:
 - (1) Standard Wind: Polymer Modified SBS Legacy.
 - (2) Hip And Ridge Shingles: Modified SBS Hip and Ridge Strips #225 **10 inches (254 mm)** or #227 **12 inches (305 mm)**.
 - b) Primary Underlayment Under Shingles:
 - (1) Synthetic Underlayment: Secure Start #1030.
 - (2) Polymer Modified SBS Underlayment: Right Start UDL.
 - c) Secondary Underlayment Under Shingles:
 - (1) Arctic Seal Self-Adhering underlayment #401.
 - d) Secondary Underlayment Under Shingles over Unheated Buildings:
 - (1) Not required over unheated buildings such as Storage Shed and Stake Pavilions.
- 4) Owens Corning:
 - a) Note:
 - (1) Duration Premium shingles are available in all areas of the USA and Canada including all Duration Premium colors under Church contract. Request shingles through local distribution.
 - (2) Any questions, contact Manufactures Area Sales Manager.
 - b) Shingles:
 - (1) Standard Wind: Duration Premium shingles.
 - (2) Hip And Ridge Shingles: DecoRidge Hip & Ridge.
 - c) Primary Underlayment Under Shingles:
 - (1) Synthetic Underlayment: Deck Defense High Performance Roof Underlayment.
 - d) Secondary Underlayment Under Shingles:
 - (1) Weatherlock G Granulated Self-Sealing Ice & Water Barrier.
 - or
 - (2) Weatherlock Specialty Tile & Metal for High Temperature.
 - or
 - (3) Weatherlock Cold Climate for cold weather adhesion and flexibility.
 - e) Secondary Underlayment Under Shingles over Unheated Buildings:
 - (1) Not required over unheated buildings such as Storage Shed and Stake Pavilions.

2.2 ACCESSORIES

A. Elastomeric Roofing Sealant:

- 1. Design Criteria:
 - a. Meet requirements of ASTM D3019/D3019M.
 - b. Non-asphalt roofing cement (not permitted).
 - c. Elastomeric.
 - d. Cold temperature pliability.
 - e. Compatible with roof penetration boots.
- 2. Category Four Products And Manufacturers. See Section 01 6200 for definitions of Categories:
 - a. Flintbond SBS Modified Bitumen Caulk by CertainTeed.

B. Fasteners:

1. Primary Underlayment:
 - a. Corrosion resistant roofing nails with **one inch (25 mm)** diameter head and **3/4 inch (19 mm)** long shank minimum.
 - 1) If shingles applied as underlayment is laid, use metal or plastic head Simplex roofing nails.
 - 2) If shingles not applied as underlayment is laid, use plastic head only.
 - b. Staples not permitted.
2. Shingles:
 - a. Design Criteria:
 - 1) Meet following requirements for nails:
 - a) Comply with ASTM F1667, Type I, Style 20-Roofing Nails.
 - b) Eleven gauge galvanized steel or equivalent corrosion-resistant roofing nail.
 - c) Nail head sizes: **3/8 inch (9.5 mm)** nominal diameter.
 - d) Sufficient length to penetrate through roof sheathing **1/4 inch (6 mm)** or **3/4 inch (19 mm)** minimum into solid wood decking.
 - e) Hot-dipped galvanized or electroplated fasteners comply with requirements of ASTM A153, Class D.
 - f) Stainless-steel fasteners meet requirements of Type 304 (UNS S30400) or Type 316 (UNS S31600).
 - b. General:
 - 1) Hot-dipped galvanized, electroplated non-corrosive gun-driver nails, or stainless-steel fasteners may be used.
 - 2) Fasteners within **15 miles (24.1 km)** of coastal areas (oceanside) applications must use hot-dipped galvanized or stainless steel.
 - 3) All exposed fasteners (including ridge shingles) must use hot-dipped galvanized or stainless steel.
 - 4) Staples not permitted:
 - a) Architect/Roof Consultant may approve in writing, staple gun that installs exposed fasteners with staples.

PART 3 - EXECUTION

3.1 INSTALLERS

- A. Category Three Approved Manufacture's Roofing Installers: See Section 01 4301.
 1. Utah Area:
 - a. Approved Installers:
 - 1) CertainTeed:
 - a) AMCO American Roofing Co., Salt Lake City, UT – Contact: Keith J Yorgason (801) 269-1276.
 - b) Far West Roofing, Bluffdale, UT – Contact Douglas Cooper (801) 253-7799.
 - c) Heritage Roofing, Bluffdale, UT – Contact: James Smith (801) 576-8447.
 - d) Island Heights Construction Inc., Logan, UT – Contact: Casey Ringer (435) 753-7403.
 - e) JTS Roofing Inc., Ogden, UT – Contact: Todd Shupe (801) 627-6450.
 - f) Mountain Peak Builders, Inc., Logan, UT – Contact: Zane Rust (435) 787-4174.
 - g) North Face Roofing, Inc., Park City, UT – Craig Peters (801) 455-8492.
 - h) Perkes Roofing, Ogden, UT – Contact: Mark Perkes (801) 731-6918.
 - i) Redd Roofing Co., Ogden, UT – Lance Redd (801) 621-1363.
 - j) Stout Roofing Inc., St George, UT - Contact: Kelly Casey (435) 635-4288.
 - k) Stuart Roofing, Ogden, UT, Forest Stuart (801) 394 1923.
 - l) VIP Roofing, Centerville, UT – Contact: Max Ker (801) 631-6182.
 - 2) GAF:
 - a) American Roofing Co. (AMCO), Salt Lake City, UT – Contact: Keith Yorgason (801) 269-1276.
 - b) Aspen Roofing, Salt Lake City, UT – Contact: Jon Brady (801) 483-1660.
 - c) Capital Roofing Service, Inc., Sandy, UT – Contact: Paul Hitzman (801) 562-5568.
 - d) Knockout Roofing, Riverton, UT – Contact Jared Gran (801) 604-4090.

- e) Lifetime Roofing, West Point, UT - Parker Cornably (801) 200-7426.
- f) Parrish Construction, American Fork, UT – Contact: Tyler Parrish (801) 787-3633.
- g) RSW Plus, Nephi, UT – Contact: Rick White (435) 623-1719.
- h) Skyline Roofing Inc., La Verkin, UT - Contact: Adam Stout (435) 635-3172.
- i) Wesley Green Roofing, UT – Contact: Scott Horsepool (801) 486-3411.
- 3) Owens-Corning:
 - a) American Roofing Co. (AMCO), Salt Lake City, UT – Contact: Keith J Yorgason (801) 269-1276.

3.2 EXAMINATION

- A. Verification Of Conditions:
 - 1. Examine deck to determine if it is satisfactory for installation of roofing system. Conditions include, but are not limited to, moisture on deck, protruding deck fasteners, specified gaps between sheathing, and other items affecting issuance of roofing warranty.
 - a. Report unsatisfactory conditions in writing to Architect.
 - b. Commencement of Work by installer is considered acceptance of substrate.
 - 2. Verify existing soffit and ridge vents meet ventilation code requirements.
 - a. Report inadequate ventilation conditions with recommendations in writing to Architect.

3.3 PREPARATION

- A. Protection Of In-Place Conditions:
 - 1. Install only as much roofing as can be made weathertight each day, including flashing and detail work.
- B. Surface Preparation:
 - 1. Clean roof deck:
 - a. Remove dirt, protruding nails, shingle nails, and debris, before installation of underlayment.
 - 2. Roof deck must be dry to help prevent buckling of deck, which can result in deck movement and damage to primary underlayment.
 - 3. Following Manufacturer's recommendations for placing materials on roof.
 - a. Prevent material from sliding off roof.

3.4 INSTALLATION

- A. General:
 - 1. Schedule and execute work without exposing interior building areas to effects of inclement weather. Protect existing building and its contents against all risks.
- B. Sequence of Roofing Materials as shown and noted on Contract Drawings:
 - 1. 12 inch strip Secondary Underlayment at Eave.
 - 2. Metal Drip Edge.
 - 3. General Secondary Underlayment.
 - 4. Valley Secondary Underlayment (8' - 6" (2.62 m) wide strip of Secondary Underlayment (3 strips) in Valleys applied over sheathing).
 - 5. Valley Secondary Underlayment (36 inch (915 mm) wide Primary Underlayment under Valley Metal).
 - 6. Valley Metal (24 inch (610 mm) wide valley metal 10 ft (3.05 m) lengths).
 - 7. 12 inch strip of Secondary Underlayment over nailed edges (of Valley Metal).
 - 8. General Primary Underlayment.
 - 9. Asphalt Shingles, Step Flashings.
 - 10. Counter Flashing.
- C. Underlayment:
 - 1. General:

- a. Temporary Roof:
 - 1) Do not use permanent underlayment installation as temporary roof.
 - 2) If temporary roof is used, remove completely before installation of permanent underlayment.
 - b. Follow Shingle Manufacturer's recommendations for installation of primary and secondary underlayment, particularly at eaves, rakes, and penetrations, unless specified installation procedures and Contract Drawing details are more stringent.
 - c. Avoid scuffing underlayment that can compromise surface and cause leaking. If scuffing occurs, following Manufacturer's recommendation for repair.
 - d. Staples are not permitted.
 - e. Weather conditions:
 - 1) Do not leave underlayment exposed to weather more than thirty (30) days after beginning of underlayment installation even if Manufacture allows longer period of time.
 - 2) If underlayment is exposed for more than thirty (30) days after beginning of underlayment installation, treat as temporary roof under first paragraph above.
 - 3) If moisture is deposited on exposed underlayment, obtain written approval from Shingle Manufacturer's Representative before installing shingles.
 - f. Install valley secondary underlayment, valley primary underlayment, and valley metal after installation of general secondary underlayment, but before installation of general primary underlayment.
2. Primary Underlayment:
 - a. Apply **48 inch (1 200 mm)** wide courses over complete deck, including areas covered with secondary underlayment unless specified otherwise.
 - 1) Overlap underlayment before fastening.
 - 2) Maintain end laps of **6 inch (150 mm)** and side laps of **3 inch (76 mm)**.
 - 3) Stop primary underlayment between **3 and 6 inches (75 and 150 mm)** of inside edge of strip of secondary underlayment installed over edge of formed valley metal.
 - b. Nailing Synthetic Underlayment:
 - 1) Use low-profile plastic or steel cap corrosion resistant nails with **1 inch (25 mm)** diameter heads to fasten underlayment in place. (Fastening underlayment without caps is not permitted).
 - 2) Nails must be driven properly. Improperly driven fasteners such as over-driving, under-driving and nails driven at an angle are not permitted.
 - 3) Fasteners should be long enough to penetrate at least **3/4 inch (19 mm)** into roof sheathing. Fasteners must be lie flush to roof deck at 90 degree angle to roof deck and tight with underlayment.
 - 4) Do not nail through metal flashing, except drip edge, when installing primary underlayment.
 - 5) Follow Shingle Manufacturer's installation instructions for following:
 - a) Securing underlayment to roof deck adjusting for roof slope nailing requirements.
 - b) Side lap, end lap, and overlapping nailing requirements.
 - c) Rake and eave nailing requirements.
 - d) High wind condition nailing requirements.
 - e) Sealants recommendations.
 3. Secondary Underlayment:
 - a. Under Shingles:
 - 1) Lap end joints **6 inches (150 mm)** and side joints **3 inch (76 mm)** minimum.
 - 2) Apply continuous **12 inches (300 mm)** wide strip at edge of eaves and rakes before installing drip edge.
 - 3) Apply on entire roof.**
 - 4) Provide high temperature along all valleys and roof to wall transitions.
 4. Valley Underlayment:
 - a. Apply three (3) continuous **36 inch (900 mm)** wide sheets of secondary underlayment in valley lapped to provide **102 inch (2 590 mm)** wide covered area centered over valley.
 - b. Apply one (1) continuous **36 inch (300 mm)** wide strip of primary underlayment atop secondary underlayment and centered over valley.
 - c. Install formed valley metal over strip of primary underlayment.
 - 1) Nail top of each section and lap **8 inches (200 mm)** in direction of flow.
 - 2) Seal laps with continuous bead of elastomeric roofing sealant.

- 3) Secure edges of valley metal with fasteners spaced at **12 inches (300 mm)** maximum on center and approximately **1/2 inch (13 mm)** in from edge of metal.
 - d. Install **12 inches (300 mm)** wide strips of secondary underlayment lapping nailed edge of formed valley metal **3 inches (75 mm)**.
- D. Shingles:
1. Before installing shingles, inspect underlayment and metal installation with Architect and Owner. Correct improperly installed and damaged material before beginning shingle installation.
 2. Racking installation method is not permitted by Owner and will be considered non-conforming work.
 3. Starter shingles:
 - a. Manufacturer's starter shingles are required for Shingle Warranty.
 - b. Install shingles at eave and rakes in accordance with Shingle Manufacturer's instructions.
 - c. Cut shingles in accordance with Shingle Manufacturer's instructions, or use approved starter course.
 - d. Nail to eave granule side up in continuous mastic bed with cut edge down-slope and edge overhanging eave **3/8 inch (9 mm)** so sealing tabs are at edge of eave.
 - e. Install shingles with maximum exposure recommended by Shingle Manufacturer.
 - f. Lay first course directly over starter strip with ends flush with starter strip at eaves and so joints in starter strip are offset **4 inches (100 mm)** minimum from joints in first course.
 4. Lay shingles so end joints are offset in accordance with Shingle Manufacturer's installation procedures.
 5. Insure alignment by snapping chalk line at least each fifth course to control horizontal and vertical alignment.
 6. Run courses true to line with end joints properly placed. Leave shingles flat without wave and properly placed.
 7. Hip and ridge shingles:
 - a. Manufacturer's hip and ridge shingles are required for Shingle Warranty.
 - b. Install specified hip and ridge shingles in accordance with Shingle Manufacturer's instructions.
 - c. Run ridge shingles as directed by Architect.
 8. Nailing:
 - a. General:
 - 1) Six (6) Nail Pattern as recommended by Shingle Manufacturer for Shingle Warranty in each shingle.
 - 2) Place in relation to top edge of shingle as required by Shingle Manufacturer.
 - 3) Place nails **one inch (25 mm)** from each end of shingle and remainder evenly spaced between.
 - 4) Should any nail fail to penetrate sheathing by **1/4 inch (6 mm)** minimum, drive additional nail nearby.
 - b. Nailing guns:
 - 1) Nails must be driven properly. Improperly driven fasteners such as over-driving, under-driving and nails driven at an angle are not permitted.
 - 2) Adjust nail gun pressure for nailing flush and tight to deck without cutting shingle surface.
 - 3) Drive nails perpendicular to shingle surface so nail head is flat against shingle.
 - 4) Should any nail fail to penetrate sheathing by **1/4 inch (6 mm)** minimum, drive additional nail nearby.
 9. Hand-Sealing:
 - a. If ambient temperature or exposure to sun will not be sufficient to secure adhesive strip to under-lying shingle within one week, hand seal shingles with elastomeric roofing sealant.
 10. Over valley metal:
 - a. Do not drive nails through valley metal.
 - b. Run chalk line so valley metal will be exposed **6 inches (150 mm)** wide at top and diverge **3/32 inch (one mm)** per **ft (300 mm)** down to eaves.
 - c. Neatly trim shingles to this line.
 - d. Seal trimmed shingle edges to valley metal with continuous bead of elastomeric roofing sealant applied within **one inch (25 mm)** of shingle edge.
 11. Vent pipe sleeve flange:
 - a. Vent pipe sleeve flange as specified in Section 07 6310.

- b. Fit shingles under lower edge and over sides and upper edge.
 - c. Set vent pipe flange in elastomeric roofing sealant.
 - d. Embed shingles in elastomeric roofing sealant where they overlap flange.
 - e. Apply bead of elastomeric roofing sealant at junction of vent pipe and vent flashing.
12. Furnished and installed in Section 07 7226 'Ridge Vents'.

3.5 FIELD QUALITY CONTROL

- A. Non-Conforming Work:
- 1. Correct any work found defective or not complying with Contract Document requirements at no additional cost to the Owner.
 - 2. Raking installation method is not permitted by Owner and will be considered to be not complying with Contract Document requirements and must be corrected at no additional cost to Owner.

3.6 CLEANING

- A. General:
- 1. All tools and unused materials must be collected at end of each workday and stored properly off finished roof surface and protected from exposure to elements.
 - 2. Leave metals clean and free of defects, stains, and damaged finish.
 - a. Replace fascia metal that is scratched through finish to base metal.
 - 3. Properly clean finished roof surface after completion.
 - 4. Verify drains and gutters are not clogged.
 - 5. Clean shingles and building of soiling caused by this installation.
 - 6. Clean and restore all damaged surfaces to their original condition.
- B. Waste Management:
- 1. Disposal:
 - a. All work areas are to be kept clean, clear and free of debris always.
 - b. Do not allow trash, waste, or debris to collect on roof. These items shall be removed from roof daily.
 - c. Remove debris resulting from work of this Section from roof and site. Dispose of or recycle all trash and excess material in manner conforming to current EPA regulations and local laws.

3.7 PROTECTION

- A. Do not permit traffic over finished roof surface.

END OF SECTION

SECTION 07 6240**ALUMINUM FLASHING AND TRIM****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install aluminum flashing, counterflashing, and hold-down clips as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 06 1100: 'Wood Framing' for wood base.
 - 2. Sections under 07 3000 heading: 'Steep Slope Roofing' for installation of gravel stops, copings, scuppers, and miscellaneous roofing related flashing.
 - 3. Sections under 07 5000 heading: 'Membrane Roofing' for installation of gravel stops, copings, scuppers, and miscellaneous roofing related flashing.
 - 4. Section 07 9213: 'Elastomeric Joint Sealant'.

PART 2 - PRODUCTS**2.1 SYSTEM**

- A. Manufacturers:
 - 1. Type Two Acceptable Manufacturers Of Metal:
 - a. ATAS International, Inc., Allentown PA www.ATAS.com.
 - b. Fabral, Lancaster, PA www.fabral.com.
 - c. Firestone Metal Products, Anoka, MN www.unaclad.com.
 - d. MBCI, Houston, TX www.mbc.com.
 - e. Metal Sales Manufacturing Corp, Sellersburg, IN www.mtlsales.com.
 - f. O'Neal Flat Rolled Metals (member of O'Neal Industries), Brighton, CO www.ofrmetals.com.
 - g. Petersen Aluminum Corp, Elk Grove, IL www.pac-clad.com.
 - h. Ryerson, Chicago, IL www.ryerson.com.
 - i. Equal as approved by Architect before installation. See Section 01 6200.
- B. Materials:
 - 1. Sheet Aluminum:
 - a. 3105-H25 alloy.
 - 1) Flashing And Counterflashing: 0.040 inch (one mm) thick minimum.
 - 2) Hold-Down Clips: 0.050 inch (1.27 mm) thick minimum.
 - b. Finish:
 - 1) Unexposed: Mill finish.
 - 2) Exposed To View:
 - a) Face coating of polyvinylidene Fluoride (PVF₂) Resin-base finish (Kynar 500 or Hylar 5000) containing 70 percent minimum PVF₂ in resin portion of formula. Thermo-cured two coat system consisting of corrosion inhibiting epoxy primer and top coat factory applied over properly pre-treated metal.
 - b) Color as selected by Architect from Manufacturer's standard colors.
- C. Fabrication:
 - 1. Form accurately to details.
 - 2. Profiles, bends, and intersections shall be even and true to line.
 - 3. Fold exposed edges 1/2 inch (13 mm) to provide stiffness.

2.2 ACCESSORIES

- A. Screws, Bolts, Nails, And Accessory Fasteners: Of strength and type consistent with function.
- B. Roof Diverter:
 - 1. Roof Diverter (Kickout Diverter) required when vertical wall extends beyond lower roof.
 - 2. Size: 6 inch (150 mm) x 6 inch (150 mm) by 12 inches (300 mm) length.
- C. Step Flashing:
 - 1. Step flashing required for steep slope for roof to wall flashing.
 - 2. Size: 5 inch (125 mm) x 5 inch (125 mm) by 8 inch (200 mm) or 12 inches (300 mm) length.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Slope to provide positive drainage.
- B. Provide sufficient hold down clips to insure true alignment and security against wind.
- C. Install with 4 inch (100 mm) minimum overlap.
- D. Bed overlap joints in appropriate sealant specified in Section 07 9213.
- E. Form and lap step flashings.
- F. Allow sufficient tolerance for expansion and contraction.
- G. Insulate work to prevent electrolytic action.
- H. Roof Diverter:
 - 1. Roof Diverter (Kickout Diverter) required when vertical wall extends beyond lower roof.

3.2 CLEANING

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

END OF SECTION

SECTION 07 6310**STEEP SLOPE ROOF FLASHING: Asphalt Shingles****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
 - 1. Roof flashing including:
 - a. Formed Valley Metal.
 - b. Pipe flashing for vent piping and flues.
 - c. Roof jacks.
 - d. Saddles and curb flashings.
 - e. Miscellaneous flashing.
- B. Related Requirements:
 - 1. Section 07 3113: 'Asphalt Shingles' for installation.
 - 2. Section 07 9213: 'Elastomeric Joint Sealants' for quality of sealants.
 - 3. Division 22: Plumbing vent piping.
 - 4. Division 23: HVAC flues and air piping.

1.2 REFERENCES

- A. Definitions:
 - 1. Base Flashing: That portion of flashing attached to or resting on roof deck to direct flow of water onto the roof covering.
 - 2. 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.
 - 3. Collar: Pre-formed flange placed over vent pipe to seal roof around vent pipe opening. Also called vent sleeve.
 - 4. Drip Edge: Non-corrosive, non-staining material used along eaves and rakes to allow water run-off to drip clear of underlying building.
 - 5. Flange: Metal pan extending up and down roof slope around flashing pieces. Usually at plumbing vents.
 - 6. 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.
 - 7. 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.
 - 8. Penetration: Any object that pierces surface of roof.
 - 9. Pipe Boot: Prefabricated flashing piece used to flash around circular pipe penetrations. Also known as a Roof Jack.
 - 10. Roof Jack: Term used to describe a Pipe Boot or Flashing Collar.
 - 11. Valley: Internal angle formed by intersection of two sloping roof planes to provide water runoff.
 - 12. 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.
 - 13. Vent Sleeve: See collar.
- 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 A792/A792M-10(2015), 'Standard Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process'.
 - 2. ASTM International: (specifically referenced for pipe flashing only):
 - a. ASTM B117-18, 'Standard Practice for Operating Salt Spray (Fog) Apparatus'.

- b. ASTM E283-04(2012), 'Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen'.
- c. ASTM E330/E330M-14, 'Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference'.
- d. ASTM E331-00(2016), 'Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference'.
- e. ASTM E2140-01(2017), 'Standard Practice for Water Penetration of Metal Roof Panel Systems by Static Water Pressure Head'.

1.3 SUBMITTALS

- A. Informational Submittals:
 - 1. Tests And Evaluation Reports:
 - a. Manufacturer's test reports:

1.4 WARRANTY

- A. Pipe Flashing:
 - 1. Manufacturer's warranty against defects in materials and workmanship when correctly installed in appropriate application for life of original roofing material from installation or replacement or fifty (50) years whichever is greater.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Manufacturers:
 - 1. Type Two Acceptable Manufacturers:
 - a. CMG – Coated Metals Group, Denver, CO www.cmgmetals.com.
 - b. Drexel Metals, LLC, Ivyland, PA www.drexmet.com.
 - c. Fabral, Lancaster, PA www.fabral.com.
 - d. Firestone Metal Products, Anoka, MN www.unaclad.com.
 - e. MBCI, Houston, TX www.mbc.com.
 - f. Metal Sales Manufacturing Corp, Sellersburg, IN www.mtlsales.com.
 - g. O'Neal Flat Rolled Metals (member of O'Neal Industries), Brighton, CO www.ofrmetals.com.
 - h. Petersen Aluminum Corp, Elk Grove, IL www.pac-clad.com.
 - i. Ryerson, Chicago, IL www.ryerson.com.
 - j. Equal as approved by Architect before installation. See Section 01 6200.
- B. Formed Valley Metal And Drip Edge:
 - 1. Metal:
 - a. Aluminum: 0.032 inch (0.81 mm) thick minimum.
- C. Fabrication:
 - 1. Valley-ribbed flashing:
 - a. Form accurately to details. Provide formed valley metal in 10 foot (3 meter) lengths with one inch (25 mm) 'V' crimp and break in center to match roof slopes.
 - 2. Profiles, bends, and intersections shall be even and true to line.
- D. Finishes:
 - 1. Face coating polyvinylidene Fluoride (PVF₂) Resin-base finish (Kynar 500 or Hylar 5000) 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.

2. Reverse side coating of steel flashings to be thermo-cured system consisting of corrosion inhibiting epoxy primer applied over properly pre-treated metal.
3. Color as selected by Architect from Manufacturer's standard colors.

2.2 ACCESSORIES

- A. Pipe Flashing For Plumbing Vent Lines metal flues, and HVAC Air Piping:
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).
 - b. Material warranty of product for life of roof.
 3. 24 ga (0.635 mm) coated galvanized steel plate.
 4. Minimum 4 inch (100 mm) flashing on each side, 6 inch (150 mm) flashing at top, 3 inch (76 mm) 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. Sizes: 1-1/4 inch (32 mm), 1-1/2 inch (38 mm), 2 inch (50 mm), 3 inch (76 mm), and 4 inch (100 mm).
 8. Slope: Flat to 18/12 pitch.
 9. 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.
 10. Color: Brown (no other color available).
 11. Category Four Approved System Manufacturers. 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.
- B. Roof Jacks For Metal Flues: Factory-made galvanized steel.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Interface With Other Work:
1. Coordinate with pipe installers for proper size of roof jacks and pipe flashing.
- B. Pipe Flashing:
1. Follow Manufacturer's installation instructions.

END OF SECTION

SECTION 07 6311**METAL SOFFIT PANELS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install metal soffit panel system as described in Contract Documents.

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 A792/A792M-10(2015), 'Standard Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process'.
 - c. ASTM B209-14, 'Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate'.
 - d. ASTM E84-18b, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.

1.3 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Manufacturer's literature or cut sheet for products furnished.
- B. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Warranty Documentation:
 - 1) Final, executed copy of Warranty.

1.4 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Fire Characteristics Performance Requirement:
 - a. Meet requirements of ASTM E84 Class A fire rating.
- B. Qualifications:
 - 1. Installer:
 - a. Minimum three (3) years experience with installations of comparable quality, scope, similar size, and complexity before bidding.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
 - 1. Materials shall be delivered in original, unopened packages with labels intact.
 - 2. Inspect delivered material for damage.
- B. Storage And Handling Requirements:

1. Stack panels on pallets or above ground, covered with weathertight and ventilated covering. Prevent condensation build-up or moisture entrapment in materials.
2. Store panels not in contact with other materials that might cause staining, denting or other surface damage.

1.6 WARRANTY

- A. Manufacturer Warranty:
1. Manufacturer's standard warranty against manufacturer defects.
 2. Manufacturer's written thirty five (35) year warranty on paint finish against cracking, peeling, blistering, chalk, and color change.

PART 2 - PRODUCTS

2.1 SYSTEMS

- A. Manufacturers:
1. Type One Acceptable Manufacturers Of Metal:
 - a. AEP / Span, Dallas, TX www.aep-span.com.
 - b. ATAS Aluminum Products, Allentown, PA www.atas.com.
 - c. Fabral, Lancaster, PA www.fabral.com.
 - d. Fashion Inc, Ottawa, KS www.fashioninc.com.
 - e. Firestone Metal Products, Anoka, MN www.unaclad.com.
 - f. MBCI, Houston, TX www.mbc.com.
 - g. O'Neal Flat Rolled Metals (member of O'Neal Industries), Brighton, CO www.ofrmetals.com.
 - h. Petersen Aluminum Corp, Elk Grove, IL www.pac-clad.com.
 - i. Ryerson, Chicago, IL www.ryerson.com.
 - j. Equal as approved by Architect before bidding. See Section 01 6200.
- B. Performance:
1. Design Criteria:
 - a. Flush panel design.
 - 1) Panels shall be interlocked full length of panel.
 - 2) Panel widths shall be Manufacturer's standard.
 - b. Performance Standard: ATAS Wind-LOK Soffit MPS120.
- C. Materials:
1. **0.032 inch (0.8 mm)** thick minimum 3105-H24 alloy aluminum meeting requirements of ASTM B209.
 2. **24 ga (0.0276 in) (0.7010 mm)** galvanized iron or steel meeting requirements of A653/A653M, G 90.
 3. **24 ga (0.0276 in) (0.7010 mm)** minimum 50 ksi galvalume steel meeting requirements of ASTM A792/A792M AZ-55.
- D. Fabrication:
1. Panels shall be uniformly dimensioned, roll formed to lengths to avoid trimming.
 2. Panel system shall be anchored as recommended by Manufacturer.
 3. Panels shall be continuous.
- E. Finish:
1. 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.
 2. Color as selected by Architect from Manufacturer's standard colors.

2.2 ACCESSORIES

- A. Fastening Devices: 1-1/2 inch (38 mm) cadmium or zinc plated ring shanked nails.
- B. Continuous Soffit Vent:
 - 1. Type Two Acceptable Products:
 - a. Aluminum 8.8 sq in (56.8 sq cm) net free ventilation per lineal foot (0.32 m). Width: 2 inches (50 mm). Color: white or brown.
 - 1) Mastic VAS70 Vent-A-Strip (Model 70) by Mastic Home Exteriors by Ply Gem Chicago, IL www.mastic.com/.
 - b. Aluminum 9.9 sq in (63.9 sq cm) net free ventilation per lineal foot (0.32 m). Width: 2-1/4 inches (57 mm). Color: white or brown.
 - 1) Mastic VAS79 Vent-A-Strip (Model 79) by Mastic Home Exteriors by Ply Gem Chicago, IL www.mastic.com/.
 - c. Equal as approved by Architect before installation. See Section 01 6200.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- A. Conceal fasteners where possible. Paint heads of exposed fasteners to match background.
- B. Isolate from dissimilar metals to prevent electrolytic action.

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 including buckling or bowing due to improper installation and touch up of minor scratches and spots at no additional cost to the Owner.

3.4 CLEANING

- A. General:
 - 1. Clean exposed panel surfaces promptly after installation in accordance with manufacturer's instructions.
- B. Waste Management:
 - 1. Dispose of waste in provided waste receptacles (dumpsters) as specified in Section 01 7400.

END OF SECTION

SECTION 07 6321**ALUMINUM FASCIA****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install aluminum fascia as described in Contract Documents.
- B. Reference Standards:
 - 1. ASTM International:
 - a. ASTM B209-14, 'Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate'.
 - b. ASTM E84-18b, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.

1.2 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Manufacturer's literature or cut sheet for products furnished.
- B. Closeout Submittals:
 - 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 selection.

1.3 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Fire Characteristics Performance Requirement:
 - a. Meet requirements of ASTM E84 Class A fire rating.
- B. Qualifications:
 - 1. Installer:
 - a. Minimum three (3) years experience with installations of comparable quality, scope, similar size, and complexity before bidding.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
 - 1. Materials shall be delivered in original, unopened packages with labels intact.
 - 2. Inspect delivered material for damage.
- B. Storage And Handling Requirements:
 - 1. Stack panels on pallets or above ground, covered with weathertight and ventilated covering. Prevent condensation build-up or moisture entrapment in materials.
 - 2. Store panels not in contact with other materials that might cause staining, denting or other surface damage.

1.5 WARRANTY

- A. Manufacturer Warranty:
 - 1. Manufacturer's standard warranty against manufacturer defects.
 - 2. Manufacturer's written thirty-five (35) year warranty on paint finish against cracking, peeling, blistering, chalk, and color change.

PART 2 - PRODUCTS

2.1 ASSEMBLIES

- A. Manufacturers:
 - 1. Type One Acceptable Manufacturers Of Metal:
 - a. AEP / Span, Dallas, TX www.aep-span.com.
 - b. ATAS Aluminum Products, Allentown, PA www.atas.com.
 - c. Fabral, Lancaster, PA www.fabral.com.
 - d. Firestone Metal Products, Anoka, MN www.unaclad.com.
 - e. Hunter-Douglas Canada Ltd, Brampton, ON www.hunterdouglas.com.
 - f. Jenisys Engineered Products, Goodlettsville, TN www.jenisysep.com.
 - g. Kaycan Ltd, Montreal, PQ www.kaycan.com.
 - h. MBCI, Houston, TX www.mbc.com.
 - i. Metal Sales Manufacturing Corp, Sellersburg, IN www.mtlsales.com.
 - j. O'Neal Flat Rolled Metals (member of O'Neal Industries), Brighton, CO www.ofrmetals.com.
 - k. Petersen Aluminum Corp, Elk Grove, IL www.pac-clad.com.
 - l. Ryerson, Chicago, IL www.ryerson.com.
 - m. VicWest, Oakville, ON www.vicwest.ca.
 - n. Equal as approved by Architect before bidding. See Section 01 6200.
- B. Materials:
 - 1. Aluminum: **0.032 inch (0.813 mm)** thick minimum complete with accessories recommended by Manufacturer for proper installation.
- C. Finishes:
 - 1. 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. Thermo-cured two coat system consisting of corrosion inhibiting epoxy primer and top coat factory applied over properly pre-treated metal.
 - 2. Color as selected by Architect from Manufacturer's standard colors.
- D. Fabrication: Fascia may either be shop-fabricated using metal from a specified manufacturer, or a factory-fabricated standard system from a specified manufacturer.

2.2 ACCESSORIES

- A. Fastening Devices: **One inch (25 mm)** zinc or cadmium plated screws.
- B. Continuous Soffit Vent:
 - 1. Type Two Acceptable Products:
 - a. Aluminum **8.8 sq in (56.8 sq cm)** net free ventilation per **lineal foot (0.32 m)**. Width: **2 inches (50 mm)**. Color: white.
 - 1) Mastic VAS70 Vent-A-Strip (Model 70) by Mastic Home Exteriors by Ply Gem Chicago, IL www.mastic.com/.
 - b. Equal as approved by Architect before installation. See Section 01 6200.

PART 3 - EXECUTION**3.1 EXAMINATION**

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

3.2 INSTALLATION

- A. Conceal fasteners except where details might require a minimum number to be exposed. Paint heads of exposed fasteners to match background.
- B. Install with slip joints at each end. Screw to substrate through pre-drilled, over-size holes.
- C. Isolate from dissimilar metals not part of fascia system to prevent electrolytic action.

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 including buckling or bowing due to improper installation and touch up of minor scratches and spots at no additional cost to the Owner.

3.4 CLEANING

- A. General:
 - 1. Clean exposed panel surfaces promptly after installation in accordance with manufacturer's instructions.
- B. Waste Management:
 - 1. Dispose of waste in provided waste receptacles (dumpsters) as specified in Section 01 7400.

END OF SECTION

SECTION 07 7226**RIDGE VENTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish ridge vent system and installed under other Sections as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 07 3113: 'Asphalt Shingles' for ridge vent installed over Asphalt Shingle roofing.
 - 2. Section 07 9213: 'Elastomeric Joint Sealants'.

1.2 REFERENCES

- A. Definitions:
 - 1. Net Free Area (NFA): Total unobstructed area (adjusted for insect screen, louvers and weather coverings) through which air can pass through a vent; generally measured in square inches. All non-powered vents have a Net Free Area rating.
- 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 A792/A792M-10(2015), 'Standard Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process'.
 - c. ASTM C920-18, 'Standard Specification for Elastomeric Joint Sealants'.
 - 2. International Building Code (IBC) (2018 or latest adopted edition):
 - a. Chapter 12, 'Interior Environment':
 - 1) Section 1203, 'Ventilation':
 - a) 1203.2, 'Attic Spaces'.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference:
 - 1. Participate in pre-installation conference held jointly with Section 07 3113.
 - 2. In addition to agenda items specified in Section 01 3100, review following:
 - a. Review if Project is in high wind area.
 - b. Review Ridge Vent Manufacturers ventilation cutout requirements on roof deck and location of ventilation cutouts shown on Contract Documents.
- B. Sequencing:
 - 1. Coordinate installation with roof membrane.
 - 2. Installation of ridge vent system.

1.4 SUBMITTALS

- A. Informational Submittals:
 - 1. Manufacturer Instructions:
 - a. Design details.
 - b. Published ridge vent installation instructions for R&I projects.

- c. Storage and handling requirements.
- B. Informational Submittals:
 - 1. Certificates:
 - a. Manufacturer's Certificates of compliance showing products meet or exceed specified requirements.
 - 2. Tests And Evaluation Reports:
 - a. Manufacturer's test reports.
 - b. Wind speed coverage for warranted wind speed.
 - 3. Special Procedure Submittals:
 - a. Contact Owner's Representative (FM Group or Project Manager) for following information:
 - 1) Installer to include following mandatory information for Warranty Information to be given to Ridge Vent Manufacturer to be added to Manufacturer Warranty included with Closing Submittals:
 - a) Name of Owner (name of FM Group) _____
 - b) Mailing Address (FM office address) _____
 - c) Property ID _____
 - d) Site address: _____
 - e) Installation of Ridge Vent (or Roof Completion) Date _____
 - f) Any addition data required from Ridge Vent Manufacturer.
- 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 including Installer project information.

1.5 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Ridge Vent System:
 - 2. Wind Speed:
 - a. As required to meet local codes having jurisdiction.
- B. Qualifications:
 - 1. Manufacturer:
 - a. Company specializing in manufacturing products specified with this section with at least five (5) years experience and no known failures of specified product manufactured.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
 - 1. Deliver products job site in original unopened containers or wrappings.
 - 2. Deliver materials in sufficient quantities to allow continuity of work.
- B. Storage And Handling Requirements:
 - 1. Storage Requirements:
 - a. Follow Manufacturer's instructions and precautions for storage of materials.
 - b. Protect materials from physical damage in a clean, dry, well vented, and protected location.
 - 2. Handling Requirements:
 - a. Handle material so as to prevent damage.

1.7 WARRANTY

- A. Manufacturer Warranty:
 - 1. General:
 - a. Ridge vent system will provide calculated net free area (NFA) stated design.

- b. Warranty starts at completion of installation.
 - c. Warranty covers replacement cost excluding labor and any costs involved with repairing or replacing other roofing or building materials.
- 2. Manufacturer's thirty (30) year warranty covering:
 - a. Kynar 500 paint and finish warranty covering color fade, chalk, and film integrity for ridge vent system.
- 3. Manufacturer's twenty (20) year warranty covering:
 - a. Ridge vent system to be free from defects that will affect its performance.
 - b. Ridge vent system will withstand winds up to 120 mph (193 kph) average wind speed.
 - c. Ridge vent system will withstand snow load.

PART 2 - PRODUCTS

2.1 SYSTEM

- A. Manufacturers:
 - 1. Category Three Manufacturers And Products. See Section 01 6200 for definitions of Categories:
 - a. Metal-Era Airflow Solutions, Waukesha, WI www.metalera.com.
 - 1) Contact Information: Alissa Kuether-Bonlender (800) 558-2162
thechurch@metalera.com.
 - b. Western Metal Products, LC, Woods Cross, UT www.westernmetalproducts.com.
 - 1) Contact Information: James Rohletter, phone (888) 298-3454, email
rvbid@westernmetalproducts.com.
- B. Materials:
 - 1. Description / Design Criteria:
 - a. Ridge Vent:
 - 1) Basis of Design:
 - a) Basis of Design Approved Product:
 - (1) HI-PERF High Velocity Ridge Vent by Metal-Era.
 - b) Basis of Design Approved Equivalent Product:
 - (1) Ridge Vent by Western Metal.
 - 2) Design Criteria:
 - a) Not approved on roof mean heights greater than 33 feet (10 m).
 - b) Weather-proof and bug-proof ventilation system.
 - c) Withstand winds up to 120 mph (193 kph) average wind speed.
 - d) Provide net free area (NFA) requirements as determined by vented roof deck system and eave condition as indicated on Contract Drawings.
 - 3) Slope to Slope Version:
 - a) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (1) Model HPSS by Metal-Era.
 - (2) Model: ASRP2 by Western Metal.
 - 4) Net free area (NFA):
 - a) Net free area: 33 sq. in. (213 sq cm) per lineal foot (305 mm).
 - 2. Components:
 - a. Category Four Approved Product:
 - 1) Basis of design for System Components for this Project is Metal-Era Ridge Vent.
 - 2) Basis of design approved equivalent system components for this Project is Western Metal.
 - b. Ridge vent system comprising of following:
 - 1) Cover plate 8 inch (200 mm) wide at each joint over ridge vent cover.
 - 2) Continuous deflector with baffle.
 - 3) Continuous Z bracket with intermittent spacer at 12 inch (305 mm) on center to supporting ridge cover.
 - 4) End cap / cover plate.
 - 5) Expanded metal support screen.
 - 6) Fasteners.

- 7) Intermittent spacers at 12 inch (305 mm) on center directly under ridge vent cover.
 - 8) Ridge vent cover in 12 feet (3.657 m) length.
 - c. Metal:
 - 1) 24 ga (0.0276 in) (0.7010 mm) minimum hot-dipped galvanized to meet requirements of ASTM A653/A653M, 1.25 oz per sq ft (381.5 g per sq m) or galvalume meeting requirements of ASTM A792/A792M AZ50.
 - 2) Aluminum: 0.040 inch, 0.050, 0.063 inch.
 - d. Expanded metal support screen:
 - 1) 0.050 inch (1.27 mm) 3003-H14 formed aluminum with minimum of 48 percent open area.
 - e. Z brackets: 20 gauge (0.0396 in) (1.0058 mm) G90 galvanized steel.
 - f. Deflector: 24 ga (0.0276 in) (0.7010 mm) minimum.
- C. Finishes:
- 1. Ridge vent and accessories:
 - a. Polyvinylidene Fluoride (PV₂) 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.
 - b. Approved Color: Medium Bronze.

2.2 ACCESSORIES

- A. Ridge Vent System:
- 1. End Caps, Cover Plates, and other accessories necessary for proper installation.
- B. Fasteners:
- 1. Ridge vent fastened to structure:
 - a. Category Four Approved Fasteners:
 - 1) Basis of design: Metal-Era Ridge Vent.
 - 2) Basis of design approved equivalent: Western Metal.
 - b. Fasteners shall be approved by Ridge Vent Manufacturer and provide minimum pull out resistance of 240 lbf (109 kg) into substrate when tested in accordance with TAS 105 test protocol:
 - 1) Screws:
 - a) #9 1-1/2 inches (38 mm) stainless steel screws.
 - b) Provided by Manufacturer.
 - 2) New Building:
 - a) #9 1-1/2 inches (38 mm) stainless steel screws.
 - b) Provided by Manufacturer.
 - c. No nailing permitted.
- C. Sealant:
- 1. Description:
 - a. Weathersealing expansion, contraction, perimeter, and other movement joint sealant.
 - 2. Design Criteria:
 - a. As specified in Section 07 9213 'Elastomeric Joint Sealants'.
 - b. Meet following standards for Sealant:
 - 1) ASTM C920: Type S Grade NS, Class 25 (min) Use O.
 - 2) 100 percent silicone.
 - 3. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a. Dow Corning: 790 Silicone Building Sealant.
 - b. Momentive Performance Materials (formerly, GE Sealants & Adhesives): GE SCS2350 Silicone Elastomeric Sealant.
 - c. Tremco: Tremsil 600 Silicone Sealant.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification Of Conditions:
 - 1. Verify Ridge Vent Manufacturers ventilation cutout requirements on roof deck and location of ventilation cutouts shown on Contract Documents to verify correct location for all cutouts.
 - a. Make adjustments to ventilation cutouts if necessary before installation of ridge vent.
 - 2. Examine deck to determine if it is satisfactory for installation of ridge vent system.
 - a. Conditions include, but are not limited to, moisture on deck and protruding deck fasteners.
 - b. Verify substrate is dry, clean and free of foreign matter.
 - 3. Do not begin installation until substrates have been properly prepared.

3.2 PREPARATION

- A. Surface Preparation:
 - 1. Clean roof sheathing, including removal of dirt, shingle nails, and debris, before installation of ridge vent system.

3.3 INSTALLATION

- A. General:
 - 1. Schedule and execute work without exposing interior building areas to effects of inclement weather. Protect existing building and its contents against all risks.
- B. Ridge Vent:
 - 1. Install in accordance with IBC Section 1503.2 'Flashing'.
 - 2. Install in accordance and as shown with Manufacturer's installation instructions for assembly of components and attachment to roof deck:
 - 3. Use provided fasteners consistent with manufacturer's instructions, suitable for substrate to which it is being installed.
 - 4. Attach to roof/wall structure with stainless steel screws provided by Manufacturer at spacing required by Manufacturer. All nail heads and vent section joints shall be sealed with silicone sealant.
 - 5. Remove protective film before applying sealant.
 - 6. Apply sealants as per Manufacturer's installation instructions.

3.4 PROTECTION

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

3.5 CLEANING

- A. General:
 - 1. Properly clean finished roof surface after completion.
- B. Waste Management:
 - 1. Disposal:
 - a. General:
 - 1) Remove debris resulting from work of this Section from roof and site. Dispose of or recycle all trash and excess material in manner conforming to current EPA regulations and local laws.

END OF SECTION

SECTION 07 8400**FIRESTOPPING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install firestopping not involving penetrations as described in Contract Documents.
 - 2. Quality of firestopping materials and systems used for penetrations on Project, including submittal requirements.
- B. Related Requirements:
 - 1. Furnishing and installing of penetration firestopping specified under Section installing work penetrating structure.

1.2 REFERENCES

- A. Reference Standards:
 - 1. American Society For Testing And Materials:
 - a. ASTM E84-18b, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
 - b. ASTM E119-18c, 'Standard Test Methods for Fire Tests of Building Construction and Materials'.
 - c. ASTM E814-13a(2017), 'Standard Test Method for Fire Tests of Penetration Firestop Systems'.
 - d. ASTM E1996-17, 'Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes'.
 - 2. International Building Code (IBC) (2018 or latest approved edition):
 - a. Chapter 7, 'Fire And Smoke Protection Features':
 - 1) Section 703, "Fire-Resistance Ratings And Fire Tests":
 - 3. Underwriters Laboratories:
 - a. UL 'Fire Resistance Directory', current edition, contains listing of approved Penetration Firestop Systems:
 - 1) Through-penetration firestop devices.
 - 2) Fire resistance ratings.
 - 3) Through-penetrations firestop systems.
 - 4) Fill, void, or cavity material.
 - b. UL 263, 'Fire Tests of Building Construction and Materials' (14th Edition).
 - c. UL 723: 'Standard for Safety Test for Surface Burning Characteristics of Building Materials'; (11th edition - 2018).
 - d. UL 1479, 'Standard for Safety for Fire Tests of Through-Penetration Firestops' (4th Edition).
 - e. UL 2079, 'Tests for Fire Resistance of Building Joint Systems' (5th Edition).

1.3 ADMINISTRATIVE REQUIREMENTS

- A. 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.
- B. 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.

1.4 SUBMITTALS

- A. Action Submittals:
 1. Shop Drawings:
 - a. Show each type of Penetration Firestop System to be used on Project with design approval reference number.
 - b. Identify locations where each type of Penetration Firestop System is to be installed.
- B. Informational Submittals:
 1. Qualification Statement:
 - a. Manufacturer/Installer:
 - 1) Provide Qualification documentation if requested by Architect or Owner.

1.5 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.
 - 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. Qualifications:
 1. Manufacturer Qualifications:
 - a. Company that specializes in manufacturing the type of products specified, with minimum of five (5) years of documented experience.
 2. Installer Qualifications:
 - a. 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.
 3. Upon request, submit documentation.

1.6 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

1.7 FIELD CONDITIONS

- A. Ambient Conditions:
1. Temperature: Do not install firestopping materials when ambient or substrate temperatures are outside limits permitted by manufacturer of firestopping materials.
 2. Humidity and Moisture: Do not install the Work of this Section under conditions that are detrimental to the application, curing, and performance of the materials.
 3. Ventilation: Provide sufficient ventilation wherever firestopping materials are installed in enclosed spaces. Follow manufacturer's recommendations.

1.8 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

2.1 SYSTEMS

- A. Manufacturers:
1. Type Two Acceptable Manufacturers:
 - a. Members of International Firestop Council www.firestop.org and member in good standing.
 - b. Equal as approved by Architect before installation. See Section 01 6200.
- B. Materials:
1. General:
 - a. Sealant, packing material, or collar system required by Firestop Manufacturer for Firestop Penetration System to comply with listed design.
 - b. Primers, sleeves, forms, insulation, packing, stuffing, and accessories: Type required for tested assembly design.
 2. Firestopping Assembly Requirements:
 - a. Head-of-Wall Firestopping at Joints Between Non-Rated Floor and Fire-Rated Wall: Use any 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.
 - b. Floor-to-Floor, Wall-to-Wall, and Wall-to-Floor Joints, Except Perimeter, Where Both Are Fire-Rated: Use any 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.
 - c. Through Penetration Firestopping: Use any system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.
 3. Firestopping System:
 - a. Any material meeting requirements.
 4. Firestop Tracks (Metal Stud Framing):
 - a. 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.
 - 1) Type Two Acceptable Products:

- a) BlazeFrame Deflection Track by ClarkDietrich Buiding Systems.
- b) Equal as approved by Architect before bidding. See Section 01 6200.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification Of Conditions:
 - 1. Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.
 - 2. Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, scale, laitance, rust, release agents, water repellents, and any other substances that may inhibit optimum adhesion.
 - 3. Verify ducts, piping, equipment, and other similar items that would interfere with application of firestopping shall be in place.
 - 4. Do not commence Work until unsatisfactory conditions have been corrected.
 - a. Commencement of installation constitutes acceptance of conditions and responsibility for satisfactory performance.

3.2 PREPARATION

- A. Protection Of In-Place Conditions:
 - 1. Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.
 - 2. 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.
- B. Surface Preparation:
 - 1. Clean out openings, control, and expansion joints immediately before installation of through-penetration firestopping. Comply with recommendations of firestopping manufacturer and the following requirements:
 - a. Remove foreign materials from surfaces of openings and joint substrates, and from penetrating items that could interfere with adhesion of firestopping.
 - b. Clean opening and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestopping. Remove loose particles remaining from cleaning operation.
 - c. Remove laitance and form release agents from concrete.
 - d. 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.
 - e. Install damming materials, as recommended by sealant manufacturer, to hold sealant in place.
 - 2. Priming:
 - a. Prime substrates where recommended by firestopping manufacturer using manufacturer's recommended products and methods.
 - b. Confine primers to areas of bond. Do not allow spillage and migration onto exposed surfaces.
 - c. Apply prime coat in compliance with manufacturer's instructions.

3.3 INSTALLATION

- A. General:
 - 1. Install firestopping in accordance with Manufacturer's instructions for installation of firestopping products.

2. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.
3. Do not cover installed firestopping until inspected by authority having jurisdiction.

3.4 PROTECTION

- A. Protect surfaces adjacent to through-penetration firestops with suitable covering to prevent firestopping from contacting adjoining surfaces that will remain exposed upon completion of Work and that would otherwise be permanently stained or damaged by such contact or that would be caused by cleaning methods used to remove smears from firestopping materials.
- B. Protect firestopping during and after curing period from contact with contaminating substances, or damage resulting from adjacent Work.

3.5 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.

END OF SECTION

SECTION 07 9213**ELASTOMERIC JOINT SEALANTS****PART 1 - GENERAL****1.1 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 3013: 'Ceramic Tiling'.

1.2 REFERENCES

- A. Definitions:
 - 1. Sealant Types and Classifications:
 - a. ASTM Specifications:
 - 1) Type:
 - a) Type S: Single-component sealant.
 - b) Type M: Multi-component sealant.
 - 2) Grade:
 - a) Grade P: Pourable or self-leveling sealant used for horizontal traffic joints.
 - b) Grade NS: Non-sag or gunnable sealant used for vertical and non-traffic joints.
 - 3) Classes: Represent movement capability in percent of joint width.
 - a) Class 100/50: Sealant that, when tested for adhesion or cohesion under cyclic movement shall withstand of at least 100 percent increase and decrease of at least 50 percent of joint width as measured at time of application.
 - b) Class 50: Sealant that, when tested for adhesion or cohesion under cyclic movement shall withstand increase and decrease of at least 50 percent of joint width as measured at time of application.
 - c) Class 25: Sealant that, when tested for adhesion or cohesion under cyclic movement shall withstand increase and decrease of at least 25 percent of joint width as measured at time of application.
 - d) Class 12: Sealant that, when tested for adhesion and cohesion under cyclic movement shall withstand increase and decrease of at least 12 percent of joint width as measured at time of application.
 - 4) Use:
 - a) T (Traffic): Sealant designed for use in joints in pedestrian and vehicular traffic areas such as walkways, plazas, decks and parking garages.
 - b) NT (Non-Traffic): Sealant designed for use in joints in non-traffic areas.
 - c) I (Immersion): Sealant that meets bond requirements when tested by immersion (Immersion rated sealant applications require primer).
 - d) M (Mortar): Sealant that meets bond requirements when tested on mortar specimens.

- e) G (Glass): Sealant that meets bond requirements when tested on glass specimens.
 - f) A (Aluminum): Sealant that meets bond requirements when tested on aluminum specimens.
 - g) O (Other): Sealant that meets bond requirements when tested on substrates other than standard substrates, being glass, aluminum, mortar.
2. Silicone: Any member of family of polymeric products whose molecular backbone is made up of alternating silicon and oxygen atoms and which has pendant hydrocarbon groups attached to silicon atoms. Used primarily as a sealant. Offers excellent resistance to water and large variations in temperature (minus 100 deg F to + 600 deg F) (minus 73.3 deg C to + 316 deg C).

B. 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 C1330-18, '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'.

1.3 ADMINISTRATIVE REQUIREMENTS

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.

1.4 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.

1.5 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.

1.6 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 90 deg F (32 deg C) or as per Manufacturer's written recommendations.
 4. Do not use sealants that have exceeded shelf life of product.

1.7 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.

1.8 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

2.1 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) Door frames.
 - e) EIFS to metal joints.
 - f) Joints and cracks around windows.
 - g) Louvers.
 - h) Masonry.
 - i) Wall penetrations.
 - j) 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. Category Four Approved Products. See Section 01 6200 for definitions of Categories:

- 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. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 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) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 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) Category Four Approved Products. See Section 01 6200 for definitions of Categories:

- 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) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 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 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) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 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.
7. Sealants At Precast Concrete Cap and Joint Covers (if Contractor Option ONE was selected in Section 03 4800):
- a. Description:
 - 1) Soft lead strip, when set and bedded in sealant, form cap which assures permanent elastic seal for any masonry joint as specified in Section 03 4800.
 - b. Design Criteria:
 - 1) Meet following standards for Sealant:
 - a) ASTM C920: Type S, Grade NS, Class 50 Use A, G, M.
 - b) Strips should be of sufficient size to cover the joint width, plus percentage allowance for anticipated joint movement, plus **1/4 inch (6.4 mm)**.
 - c. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 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) Sika:
 - a) Primer: Sikasil Primer-2100.
 - b) Sealant: Sikasil-728 NS Non-Sag Silicone Sealant.
 - 4) Tremco:
 - a) Primer:
 - (1) Metal surface: No. 20 primer.
 - (2) Porous surfaces: No. 23 primer.
 - b) Sealant: Spectrum 1 Silicone Sealant.
- 8. 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. Non-Paintable Sealant (Installer Option A):
 - 1) Category Four Approved Product. See Section 01 6200 for definitions of Categories:
 - a) Dow Corning: Tub, Tile, And Ceramic Silicone Sealant.
 - b) Laticrete: Latasil 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.
 - d. Paintable Sealant (Installer Option B):
 - 1) Category Four Approved Product. See Section 01 6200 for definitions of Categories:
 - a) Momentive Performance Materials (formerly, GE Sealants & Adhesives): GE SCS7000 Paintable Silicone Sealant.
- 9. 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 9213 and installed in Section 09 3013 'Ceramic Tiling' including the following:
 - 1) Ceramic tile inside corners.
 - 2) Ceramic tile and paver tile joints.
 - 3) Termination joints in font.
 - c. Description:
 - 1) One-part acetoxycure 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. Color: As selected by Architect from Manufacturer's standard colors.
 - f. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 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.

2.2 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.
- 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

3.1 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.

3.2 PREPARATION

- A. Surface Preparation:
 - 1. Remove existing joint sealant materials where specified.
 - a. Clean joint surfaces of residual sealant and other contaminants capable of affecting sealant bond to joint surface using manufacturer's recommended joint preparation methods.
 - b. Repair deteriorated or damaged substrates as recommended by Sealant Manufacturer to provide suitable substrate. Allow patching materials to cure.
 - 2. 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.
 - 3. 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.
4. 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.

3.3 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. 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.

3.4 TOLERANCES

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

3.5 FIELD QUALITY CONTROL

- A. 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.

3.6 CLEANING

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

END OF SECTION

SECTION 07 9219**ACOUSTICAL JOINT SEALANTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Quality of sealants to be used at perimeters of and penetrations through acoustically insulated walls and associated ceilings.
- B. Related Requirements:
 - 1. Section 09 2900: Furnishing and installing of acoustical sealants.

1.2 REFERENCES

- A. Definitions:
 - 1. Sealant. Sealants are generally used in applications where elastic properties are needed while adhesives are generally used in applications where bonding strength and rigidity are needed. With technology advancements both sealants and adhesives can be used interchangeably depending on the applications performance requirements.
 - 2. Sealant Types and Classes:
 - a. Federal Specifications:
 - 1) Type I: Self-leveling, pour grade.
 - 2) Type II: Non-sag, gun grade.
 - 3) Type NS: Non-sag, gun grade.
 - 4) Class A: +25 percent, -25 percent expansion – contraction.
 - b. ASTM Specifications:
 - 1) Type S: Single-component sealant.
 - 2) Type M: Multi-component sealant.
 - 3) Grade P: Pourable or self-leveling sealant for joints on horizontal surfaces.
 - 4) Grade NS: Non-sag or gunnable sealant for joints in vertical surfaces.
 - 5) Class 25: Sealant that, when tested for adhesion or cohesion under cyclic movement shall withstand increase and decrease of at least 25 percent of joint width as measured at time of application.
 - 6) Class 12: Sealant that, when tested for adhesion and cohesion under cyclic movement shall withstand increase and decrease of at least 12 percent of joint width as measured at time of application.
 - 7) T: Sealant designed for use in joints in pedestrian and vehicular traffic areas such as walkways, plazas, decks and parking garages.
 - 8) NT: Sealant designed for use in joints in non-traffic areas.
 - 9) M: Sealant will remain adhered to mortar.
 - 10) G: Sealant will remain adhered to glass.
 - 11) A: Sealant will remain adhered to aluminum.
 - 12) O: Sealant will remain adhered to substrates other than glass, aluminum, mortar.
- B. Reference Standards:
 - 1. ASTM International:
 - a. ASTM C834-17, 'Standard Specification for Latex Sealants'.
 - b. ASTM C919-18, 'Standard Practice for Use of Sealants in Acoustical Applications'.
 - c. ASTM C1193-16, 'Standard Guide for Use of Joint Sealants'.
 - d. ASTM E84-18b, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
 - e. ASTM E90-09(2016), 'Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements'.

2. Underwriters Laboratories, Inc.:
 - a. UL 723: 'Standard for Safety Test for Surface Burning Characteristics of Building Materials'; (11th edition - 2018)'

1.3 SUBMITTALS

- A. Action Submittals:
 1. Product Data:
 - a. Manufacturer's literature for each Product.
- 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.

1.4 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 1. Surface-Burning Characteristics:
 - a. 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).

1.5 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 to prevent inclusion of foreign matter, damage by water, or breakage.
 2. Store in cool, dry location, and at temperatures never under 40 deg F (4 deg C) nor exceeding 80 deg F (26.7 C).

1.6 FIELD CONDITIONS

- A. Ambient Conditions:
 1. Do not apply caulking at temperatures below 40 deg F (4 deg C).

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Sealants:
 1. Design Criteria:
 - a. Meet requirements of ASTM C834.
 - b. Meet Class A flame spread rating.
 2. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 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.

2.2 ACCESSORIES

- A. Bond Breaker: Pressure sensitive tape recommended by Sealant Manufacturer to suit application.
- B. Joint Backing:
 - 1. Flexible closed cell polyurethane or polyolefin rod or bond breaker tape as recommended by Sealant Manufacturer for joints being sealed.
 - 2. Oversized 25 to 50 percent larger than joint width.
- C. Joint Cleaner: Non-corrosive and non-staining type, recommended by Sealant Manufacturer, compatible with joint forming materials.
- D. Masking Tape: Pressure sensitive tape recommended by Sealant Manufacturer to suit application.
- E. Primer: Non-staining type, type, recommended by Sealant Manufacturer to suit application.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification Of Conditions:
 - 1. Examine substrate surfaces and joint openings are ready to receive Work.
 - 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.

3.2 PREPARATION

- A. Surface Preparation:
 - 1. Prepare joints in accordance with ASTM C1193 and Manufacturer's instructions.
 - 2. Clean joint surfaces to remove dirt, dust, oils, wax, paints, and other contamination capable of affecting primer and sealant bond.
 - 3. Protect elements surrounding the Work of this section from damage or disfiguration. Apply masking tape to adjacent surfaces when required to prevent damage to finishes from sealant installation.
- B. Surface Preparation:
 - 1. Remove existing sealants where specified.
 - 2. Clean joint surfaces of residual sealant and other contaminates capable of affecting sealant bond to joint surface.
 - 3. Surfaces shall be clean, dry, and free of dust, oil, grease, dew, or frost.

3.3 INSTALLATION

- A. General:
 - 1. Do not use damaged or deteriorated materials.

2. Install primer and sealants in accordance with ASTM C1193 and Manufacturer's instructions where required for sealant adhesion.
 3. Install sealants immediately after joint preparation.
 4. Do not apply caulking/sealant at temperatures below 40 deg F (4 deg C).
- B. Joint Backing:
1. 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.
 2. Apply bond-breaker tape in shallow joints as recommended by Sealant Manufacturer.
- C. 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.
- D. Tool joints immediately after application of sealant if required to achieve full bedding to substrate or to achieve smooth sealant surface.
- E. 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.

3.4 FIELD QUALITY CONTROL

- A. Inspection:
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.

3.5 CLEANING

- A. General:
1. Remove sealant from adjacent surfaces in accordance with Sealant Manufacturer and Substrate Manufacturer recommendations as work progresses.
 2. Remove masking tape and any other foreign material.
 3. Clean adjacent materials that have been soiled immediately (before setting) as recommended by Manufacturer.
- B. Waste Management: Dispose of products in accordance with Sealant Manufacturer's recommendation.

END OF SECTION

SECTION 08 0601**HARDWARE GROUP AND KEYING SCHEDULES****PART 1 - GENERAL****1.1 SUMMARY**

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

1.2 REFERENCES

- A. Definitions:
 - 1. Builders Hardware Manufacturer's Association (BHMA) Hardware Functions:
 - a. F75 Passage Latch: Latch bolt operated by lever from either side at all times.
 - b. F76 Privacy Lock: Latch bolt operated by lever from either side. Outside lever locked by push button inside and unlocked by emergency key from outside or rotating lever from inside.
 - c. F81 Office Door Lock: Dead locking latch bolt operated by lever from either side, except when outside lever is locked by turn button in inside lever. When outside lever is locked, latch bolt is operated by key in outside lever or by rotating inside lever. Turn button must be manually rotated to unlock outside lever.
 - d. F84 Classroom Deadlock: Dead locking latch bolt operated by lever from either side, except when outside lever is locked, latch bolt is operated by key in outside lever or by rotating inside lever.
 - e. 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.
 - f. F91 Store Door Lock: Deadlocking latch operated by either lever. Key in either lever locks / unlocks both levers.
 - g. 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.
 - h. E2142 Deadbolt: Dead bolt operated by key from either side. Bolt automatically dead locks when fully thrown.
 - i. E2152 Deadbolt: Dead bolt operated by key from outside and turn unit from inside. Bolt automatically dead locks when fully thrown.

1.3 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**2.1 STOREFRONT ENTRY DOORS**

- A. Single Doors:
 - 1. **Group ST1:**
 - a. 1 set: Pivots.
 - b. 1 set: Weatherstrip.
 - c. 1 each: Closer.

- d. 1 each: Exit Door Exit Device.
 - e. 1 each: Exit Device with dogging capability and locking cylinder.
 - f. 1 each: Pull.
 - g. 1 each: Stop.
 - h. 1 each: Threshold.
2. **Group ST3:**
- a. 1 set: Pivots.
 - b. 1 set: Weatherstrip.
 - c. 1 each: Closer.
 - d. 1 each: Kick Plate.
 - e. 1 each: Pull.
 - f. 1 each: Push.
 - g. 1 each: Stop.
 - h. 1 each: Threshold.

2.2 INTERIOR DOORS

A. Single Interior Doors:

- 1. **Group 20:**
 - a. 1 set: Smoke Gaskets.
 - b. 3 each: Hinges.
 - c. 1 each: Latchset Function F75.
 - d. 1 each: Stop.
- 2. **Group 26:**
 - a. 1 set: Smoke Gaskets.
 - b. 1 each: Acoustic Seal.
 - c. 3 each: Hinges.
 - d. 1 each: Lockset Function F81.
 - e. 1 each: Stop.
 - f. 1 each: Threshold.
- 3. **Group 28:**
 - a. 1 set: Smoke Gaskets.
 - b. 1 each: Closer.
 - c. 3 each: Hinges.
 - d. 1 each: Kick Plate.
 - e. 1 each: Pull.
 - f. 1 each: Push.
 - g. 1 each: Stop.
- 4. **Group 35:**
 - a. 1 set: Smoke Gaskets.
 - b. 1 each: Closer.
 - c. 1 each: Deadbolt Function E2152.
 - d. 3 each: Hinges.
 - e. 1 each: Pull.
 - f. 1 each: Push.
 - g. 1 each: Stop.

B. Double Interior Doors:

- 1. **Group 50F:**
 - a. General:
 - 1) 1 set: Smoke Gaskets.
 - b. Active Leaf:
 - 1) 1 each: Deadbolt, Function E2152.
 - 2) 3 each: Hinges.
 - 3) 1 each: Stop.
 - c. Inactive Leaf:
 - 1) 1 each: Astragal (font side of door).
 - 2) 1 each: Dummy Latchset, (pull side only).
 - 3) 1 each: Flush Bolt (top).

- 4) 3 each: Hinges.

PART 3 - KEYING SCHEDULE for FINISH HARDWARE

PART 4 - KEYING SCHEDULE for FINISH HARDWARE

4.1 KEYING SCHEDULE

A. Stake Center Meetinghouse Keying Schedule:

1. General access Storage Rooms, Font / Font Dressing:

Key	Stamped	Amount	Door Numbers of Doors Operated by Key
XAA1	GEN	45	

- a. All AA keys, except XAA12, XAA13, XAA14, XAA18, and XAA19, will open these doors.
- b. 45 keys based on 3 units occupying building and each unit has 15 keys. Adjust accordingly if needed.

2. Stake President's Office:

Key	Stamped	Amount	Doors Operated by Key
AA15	STK PR	5	Key AA15 will also open XAA1, XAA12, XAA16, XAA18 and XAA19.

3. Remaining Stake Suite Doors:

Key	Stamped	Amount	Doors Operated by Key
XAA16	STK	20	Key AA16 will also open XAA1.

END OF SECTION

SECTION 08 1213**HOLLOW METAL FRAMES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
 - 1. Hollow metal frames.
- B. Related Requirements:
 - 1. Section 06 2024: 'Door, Frame, And Finish Hardware Installation' for installation.
 - 2. Section 08 4113: 'Aluminum-Framed Entrances And Storefronts' for aluminum entry frames.

1.2 REFERENCES

- A. Reference Standards:
 - 1. American Architectural Manufacturers Association / Window & Door Manufacturers Association / CSA Group:
 - a. AAMA/WDMA/CSA 101/I.S.2/A440-17, 'North American Fenestration Standard/Specification for windows, doors, and skylights'.
 - 2. ASTM International:
 - a. ASTM A568/A568M-17a, 'Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for.
 - b. ASTM A653/A653M-17, 'Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process'.
 - 3. Steel Door Institute:
 - a. SDI A250.8-2017, 'Specifications for Standard Steel Doors and Frames'.
 - b. SDI A250.11-2012, 'Recommended Erection Instructions for Steel Frames'.

1.3 SUBMITTALS

- A. Informational Submittals:
 - 1. Copy of SDI A250.11.

PART 2 - PRODUCTS**2.1 MANUFACTURED UNITS**

- A. Suppliers:
 - 1. Category Three Approved Suppliers. See Section 01 6200 for definitions of Categories and Section 01 4301 for Qualification Requirements:
 - 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.

- B. Manufacturers:
 - 1. Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories:
 - a. Any current member of Steel Door Institute.
- C. Frames:
 - 1. Cold rolled furniture steel:
 - a. Interior Frames: 16 ga. (1.6 mm).
 - b. Exterior Frames: 14 ga. (1.9 mm).
 - 2. Provide labeled frame to match fire rating of door.
 - 3. Finish:
 - a. Use one of following systems:
 - 1) Prime surfaces with rust inhibiting primer.
 - 2) Galvanize.
 - 4. Anchors: 16 US ga (1.6 mm) minimum meeting UL or other code acceptable requirements for door rating involved.
- D. Fabrication:
 - 1. General Requirements:
 - a. Frames shall be welded units. 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 (3 mm) 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.

PART 3 - EXECUTION: Not Used

END OF SECTION

SECTION 08 1429**FLUSH WOOD DOORS: Factory-Finished, Clear****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
 - 1. Factory-finished flush wood doors.
- B. Related Requirements:
 - 1. Section 06 2024: 'Door, Frame, And Finish Hardware Installation' for installation.
 - 2. Section 06 4114: 'Wood-Veneer-Faced Architectural Cabinets' for cabinet doors.
 - 3. Section 09 9324: 'Interior Clear-Finished Hardwood'.

1.2 REFERENCES

- A. Abbreviations And Acronyms:
 - 1. AWS: Architectural Woodwork Standards (formerly AWI).
 - 2. FD: Fire-resistant core, fire-resistant materials assembled to stiles and rails according to methods prescribed by the testing agency to meet rigorous smoke, flame, and pressure tests.
 - 3. FD-5: Core with 2 layers on each side.
 - 4. ME: Matching edges, i.e., vertical edges same as decorative faces.
 - 5. PC: Particleboard core, solid core door with stiles and rails bonded to the core and abrasive planed flat prior to the application of the faces.
 - 6. PC-5: Core with 2 layers on each side.
- B. Association Publications:
 - 1. Architectural Woodwork Institute / Architectural Woodwork Manufacturers Association of Canada, 46179 Westlake Drive, Suite 120, Potomac Falls, VA www.awinet.org.
 - a. Architectural Woodwork Standards (AWS), 2nd Edition, 2014.
- C. 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.
- D. Reference Standards:

1. American Architectural Manufacturers Association / Window & Door Manufacturers Association / CSA Group:
 - a. AAMA/WDMA/CSA 101/I.S.2/A440-17, 'North American Fenestration Standard/Specification for windows, doors, and skylights'
2. ASTM International:
 - a. ASTM C1036-16, 'Standard Specification for Flat Glass'.
 - b. ASTM C1048-18, 'Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass'.
3. Hardwood, Plywood, and Veneer Association:
 - a. HPVA HP-1-2016 'Standard for Hardwood and Decorative Plywood'.
4. National Particleboard Association / Composite Panel Association:
 - a. NPA A208.1-2009, 'Particleboard'.

1.3 SUBMITTALS

- A. Action Submittals:
 1. Shop Drawings:
 - a. Schedule showing type of door at each location. Included shall be size, veneer, core type, fire rating, hardware prep, openings, blocking, etc.
 - b. Indicate factory finish color and type.
 2. Samples:
 - a. Interior Hardwood for Transparent Finish:
 - 1) Before performing work of this Section, prepare sample, to match Control Sample available from project, to be used as finishing standard for interior clear finished hardwood as specified in Section 09 9324. Control Sample will be wood item from existing project such as existing door.
 - 2) Design Criteria:
 - a) Provide 8 inch by 10 inch (200 mm by 255 mm) sample of Red Oak to match stain Control Sample provided for Project.
 - b) Control Sample will be used as performance standard for evaluating finish provided.
- B. Informational Submittals:
 1. Source Quality Control Submittals:
 - a. Samples:
 - 1) Interior Hardwood for Transparent Finish:
 - a) Owner will provide Control Sample from project for finish.
- C. 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.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
 1. Deliver in clean truck and, in wet weather, under cover.
 2. Deliver to building site only after plaster, cement, and taping compound are completed and dry and after interior painting operations have been completed.
 3. Individually wrap in polyethylene bags for shipment and storage.
- B. Storage And Handling Requirements:
 1. Store doors in a space having controlled temperature and humidity range between 25 and 55 percent.

2. Store flat on level surface in dry, well ventilated space.
3. Cover to keep clean but allow air circulation.
4. Do not subject doors to direct sunlight, abnormal heat, dryness, or humidity.
5. Handle with clean gloves and do not drag doors across one another or across other surfaces.
6. Leave shipping bag on door after installation until immediately before substantial completion inspection.
7. Doors have been acclimated to the field conditions for a minimum of 72 hours before installation is commenced.

1.5 WARRANTY

A. Manufacturer Warranty:

1. Manufacturer's standard full door warranty for lifetime of original installation.
 - a. Warranty shall include finishing, hanging, and installing hardware if manufacturing defect was discovered after door was finished and installed.
 - b. Warranty to include defects in materials including following:
 - 1) Delaminating in any degree.
 - 2) Warp or twist of **1/4 inch (6 mm)** or more in door panel at time of one-year warranty inspection.
 - 3) Telegraphing of core assembly: Variation of **1/100 inch (0.25 mm)** or more in **3 inch (75 mm)** span.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Suppliers:

1. Category Three Approved Suppliers. See Section 01 6200 for definitions of Categories and Section 01 4301 for Qualification Requirements:
 - 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.

B. Manufacturers:

1. Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories:
 - a. Graham Wood Doors, Mason City, IA.
 - b. Marshfield Door Systems Inc, Marshfield, WI.
 - c. VT Industries, Holstein, IA.

C. Wood Doors:

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. Plain sliced Red Oak meeting requirements of AWS Grade A, **1/50 inch (0.5 mm)** thick minimum immediately before finishing.
 - b. Face veneers shall be running book matched.
5. Core:
 - a. Fully bonded to stiles and rails and sanded as a unit before applying veneers.
 - b. Non-Rated:

- 1) 32 lb density meeting requirements of ANSI A208.1 Mat Formed Wood Particle Board, Grade 1-L-1 minimum.
 - 2) Stiles:
 - a) 1-3/8 inches (35 mm) deep minimum before fitting.
 - b) Stile face to be hardwood matching face veneer material, thickness manufacturer's standard.
 - 3) Rails:
 - a) 1-1/8 inches (28 mm).
 - b) Manufacturer's option.
6. Factory Glazing (non-fire-rated openings):
- a. Glazing: Tempered glazing meeting requirements of ASTM C1048, Kind FT, Condition A, Type I, Class I, Quality q3. Thickness 1/4 inch (6 mm).
 - b. Lite Kit:
 - 1) Design Criteria:
 - a) Pre-finished wood or wood veneer frames.
 - 2) Dimensions:
 - a) **Meetinghouse Classroom Doors: Match Existing.**
 - 3) Category Four Approved Product. See Section 01 6200 for definitions of Categories:
 - a) Profile M6G by Graham.
 - b) Profile W6 by Marshfield.
 - c) Profile VT1 by VT Industries.
- D. Fabrication:
1. Doors shall be factory-machined. Coordinate with Section 08 1213 and Sections under 08 7000.
- E. Finishes:
1. Factory Finishing:
 - a. Applied by Door Manufacturer before leaving factory.
 - b. Performance / Design Criteria:
 - 1) Finish factory-finish to match Owner selected sample as specified in Section 09 9324.
 - c. Match existing Project Color Scheme:
 - a) Control Sample will be existing wood item from Project.
 - d. Finish: AWS Finish System TR-6 Catalyzed Polyurethane Premium Grade for unfilled, open-grain woods.

2.2 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. Color matches Owner provided sample specified in Section 09 9324.

PART 3 - EXECUTION: Not Used

END OF SECTION

SECTION 08 3110**ACCESS DOORS AND PANELS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
 - 1. Manufactured access doors.
- B. Related Requirements:
 - 1. Section 06 2001: 'Common Finish Carpentry Requirements' for Installation.

PART 2 - PRODUCTS**2.1 MANUFACTURED UNITS**

- A. Acceptable Manufacturers:
 - 1. Babcock-Davis, Minneapolis, MN www.babcock-davis.com.
 - 2. The Bilco Company, New Haven, CT www.bilco.com or Bilco Canada, London, ON (519) 659-7331.
 - 3. Dur-Red Products, Cudahy, CA www.dur-red.com.
 - 4. Elmdor Stoneman, City of Industry, CA www.elmdorstoneman.com.
 - 5. Jensen Industries, Los Angeles, CA www.jensen-ind.com.
 - 6. Karp Associates Inc, Maspeth, NY www.karpinc.com.
 - 7. Larsen's Manufacturing Co, Minneapolis, MN www.larsensmfg.com.
 - 8. Mifab Manufacturing Co, Minneapolis, MN www.mifab.com.
 - 9. Milcor, Bensenville, IL www.milcorinc.com.
 - 10. Nystrom Inc, Brooklyn Park, MN www.nystrom.com.
 - 11. Williams Brothers Corporation of America, Reno, NV www.wbdoors.com.
 - 12. Equal as approved by Architect before bidding. See Section 01 6200.
- B. Standard Ceiling or Wall Access Doors:
 - 1. Manually operated with single key operated lock, interior latch release, and continuous piano hinge hardware.
 - 2. Factory powder-coated prime finish.
 - 3. Non-Fire-Rated, Class Two Quality Standards:
 - a. Acoustical Tile: DSC-210 by Karp.
 - b. Plaster: DSC-210 PL by Karp.
 - c. Drywall: KDW or Sesame (KSTDW or KSTE) by Karp.
 - d. Masonry: DSC-214M by Karp.
 - 4. Non-Fire-Rated Insulated, Class Two Quality Standard:
 - a. KRP-150 FR or KRP-350.FR by Karp.

PART 3 - EXECUTION: Not Used**END OF SECTION**

SECTION 08 4113**ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install aluminum storefront entry and window systems, including hardware, glazing, and caulking, as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 01 1100: 'Summary Of Work' for cores for High Security Cylinders are excluded from Contract and provided by Owner. This specification establishes quality of materials and installation of those items for information of Contractor, Architect, and Owner's Representatives.
 - 2. Section 06 1100: 'Wood Framing':
 - a. Pre-installation conference held jointly with Section 08 4113.
 - 3. Section 07 9213: 'Elastomeric Joint Sealant' for quality of sealants.
 - 4. Section 08 7103: 'Securing Devices' for furnishing of locking cylinders.
 - 5. Section 08 8100: 'Glass Glazing' for quality of glass glazing.
 - 6. Section 28 1316: 'Access Control System':
 - a. Coordination and location of pull string inside storefront door mullion for electric strike and proximity reader.
 - 7. Division 26: 'Electrical' for power source, raceway, boxes, wiring for controls and operator.

1.2 REFERENCES

- A. Association Publications:
 - 1. American Architectural Manufacturers Association (AAMA):
 - a. AAMA 501-15, 'Methods of Test for Exterior Walls'.
 - b. AAMA 609 & 610-15, 'Cleaning and Maintenance Guide for Architecturally Finished Aluminum' (combined documents).
 - c. AAMA SFM 1-14, 'Aluminum Store Front and Entrance Manual'.
 - d. AAMA 611-14, 'Voluntary Standards for Anodized Architectural Aluminum'.
 - e. AAMA 2605-17a, 'Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels'.
- B. Definitions:
 - 1. Glass Surface:
 - a. Insulated glass unit:
 - 1) Surface 1: Exterior surface of outer lite.
 - 2) Surface 2: Interspace-facing surface of outer lite.
 - 3) Surface 3: Interspace-facing surface of inner lite.
 - 4) Surface 4: Interior surface of inner lite.
 - b. Monolithic glass:
 - 1) Surface 1: Exterior surface.
 - 2) Surface 2: Interior surface.
- C. Reference Standards:
 - 1. American National Standards Institute / Builders Hardware Manufacturers Association:
 - a. ANSI/BHMA A156.19-2013, 'Power Assist & Low Energy Operated Doors'.
 - 2. ASTM International:
 - a. ASTM B221-14, 'Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes'.

- b. ASTM B456-17, 'Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium'.
- c. ASTM B633-15, 'Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel'.
- d. ASTM C920-18, 'Standard Specification for Elastomeric Joint Sealants'.
- e. ASTM C1184-18, 'Standard Specification for Structural Silicone Sealants'.
- f. ASTM E283-04(2012), 'Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen'.
- g. ASTM E330/E330M-14, 'Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference'.
- h. ASTM E331-00(2016), 'Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference'.
- 3. International Building Code (IBC) (2018 or most recent edition adopted by AHJ):
 - a. Chapter 10, 'Means of Egress'.
 - b. Chapter 16, 'Structural Design'.
 - 1) Section 1609 'Wind Loads'.
- 4. International Code Council / American National Standards Institute:
 - a. ICC / ANSI A117.1-2009, 'Accessible and Usable Buildings and Facilities'.
- 5. National Fenestration Rating Council (NFRC):
 - a. NFRC 100-2017, 'Procedure for Determining Fenestration Product U-factors'.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference:
 - 1. Participate in MANDATORY pre-installation conference as specified in Section 06 1100.
 - a. Schedule pre-installation conference one (1) week before scheduled installation of storefront system.
 - b. In addition to requirements of Section 01 3100, review following:
 - 1) Review rough opening requirements:
 - a) Make certain rough openings are within tolerances required for installation of factory-fabricated frames.
 - b) These dimensions have been agreed upon between Owner and Manufacturer and are shown on Standard Plan Drawings.
 - 2) Review rough opening requirements:
 - a) New additions:
 - (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.
 - 3) Review installation scheduling, coordination, placement of doors.
 - 4) Review delivery, storage, and handling requirements.
 - 5) Review 'Examination' requirements before sliding door installation.
 - 6) Review 'Finish' door and hardware requirements.
 - 7) Review 'Protection' responsibilities.
 - 8) Review 'Cleaning' responsibilities.

1.4 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Manufacturer's literature.
 - 1) Storefront entry system.
 - b. Color and finish.
 - 2. Shop Drawings:
 - a. Clearly mark components to identify their location in Project.
 - b. Show locations, sizes, etc, of hardware reinforcing.

- B. Informational Submittals:
 - 1. 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, 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.

1.5 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. 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. Provide wind load and impact testing by testing laboratory when required by local codes and jurisdictions:
- B. Qualifications: Requirements of Section 01 4301 applies, but not limited to following:
 - 1. Manufacturer Qualifications:
 - a. 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. Fabricator Qualifications:
 - a. 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.
 - b. Fabricator shall have sufficient production capacity to produce components required without causing delay in progress of the Work.
 - 3. Installer Qualifications:
 - a. Minimum three (3) years experience in storefront installations.

- b. Minimum five (5) satisfactorily completed projects of comparable quality, similar size, and complexity in past three (3) years before bidding.
- c. Upon request, submit documentation.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
 - 1. Deliver all parts of door, together with hardware, in original, unopened packages with labels intact to Project at same time.
- B. Storage And Handling Requirements:
 - 1. Store in clean, dry location, indoors in Manufacturer's unopened packaging until ready for installation and in accordance with Manufacturer's instructions.
 - 2. Stack framing components in a manner that will prevent bending and avoid significant or permanent damage.
 - 3. Protect materials and finish from damage during storage, handling and installation.

1.7 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.

PART 2 - PRODUCTS

2.1 ASSEMBLIES

- A. Manufacturers:
 - 1. Category Three Approved Manufacturers. See Section 01 6200 for definitions of Categories:
 - a. Arcadia Inc., Vernon CA www.arcadiainc.com.
 - 1) Contact Information: Ken Martinek, (602) 734-5327 kmartinek@arcadiainc.com.
 - b. Kawneer North America, Norcross, GA, www.kawneer.com/kawneer/north_america.
 - 1) 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.
- D. Materials:
 - 1. 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.
 - 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) Match height of door bottoms.
 - 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 9213.
 - c) 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. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 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.
2. 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) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 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) Polyvinylidene Fluoride (PVDF) Resin-base finish (Kynar 500 or Hylar 5000) containing seventy (70) percent minimum (PVDF) in resin portion of formula and providing pencil hardness of 3H. Thermo-cured two-coat system consisting of corrosion inhibiting epoxy primer and topcoat factory-applied over properly pre-treated metal.
 - b) Category Four Approved Colors:
 - (1) Classic Bone White by Arcadia.
 - (2) Bone White by Kawneer.
 - c) Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories:
 - (1) BASF.
 - (2) PPG Industries, Inc.
 - (3) Valspar Corporation.
 - j. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Non-Thermal:
 - a) MS362 Medium Stile by Arcadia.
 - b) 350 Medium Stile by Kawneer.
3. Glazing:
- a. Glazing as specified in Section 08 8100: '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 C 920 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.
- 3) 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.
- 4. Hardware:
 - a. Hinging:
 - 1) Top and bottom offset, ball bearing pivots per door leaf.
 - b. Exit Devices:
 - 1) Entry Doors:
 - a) Operation:
 - (1) Entry shall be by key. Device shall be locked by cylinder from outside. Key shall be removable when cylinder is in locked or unlocked position.
 - (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: Rim Type. Provide type of strike that will allow installation of specified panic devices on storefront system specified.
 - 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: Rim Type. Provide type of strike that will allow installation of specified panic devices on storefront system specified.
 - 3) Emergency Egress Exit Doors:
 - a) Operation:
 - (1) Exit only with no dogging.
 - (2) Exterior Trim: None.
 - (3) Type: Rim Type with type of strike that will allow installation of specified panic devices on storefront system specified.
 - 4) Color:
 - a) Equivalent to clear anodized.
 - 5) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) Apex Series by Precision.
 - b) 80 Series by Sargent.
 - c) 98 or 99 Rim Series by Von Duprin.
 - c. Thresholds:
 - 1) Exterior:
 - a) Design Criteria: Meet handicap accessibility requirements.
 - b) Exterior to Thin-Set Paver Tile: Similar to Pemko 253, 254, or 255 Profile.
 - c) Exterior to Carpet Tile: Similar to Pemko 273 Profile.
 - 2) Interior:
 - a) Design Criteria: Meet handicap accessibility requirements.
 - b) Carpet Tile / Carpet to Carpet: Similar to Pemko 236.
 - d. Sweep Strips:
 - 1) Class Two Quality Standard:
 - a) Entrance Manufacturer's standard (cover cap with no exposed fasteners).
 - b) Pemko 293100 N8.
 - e. Push / Pulls:
 - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) PBR and OPR-9 by Arcadia.
 - b) Kawneer CP and CO-9, clear anodized.
 - f. High Security Cylinders And Cores:
 - 1) ASSA Instacores with ASSA Profile 62 key system:
 - a) Church And Factory Authorized Distributor:
 - (1) Clark Security Products, 135 West 2950 South, Salt Lake City, UT.
 - (a) Local: (801) 487-3227.
 - (b) Other: (800) 453-6430.

- (c) FAX: (801) 487-3254.
- 2) Medeco cores with Level Six HUK-IC keying system with special Church keyway:
 - a) Church And Factory Authorized Distributors:
 - (1) Intermountain Lock & Supply Co, 3106 South Main, Salt Lake City, UT:
 - (a) Utah: (801) 486-0079.
 - (b) Other: (800) 453-5386.
 - (c) FAX: (801) 485-7205.
 - (2) Clark Security Products, 135 West 2950 South, Salt Lake City, UT.
 - (a) Local: (801) 487-3227.
 - (b) Other: (800) 453-6430.
 - (c) FAX: (801) 487-3254.
 - 3) Schlage cores with Primus Level 4+ keying system with special Church side bit milling:
 - a) Church And Factory Authorized USA Distributors:
 - (1) Architectural Building Supply, P O Box 65678, Salt Lake City, UT 84165-0678 or 2965 South Main St, Salt Lake City, UT 84115.
 - (a) (801) 486-3481.
 - (b) FAX: (801) 484-6817.
- g. Kick Plates:
 - 1) Push side of Door only.
 - 2) 10 inches (254 mm) high by width of door less 3/4 inch (19 mm) on each side.
 - 3) Material: 0.050 inch (1.27 mm) thick Stainless Steel.
 - 4) Type Two 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 6200.

E. Fabrication:

1. Construction shall meet Manufacturer's recommendations.
2. Fabricate components that, when assembled, have following characteristics:
 - a. Profiles sharp, straight, and free of defects or deformations.
 - b. Accurately fit joints; make joints flush, hairline and weatherproof.
 - c. Means to drain water passing joints, condensation within framing members, and moisture migrating within system to exterior.
 - d. Physical and thermal isolation of glazing from framing members.
 - e. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 - f. Provisions for field replacement of glazing.
 - g. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
 - h. Framing members shall be internally reinforced and secured at head and sill as necessary for structural performance requirements and for hardware attachment.
3. Fabricate in factory to dimensions required to fit framed openings detailed on Contract Documents. Joints shall be tightly closed.
4. Mortise in manner to give maximum hardware-door connection strength and neatness of appearance. Adequately reinforce with back plates or rivnuts to hold pivots and closers.
5. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
6. Structural-Sealant-Glazed Framing Members: Include accommodations for using temporary support device to retain glazing in place while structural sealant cures.
7. Storefront Framing: Fabricate components for assembly using manufactures standard installation instructions.
8. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

F. Hardware Finishes:

1. Finishes for steel, brass, or bronze hardware items shall be satin chromium plated.
2. Materials other than steel, brass, or bronze shall be finished to match the appearance of satin chromium plated.

PART 3 - EXECUTION

3.1 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.

3.2 EXAMINATION

- A. Verification Of Conditions:
1. Verify that framed openings comply with Contract Document requirements.
 2. Verify floor is level across entire width of automatic door opening.
 3. Verify sill conditions are level and/or sloped away from openings as specified.
 4. 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.
 5. Notify Architect and Owner in writing if framed openings are not as agreed upon.
 - a. Do not install storefront entry and window frames until deficiencies in framed openings have been corrected to allow installation of standard entries and windows.
 - b. Commencement of Work by installer is considered acceptance of substrate.

3.3 INSTALLATION

- A. General:
1. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.
 2. All installation shall be in accordance with manufacturer's published recommendations and in accordance with approved shop drawings.
 3. Do not install damaged components. Fit frame joints tight, free of burrs and distortion. Rigidly secure non-movement joints.
 4. Isolate metal surfaces in contact with incompatible metal or corrosive substrates, including wood, by applying sealer tape to prevent electrolytic action.
- B. 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.
- C. Install doors without warp or rack. Adjust doors and hardware to provide ninety (90) degree operation, tight fit at contact points and smooth operation.
- D. Install exterior window units with through wall sill flashing.
- E. 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.
- F. Sealants:
1. Apply in accordance with Section 07 9213 'Elastomeric Joint Sealant' requirements.
 2. Caulk joints between frames and walls, both interior and exterior to provide weather tight installation.

- G. Glazing Characteristics:
 - 1. Interior Vestibule Glazing: Clear.
 - 2. Exterior Storefront Doors And Sidelights Opening Into Foyers And Corridors:
 - a. Clear interior pane and Clear exterior pane with Low E treatment on surface 2.
 - 3. All Other Exterior Storefront Doors And Storefront:
 - a. Obscure interior pane with pattern on surface 3 and Clear exterior pane with Low E treatment on surface 2.

3.4 FIELD QUALITY CONTROL

- A. 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.
- 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 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.

3.5 ADJUSTING

- A. 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.

3.6 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.

3.7 CLEANING

- A. General:
 - 1. Installer's Responsibility:
 - 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. Clean glass and aluminum surfaces, inside and out, promptly after installation. Remove excess glazing and sealant compounds, dirt, and other substances. Exercise care to avoid damage to coatings.
 - c. Remove nonpermanent labels, protective films, and clean surfaces following recommended procedures.
 - 1) Do NOT remove permanent AAMA/CSA or NFRC labels.
- B. Waste Management:

1. Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

SECTION 08 5313**VINYL WINDOWS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
 - 1. Window units.
- B. Related Requirements:
 - 1. Section 06 2001: 'Common Finish Carpentry Requirements' for installation.
 - 2. Section 07 9213: 'Elastomeric Joint Sealants' for quality of sealant and backer rod.
 - 3. Section 08 4113: 'Aluminum-Framed Entrances And Storefront' for fixed storefront windows.
 - 4. Section 08 8100: 'Glass Glazing' for quality of glass glazing.

1.2 REFERENCES

- A. Association Publications:
 - 1. American Architectural Manufacturers Association:
 - a. AAMA 701/702-11, 'Voluntary Specifications for Pile Weatherstripping and Replaceable Fenestration Weatherseals'.
 - b. AAMA 711-13, Voluntary Specification for Self-Adhering Flashing Used for Installation of Exterior Wall Fenestration Products, American Architectural Manufacturers Association.
 - c. AAMA 851-09, 'Fenestration Sealants Guide for Windows, Window Walls and Curtain Walls'.
 - d. AAMA 902-16, 'Voluntary Specification for Sash Balances'.
 - e. AAMA 910-16, 'Life Cycle Specifications and Test Methods for AW Class Architectural Windows and Doors'.
 - f. AAMA 1503-09, 'Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections'.
 - g. AAMA 2605-17a, 'Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Plastic Profiles'.
 - 2. American Architectural Manufacturers Association / Window & Door Manufacturers Association / Canadian Standards Association:
 - a. AAMA/WDMA/CSA 101/I.S.2/A440-17, 'North American Fenestration Standard/Specification for windows, doors, and skylights'.
 - 3. Fenestration Manufacturers Association / American Architectural Manufacturers Association:
 - a. FMA/AAMA100-12, 'Standard Practice for the Installation of Windows with Flanges or Mounting Fins in Wood Frame Construction'.
 - 4. National Fenestration Rating Council, Silver Spring, MD:
 - a. NFRC 200-2014, Section 5.6 (Non-Residential Fenestration).
 - b. NFRC Certification Program.
- B. Definitions:
 - 1. Air Leakage: Flow of air which passes through fenestration products.
 - 2. Fenestration: Openings in or on the building envelope, such as windows, doors, secondary storm products (SSPs) curtain walls, storefronts, roof windows, tubular daylighting devices (TDDs), sloped glazing, and skylights, designed to permit the passage of air, light, or people.
 - 3. Obscure Glass: Adds privacy where window coverings are impractical or undesirable. Various colors and texture patterns provide translucent or semi-opaque effect. May be tempered for use where safety glass is required.
 - 4. Water Penetration: Measurement of the resistance of a fenestration product to the passage of water.
- C. Reference Standards:

1. ASTM International:
 - a. ASTM E90-09(2016), 'Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements'.
 - b. ASTM E330-14, 'Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference'.
 - c. ASTM E2112-19, 'Standard Practice for Installation of Exterior Windows, Doors and Skylights'.
 - d. ASTM F588-17, 'Standard Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing Impact'.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference:
 1. Participate in pre-installation conference.
 2. Schedule conference before scheduled installation of vinyl windows.
 3. In addition to agenda items specified in Section 01 3100, review following:
 - a. Review Installation scheduling, coordination, and placement of windows.
 - b. Review Manufacturer's installation requirements to assure issuance of Manufacturer's warranty.
 - c. Before installing windows, review Manufacturer's submitted installation requirements and install first window, including flashing and sealant, to demonstrate standard for installation of remaining windows.

1.4 SUBMITTALS

- A. Action Submittals:
 1. Product Data:
 - a. Manufacturer's literature or cut sheet.
 - b. Literature on glazing.
 - c. Color selection.
 - d. Window U and SHGC Factors, written certificate from window manufacture.
 2. Shop Drawings: Submit before framing. Show rough opening requirements.
- B. Informational Submittals:
 1. Manufacturer Instructions:
 - a. Manufacturer's published installation instructions for windows, flashing, and sealants.
- 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.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
 1. Materials shall be delivered in original, unopened packages with labels intact.
 2. Examine and report damaged materials to Architect and/or Owner immediately.
- B. Storage And Handling Requirements:
 1. Provide secure location protected from the weather and other trades.
 2. Store window units in an upright position in clean and dry storage area above ground and protect from weather.

1.6 WARRANTY

- A. Special Warranty:
 - 1. Provide written non-prorated Manufacturer's warranty including:
 - a. Ten (10) years for glass, parts and labor.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

- A. Manufacturers:
 - 1. Type One Acceptable Products:
 - a. Montecito Window if available or Tuscany Window by Milgard Manufacturing Inc, Tacoma, WA www.milgard.com:
 - 1) Contact Information:
 - a) General Information: 1010 54th Ave East, Tacoma, WA 98424 Phone (253) 922-2030, www.milgard.com.
 - b) Primary Contact: Jeff Mead, cell (801) 597-2664 jeffmead@milgard.com.
 - c) Inside Sales, (800) 777-7714 Candice Willis, candicewillies@milgard.com.
 - 2) Equal as approved by Architect before bidding. See Section 01 6200.
- B. Manufactured Window Units:
 - 1. Fixed Window:
 - a. Quality Standard:
 - 1) Montecito Picture:
 - a) Model: 8320M.
 - 2) Tuscan Series Picture.
- C. Design Criteria:
 - 1. Performance:
 - a. Comply with minimum test requirements of AAMA / WDMA / CSA 101 for classification of specified window in following:
 - 1) Air infiltration.
 - 2) Water Resistance.
 - 3) Wind Load Resistance.
 - 4) Condensation Resistance.
 - 5) Uniform structural load.
 - b. AAMA / WDMA / CSA 101 classification C30 minimum for windows, tested at 4 feet wide by 7 feet high minimum.
 - c. Meet following thermal performance:
 - 1) Condensation Resistance Factor (CRF) of 48 minimum when tested in accordance with AAMA 1503.
 - 2) Thermal Transmittance of 0.65 maximum when tested in accordance with AAMA 1503.
- D. Manufactured Units:
 - 1. Windows:
 - a. Factory glazed.
 - b. Weatherstripped.
 - c. Flanged for installation in framed buildings; Non-flanged for installation in masonry buildings. Installation method shall not require drilling into frame.
 - d. Approved Color:
 - 1) White.
 - e. Muntin Pattern:
 - 1) **Match Existing.**
- E. Fabrication:
 - 1. Corners shall be thermally fused.

- F. Glazing Requirements:
 - 1. Glazing Characteristics:
 - a. Obscure interior pane with pattern on surface 3 and Clear exterior pane with Low E treatment on surface 2.
 - b. Low E Quality Standard:
 - 1) Milgard SunCoatMax 366 Low-E.
 - 2. Glazing Beads: Manufacturer's standard.

2.2 ACCESSORIES

- A. Anchoring Devices:
 - 1. Aluminum or stainless steel.
 - 2. Other corrosion-resistant or insulated anchors as specifically approved by Architect in writing before use.
- B. Flashing:
 - 1. Self-adhesive rubberized asphalt with protective sheet.
 - 2. Type Two Acceptable Products:
 - a. Flexwrap by duPont Tyvek, Wilmington, DE www.tyvek.com.
 - b. Eternabond, Mundelein, IL www.eternabond.com.
 - c. FortiFlash 20 mil by Fortifiber, Reno, NV www.fortifiber.com.
 - d. Vycor Self-Adhered Flashing by Grace Construction Products, Cambridge, MA www.na.graceconstruction.com.
 - e. Optiflash B-20 by Covalence Coated Products, Homer, LA www.covalencecoatedproducts.com.
 - f. BT25XL Window Sealing Tape by Protecto Wrap, Denver, CO www.protectowrap.com.
 - g. Rufco-Shield Window & Door Flashing by Raven Industries, Sioux Falls, SD www.ravenind.com.
 - h. Equal as approved by Architect before installation. See Section 01 6200.

2.3 SOURCE QUALITY CONTROL

- A. Identification:
 - 1. When delivered to Project site, windows shall bear permanent label stating model of window and Manufacturer's name, or AAMA label.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Evaluation And Assessment:
 - 1. Openings:
 - a. Examine openings for adequacy in allowing successful installation and operation.
 - b. Verify openings are prepared to specified dimensions and are plumb and level.
 - 2. Notify Architect in writing of inadequate conditions.
 - a. Do not install windows until conditions have been corrected.
 - 3. Commencement of Work by installer is considered acceptance of substrate.

3.2 INSTALLATION

- A. Set window frame plumb, level, and in alignment. Secure window properly in opening.
- B. Apply specified sealant between window frame and building wall as specified in Section 07 9213.

- C. Apply flashing.

3.3 FIELD QUALITY CONTROL

- A. Field Inspections:
 - 1. After installation of windows and before installation of exterior wall finish, inspect windows and compare to installation standard accepted at Pre-Installation Conference.
- 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.

3.4 CLEANING

- A. After installation, clean interior and exterior surfaces of windows and accessories of mortar, plaster, paint, and other contaminants. Maintain protection and provide final cleaning.

END OF SECTION

SECTION 08 7101**COMMON FINISH HARDWARE REQUIREMENTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. General requirements for finish hardware related to architectural wood and hollow metal doors.
- B. Related Requirements:
 - 1. Section 06 2024: 'Door, Frame, And Finish Hardware Installation' for installation of hardware.
 - 2. Section 06 4114: 'Wood-Veneer-Faced Architectural Cabinets' for architectural woodwork hardware.
 - 3. Section 08 0601: 'Hardware Group and Keying Schedules'.
 - 4. Section 08 4113: 'Aluminum-Framed Entrances and Storefronts' for storefront hardware.

1.2 REFERENCES

- A. Association Publications:
 - 1. Builders Hardware Manufacturers Association (BHMA), 355 Lexington Avenue, 15th Floor, New York, NY 10017-6603, Tel: 212-297-2122 Fax: 212-370-9047, www.buildershardware.com.
- B. Reference Standards:
 - 1. International Code Council / American National Standards Institute:
 - a. ICC / ANSI A117.1-2009, 'Accessible and Usable Buildings and Facilities'.
 - 2. Underwriters Laboratories (UL):
 - a. UL 10B, 'Fire Tests of Door Assemblies' (10th Edition).
 - b. UL 10C, 'Positive Pressure Fire Tests of Door Assemblies' (Third Edition).

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Hardware Templates:
 - a. Provide hardware templates to Sections 08 1213, 08 1313, and 08 1429 within fourteen (14) days after Architect approves hardware schedule.
 - b. Supply necessary hardware installation templates to Section 06 2024 before pre-installation conference.

1.4 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Manufacturer's cut sheets.
 - b. 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.
 - c. Copy of hardware schedule.
 - d. Written copy of keying system explanation.
 - 2. Shop Drawings:
 - a. Submit hardware schedule indicating hardware to be supplied.
 - b. 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.

B. 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.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Storage And Handling Requirements:

1. 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.
2. Include fasteners and accessories necessary for installation and operation of finish hardware in same package.

PART 2 - PRODUCTS

2.1 SUPPLIERS

A. Existing Projects (Doors and Door Hardware):

1. USA Projects:
 - a. Category Three Approved Suppliers. See Section 01 6200 for definitions of Categories:
 - 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.

2.2 FINISHES

A. Hardware Finishes:

1. Finishes for brass or bronze hardware items shall be:
 - a. ANSI / BHMA Finish Code 626.
 - 1) Description: Satin Chromium Plated.
 - 2) Base Metal: Brass. Bronze.
2. Finishes for flat goods items may be:
 - a. ANSI / BHMA Finish Code 630.
 - 1) Description: Satin Stainless Steel.
 - 2) Base Metal: Stainless Steel (300 Series).
3. 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.

2.3 FASTENERS

- A. Fasteners shall be of suitable types, sizes and quantities to properly secure hardware. Fasteners shall be of same material and finish as hardware unless otherwise specified. Fasteners exposed to weather shall be non-ferrous or corrosion resisting steel.

PART 3 - EXECUTION**3.1 PREPARATION**

- A. Before ordering materials, examine Contract Documents to be assured that material to be ordered is appropriate for thickness and substrate to which it is to be secured and will function as intended.

END OF SECTION

SECTION 08 7102**HANGING DEVICES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
 - 1. Hinges for flush wood and hollow metal doors.
- B. Related Requirements:
 - 1. Section 08 7101: 'Common Hardware Requirements'.

PART 2 - PRODUCTS**2.1 MANUFACTURED UNITS**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Hager Companies, St Louis, MO www.hagerhinge.com.
 - b. Ives, New Haven, CT www.iveshardware.com.
 - c. McKinney, Scranton, PA www.mckinneyhinge.com.
 - d. PBB, Ontario, CA www.pbbinc.com.
 - e. 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 (100 mm by 100 mm).
 - b) 1-3/8 inch 35 mm wood or metal doors: 3-1/2 inches by 3-1/2 inches (89 mm by 89 mm).
 - 2. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a. Interior:
 - 1) Hager: BB 1279.
 - 2) Ives: 5BBI.
 - 3) McKinney: TA 2714.
 - 4) MacPro / McKinney: MPB79.
 - 5) PBB: BB81.
 - 6) Stanley: FBB 179.

PART 3 - EXECUTION: Not Used**END OF SECTION**

SECTION 08 7103**SECURING DEVICES****PART 1 - GENERAL****1.1 SUMMARY****A. Products Furnished But Not Installed Under This Section:**

1. Items for architectural wood or hollow metal doors:
 - a. Flush bolts.
 - b. Locksets and latchsets.
 - c. Deadbolts.
 - d. Cylinders.
2. Miscellaneous Items:
 - a. Surface bolts.

B. Related Requirements:

1. Section 08 7101: Common Hardware Requirements.

1.2 REFERENCES**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.

1.3 DELIVERY, STORAGE, AND HANDLING**A. Delivery And Acceptance Requirements:**

1. Standard Key Delivery:
 - a. Include change keys with hardware.

PART 2 - PRODUCTS**2.1 MANUFACTURED UNITS****A. Manufacturers:**

1. Manufacturer List:
 - a. Best Locks by Stanley, Indianapolis IN www.stanleysecuritysolutions.com.
 - b. Glynn-Johnson, Indianapolis, IN www.glynn-johnson.com.
 - c. Hager, St Louis, MO www.hagerhinge.com.
 - d. Ives, New Haven, CT www.iveshardware.com.
 - e. Knape & Vogt, Grand Rapids, MI www.knapeandvogt.com.
 - f. Marks USA, Amityville, NY www.marksusa.com.
 - g. Precision Hardware, Romulus, MI www.precisionhardware.com.
 - h. Rockwood, Manufacturing Co, Rockwood, PA www.rockwoodmfg.com.
 - i. Sargent, New Haven, CT www.sargentlock.com.
 - j. Schlage, Colorado Springs, CO www.schlage.com.

- k. Von Duprin, Indianapolis, IN www.vonduprin.com.
 - l. Yale Commercial Locks, Lenoir City, TN www.yalecommercial.com.
- B. General:
- 1. Backsets shall be 2-3/4 inches (70 mm).
 - 2. Furnish lead shields where required.
- C. Flush Bolts:
- 1. Rod length: 12 inch (300 mm) minimum.
 - 2. Type Two Acceptable Products:
 - a. Manual Flush Bolts (Wood Doors):
 - 1) Hager 283D.
 - 2) Ives FB458.
 - 3) Rockwood 555.
 - b. Equal as approved by Architect before installation. See Section 01 6200.
 - 3. Dust Proof Strike:
 - a. Floor and/or threshold.
 - b. Type Two Acceptable Products:
 - 1) Hager: 280X.
 - 2) Ives: DP2.
 - 3) Rockwood 570.
 - 4) Equal as approved by Architect before installation. See Section 01 6200.
- D. Locksets And Latchsets:
- 1. Design Criteria:
 - a. Grade 2 Standard Duty Key-In Lever Cylindrical Lockset:
 - 1) ANSI/BHMA A156.02 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.
 - 2. Lever Operated:
 - a. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Grade 2 Standard Duty Key-In Lever Cylindrical Locksets:
 - a) 7K Series Best Lock with 15D Lever by Stanley standard cylinders - (I/C cores may be used when authorized by AEC).
 - b) 175 Series with American Lever by Marks USA.
 - c) 7 Line Series with L Lever by Sargent.
 - d) AL Series with Saturn (SAT) Lever by Schlage.
 - e) 5300LN Series with Augusta (AU) Lever by Yale.
- E. Deadbolts:
- 1. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a. Match manufacturer of locksets.
- F. Standard Cylinders:
- 1. Aluminum Entry Door Cylinders: Provide cylinders to Section 08 4113 to fit aluminum entrance system and hardware provided.
 - 2. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a. Match Manufacturer of locksets.

PART 3 - EXECUTION

3.1 CLOSE-OUT ACTIVITIES

- A. Owner's Instructions:
- 1. Before Final Acceptance Meeting, send master keys to Facility Manager.

END OF SECTION

SECTION 08 7104**OPERATING TRIM****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
 - 1. Interior push / pulls.
- B. Related Requirements:
 - 1. Section 08 7101: Common Hardware Requirements and VMR Suppliers.

PART 2 - PRODUCTS**2.1 MANUFACTURED UNITS**

- A. Standard Door Push / Pulls:
 - 1. Size: **15 inches** (380 mm) by **3-1/2 inch** (89 mm).
 - 2. Type Two 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 6200.

PART 3 - EXECUTION: Not Used**END OF SECTION**

SECTION 08 7105**ACCESSORIES FOR PAIRS OF DOORS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
 - 1. Astragals for wood doors.
- B. Related Requirements:
 - 1. Section 08 7101: Common Hardware Requirements And VMR Suppliers.

PART 2 - PRODUCTS**2.1 MANUFACTURED UNITS**

- 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. National Guard Products - NGP, Memphis, TN www.ngpinc.com.
 - e. Pemko Manufacturing, Ventura, CA www.pemko.com.
 - f. Rockwood Manufacturing Co, Rockwood, PA www.rockwoodmfg.com.
- B. Astragals:
 - 1. Type Two Acceptable Products:
 - a. 835S by Hager.
 - b. 139 DKB by NGP.
 - c. 357D by Pemko.
 - d. Equal as approved by Architect before installation. See Section 01 6200.

PART 3 - EXECUTION: Not Used**END OF SECTION**

SECTION 08 7106**CLOSING DEVICES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
 - 1. Closers for flush wood doors.
- B. Related Requirements:
 - 1. Section 08 7101: 'Common Finish Hardware Requirements'.
 - 2. Section 08 7108: 'Stops And Holders'.

1.2 SUBMITTALS

- A. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Warranty Documentation:
 - 1) Manufacturer's final executed copy of warranty.

1.3 WARRANTY

- A. Manufacturer Warranty:
 - 1. Manufacturer's Standard Warranty, five (5) years minimum.

PART 2 - PRODUCTS**2.1 MANUFACTURED UNITS**

- A. Manufacturers:
 - 1. Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories:
 - a. 8900 Series by Dorma Architectural Hardware, Reamstown, PA www.dorma.com/usa.
 - b. 1461 Series by LCN Closers, Princeton, IL www.lcnclosers.com.
 - c. 8501 Series by Norton Door Controls, Charlotte, NC www.nortondoorcontrols.com.
 - d. 1431 Series by Sargent, New Haven, CT www.sargentlock.com.
 - e. D-3550/D-3551 Series by Stanley (dormakaba Americas), Indianapolis IN www.stanleyhardwarefordoors.com/products/.
- B. Surface-Mounted Overhead Door Closers:
 - 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).
 - 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) (Non-Fire-Rated Corridors).

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Mount closers on stop side of door wherever conditions permit.
- B. Through-bolt hardware-to-door connections.

3.2 ADJUSTING

- A. Adjust closers to provide maximum opening force as required by governing code authority and proper backcheck and sweep speed.

END OF SECTION

SECTION 08 7107**PROTECTIVE PLATES AND TRIM****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
 - 1. Kick plates.
- B. Related Requirements:
 - 1. Section 08 7101: Common Hardware Requirements and VMR Suppliers.

PART 2 - PRODUCTS**2.1 MANUFACTURED UNITS**

- A. Manufacturers:
 - 1. Type Two 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 installation. See Section 01 6200.
- B. Protective Plates:
 - 1. Material: 0.050 inch (1.27) mm thick Stainless Steel.
 - 2. Sizes:
 - a. Kick Plates: 10 inches (255) mm high by width of door less 3/4 inch (19 mm) on each side.

PART 3 - EXECUTION: Not Used**END OF SECTION**

SECTION 08 7108**STOPS AND HOLDERS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Supplied But Not Installed Under This Section:
 - 1. Door stops.
- B. Related Sections:
 - 1. Section 08 7101: Common Hardware Requirements.

PART 2 - PRODUCTS**2.1 MANUFACTURED UNITS**

- 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. Type Two Acceptable Products:

	Interior Wall	Exterior Wall	Overhead.
b. Hager	236W	255W	---
c. Ives	WS407CCV	WS447	---
d. Rockwood	409	474 / 475	---
e. Glynn Johnson	---	---	GJ 90S
f. Sargent	---	---	590S Series
g.	Equal as approved by Architect before Installation. See Section 01 6200.		

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Interface With Other Work: When using overhead stops, coordinate installation with door closer and other door hardware.

END OF SECTION

SECTION 08 7109**ACCESSORIES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
 - 1. Acoustical seals.
 - 2. Smoke Gaskets.
 - 3. Door bottoms/door sweeps.
- B. Related Requirements:
 - 1. Section 08 4113: 'Aluminum-Framed Entrances And Storefronts' for thresholds.
 - 2. Section 08 7101: 'Common Finish Hardware Requirements' for general finish hardware requirements and Approved Suppliers.
 - 3. Section 09 3013: 'Ceramic Tiling' for stone thresholds.

1.2 REFERENCES

- A. Association Publications:
 - 1. American Architectural Manufacturers Association (AAMA):
 - a. AAMA 609 & 609-09, 'Cleaning and Maintenance Guide for Architecturally Finished Aluminum' (combined document).
 - b. AAMA 611-12, 'Voluntary Standards for Anodized Architectural Aluminum'.
 - c. AAMA 701/702-11, 'Voluntary Specification for Pile Weatherstripping and Replaceable Fenestration Weatherseals'.
 - 2. National Association of Architectural Metal Manufacturers (NAAMM):
 - a. AMP 500-06, 'Metal Finishes Manual' for Architectural and Metal Products.
- B. Reference Standards:
 - 1. American National Standards Institute / Builders Hardware Manufacturers Association:
 - a. ANSI / BHMA A156.18-2012, 'Materials and Finishes'.
 - b. ANSI / BHMA A156.21-2014, 'American National Standard for Thresholds'.
 - 2. International Code Council / American National Standards Institute:
 - a. ICC / ANSI A117.1-2009, 'Accessible and Usable Buildings and Facilities'.

PART 2 - PRODUCTS**2.1 MANUFACTURED UNITS**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Hager, St Louis, MO www.hagerhinge.com.
 - b. NGP - National Guard Products, Memphis, TN www.ngpinc.com.
 - c. Pemko Manufacturing, Ventura, CA www.pemko.com.
- B. Acoustical Seals:
 - 1. Color as selected by Architect.
 - 2. Type One Acceptable Products:
 - a. Door Bottom Shoe for Wood Door:
 - 1) 13VDkB by NGP.
 - 2) 211DV by Pemko.

- b. Door Bottom Shoe for Metal Door:
 - 1) 779S-A by Hager.
 - 2) 35EV by NGP.
 - 3) 217AV by Pemko.
 - c. Equal as approved by Architect before bidding. See Section 01 6200.
- C. Smoke Gaskets:
- 1. Color as selected by Architect.
 - 2. Type One Acceptable Products:
 - a. 726 by Hager.
 - b. 5050 by NGP.
 - c. PK 55 by Pemko.
 - d. Equal as approved by Architect before bidding. See Section 01 6200.
- D. Thresholds:
- 1. Type One 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. Equals as approved by Architect before bidding. See Section 01 6200.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. 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.

END OF SECTION

SECTION 08 8100**GLASS GLAZING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Quality of glazing used in entries, doors, and windows.
- B. Related Requirements:
 - 1. Sections Under 08 1000 Heading: 'Doors And Frames' for furnishing and installing of flush wood door lites in new doors.
 - 2. Section 08 4113: 'Aluminum-Framed Entrances And Storefronts' for furnishing and installing of glazing in aluminum-framed storefront.
 - 3. Section 08 5113: 'Vinyl Windows' for furnishing and installing of glazing in windows.
 - 4. Section 11 9119: 'Font Railing' for glass provided in Font Railing.

1.2 REFERENCES

- A. Definitions:
 - 1. Glass Surface:
 - a. Insulated glass unit:
 - 1) Surface 1: Exterior surface of outer lite.
 - 2) Surface 2: Interspace-facing surface of outer lite.
 - 3) Surface 3: Interspace-facing surface of inner lite.
 - 4) Surface 4: Interior surface of inner lite.
 - b. Monolithic glass:
 - 1) Surface 1: Exterior surface.
 - 2) Surface 2: Interior surface.
 - 2. Insulated Glass: Two pieces of glass spaced apart and hermetically sealed to form single-glazed unit with air space between. Heat transmission through this type of glass may be as low as half that without air space. Also called double glazing, double pane, insulated unit, and thermal pane.
 - 3. Laminated Glass: Two or more sheets with inner layer of transparent plastic to which glass adheres if broken. Used for overhead, safety glazing, and sound reduction.
 - 4. Low-Emissivity Glass (Low-E): Reduces wintertime heat loss from interior with thin, almost colorless metallic coating that reflects heat back inside structure. Allows moderate solar heat gain while reducing harmful ultraviolet light in any season. Minimizes summertime air conditioning loss by reflecting radiated heat to outside. May be tempered for where safety glass is required. Available in single strength clear, gray and bronze (brown) color.
 - 5. Shading Coefficient: Ratio of solar heat gain passing through a glazing system to solar heat gain that occurs under the same conditions if the window was made of clear, unshaded double strength glass. Lower SC number, the better solar control efficiency of glazing system.
 - 6. Solar Heat Gain Coefficient (SHGC): Ratio of total solar heat passing through a given window relative to the solar heat incident on the projected window surface at normal solar incidence. (Percentage of solar energy directly transmitted or absorbed and re-radiated into a building). Lower SHGC, the better it is able to reduce heat.
 - 7. Solar Reflectance (R): Percent of incident solar radiation that is reflected by window film/glass system. Lower the number, the less solar radiation reflected.
 - 8. Tempered Glass: Glass strengthened through process of heating, creating tensile strength that causes glass to resist breakage, yet disintegrate into small pieces if break occurs. Tempered glass is type of safety glass.

9. U-Value: Measurement of heat transfer through film due to outdoor/indoor temperature differences. Lower U-value, less heat transfers. When using performance data, the lower U-value, better insulating qualities of window film/glass system.
10. Visible Light Transmitted (VLT): Percent of total visible light (380-780 nanometers) that passes through glass. Lower the number, the less visible light transmitted.

B. Reference Standards:

1. American National Standards Institute:
 - a. ANSI Z97.1-2009, 'Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test'.
2. ASTM International:
 - a. ASTM C1036-16, 'Standard Specification for Flat Glass'.
 - b. ASTM C1048-18, 'Standard Specification for Heat-Treated Flat Glass - Kind H, Kind FT Coated and Uncoated Glass'.
 - c. ASTM C1172-14, 'Standard Specification for Laminated Architectural Flat Glass'.
 - d. ASTM C1281-16, 'Standard Specification for Preformed Tape Sealants for Glazing Applications'.
 - e. ASTM E2190-10, 'Standard Specification for Insulating Glass Unit Performance and Evaluation'.
3. Consumer Products Safety Commission (CPSC):
 - a. 16 CFR, Part 1201 CAT 1 and 11, 'Safety Standard for Architectural Glazing Materials'.

1.3 SUBMITTALS

A. Action Submittals:

1. Product Data:
 - a. Manufacturer's data sheets for each glass product and glazing material.

B. Informational Submittals:

1. 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. Warranty Documentation:
 - 1) Final, executed copy of Warranty.

1.4 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:

1. Glazing shall meet applicable requirements of Federal Consumer Product Safety Standard 16 CFR 1201.
2. Comply with published recommendations of glass product Manufacturers and organizations, except where more stringent requirements are indicated.

B. 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.

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.

1.5 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.

1.6 FIELD CONDITIONS

- A. Ambient Conditions:
 - 1. 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.

1.7 WARRANTY

- A. Manufacturer Warranty:
 - 1. Insulating Glass Warranty:
 - a. Manufacturer's standard form, signed by insulating-glass product Manufacturer/Fabricator, agreeing to replace insulating-glass units that exhibit failure of hermetic seal under normal use evidenced by obstruction of vision by dust, moisture, or film on interior surfaces of glass, for ten [10] years of date of installation.
 - 2. Installer's Warranty:
 - a. 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.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Manufacturers:
 - 1. Manufacturer Contact List for Low E Glazing:
 - a. AGC Flat glass North America, Kingsport, TN www.us.agc.com.
 - b. Carlex (subsidiary of Central Glass Co., Ltd., Nashville, TN www.carlex.com.
 - c. Guardian Industries Corp., Auburn Hills, MI www.guardian.com.
 - d. Oldcastle BuildingEnvelope, Santa Monica, CA www.oldcastlebe.com.
 - e. Pilkington North America Inc., Toledo, OH www.pilkington.com.
 - f. Vitro Architectural Glass (formerly PPG glass), Cheswick, PA www.ppgglass.com or PPG Canada Ltd, Glass Division, Toronto, ON (416) 789-3331.
- 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) Type Two Low-Emissivity (or Low E) Acceptable Product:
 - a) Performance Standard:
 - (1) 70 percent Visible Light Transmission (VLT).
 - (2) 0.29 U-value winter.
 - (3) 0.27 U-value summer.
 - (4) 0.38 Solar Heat Gain Coefficient (SHGC).
 - (5) 0.44 Shading Coefficient.
 - (6) 11 percent Visible Light Reflectance.
 - b) Quality Standard:
 - (1) Cardinal LoE³-366.
 - (2) Solarban 70 XL.
 - (3) 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 6200.
 - 3) Acceptable Manufacturers:
 - a) AGC.
 - b) Guardian.
 - c) Vitro Architectural Glass.
 - d) Equal as approved by Architect before bidding. See Section 01 6200.
 - 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) Type Two Low-Emissivity (or Low E) Acceptable Product:
 - a) Performance Standard:
 - (1) 64 percent Visible Light Transmission (VLT).
 - (2) 0.28 U-value winter.
 - (3) 0.26 U-value summer.
 - (4) 0.27 Solar Heat Gain Coefficient (SHGC).
 - (5) 0.32 Shading Coefficient.
 - (6) 12 percent Visible Light Reflectance.
 - b) Quality Standard:
 - (1) Cardinal LoE³-366.
 - (2) Solarban 70 XL.
 - (3) Equal product by Acceptable Manufacturer as approved by Architect before bidding. See Section 01 6200.
 - 3) Acceptable Manufacturers:
 - a) AGC.
 - b) Guardian.
 - c) Vitro Architectural Glass.
 - d) Equal as approved by Architect before bidding. See Section 01 6200.
 - b. 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. Install muntins for exterior aluminum entries and aluminum windows between panes of insulating glazing units. No muntins on interior Vestibule storefront entries.
 - 3. 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. Category Four Approved Fabricators. See Section 01 6200 for definitions of Categories.
 - 1) Members of Sealed Insulating Glass Manufacturer's Association.

2.2 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.

PART 3 - EXECUTION: Not Used

END OF SECTION

SECTION 09 0503**FLOORING SUBSTRATE PREPARATION****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Preparing floor substrate to receive flooring as described in Contract Documents.
 - 2. Perform building modifications and repairs to accommodate carpet and carpet base as described in Contract Documents.
- B. Related Requirements:
 - 1. Pre-Installation conferences held jointly with Section 09 0503 as described in Administrative Requirements on Part 1 of this specification section.
 - 2. Section 03 3111: 'Cast-In-Place Structural Concrete' for installation tolerances for concrete slabs.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference:
 - 1. Participate in MANDATORY pre-installation conference held jointly if possible for all related Division 09 6000 'Flooring' used for Project.
 - 2. 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).
 - 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. In addition to agenda items specified in Section 01 3100, review following:
 - a. Review condition of floor with regards to compliance with concrete installation tolerances and other work necessary to prepare floors for installation of flooring.
 - 5. Review condition of floor regarding compliance with concrete installation tolerances and other work necessary to prepare floors for installation of flooring.
 - 6. Review additional agenda items all related flooring sections.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Storage And Handling Requirements:
 - 1. Provide storage space and protection for flooring and installation accessories if materials are delivered before start of flooring installation.

PART 2 - PRODUCTS Not Used**PART 3 - EXECUTION****3.1 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.
- B. Carpet Accessories:
 - 1. Sundry items, such as adhesives, shall be conditioned to building ambient conditions before use.

END OF SECTION

SECTION 09 2226**METAL SUSPENSION SYSTEM: Gypsum Board****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install metal suspension system for supporting gypsum drywall in typical ceiling and soffit areas and to support items penetrating ceiling as described in Contract Documents including:
 - a. Hanger wires, fasteners, main runners/tees, cross runners/tees, and wall molding/track.
- B. Related Requirements:
 - 1. Section 09 2900: 'Gypsum Board'.
 - 2. Section 09 5116: 'Acoustical Tile Ceilings'.
 - 3. Section 26 5100: 'Interior Lighting' for electrical fixtures installed in ceiling.
 - 4. Division 21: 'Fire Suppression' for sprinklers installed in ceiling.
 - 5. Division 23: 'Mechanical' for related sections for HVAC installed in ceiling.
 - 6. Division 26: 'Electrical' for related electrical work.
 - 7. Division 27: 'Communications' for related sound and video work.

1.2 REFERENCES

- A. Association Publications:
 - 1. The Ceilings & Interior Systems Construction Association (CISCA), 405 Illinois Avenue, 2B, St Charles IL. www.cisca.org.
 - a. *'Ceiling Systems Handbook'*: Recommendations for direct hung acoustical tile and lay-in panel ceiling installation.
 - b. CISCA 0-2, *'Guidelines for Seismic Restraint for Direct-hung Suspended Ceiling Assemblies (zones 0-2)'* Covers Seismic Design Category C.
 - c. CISCA 3-4, *'Guidelines for Seismic Restraint for Direct-hung Suspended Ceiling Assemblies (zones 3-4)'* Covers Seismic Design Category D, E, and F.
 - d. *'Production Guide'*: Practical reference for ceiling systems and estimating costs.
- B. Definitions:
 - 1. Ceiling Suspension System: System of metal members, designed to support a suspended ceiling. May accommodate lighting fixtures or air diffusers.
 - 2. Clips: Designs to suit applications such as fire resistance, wind uplift and impact.
 - 3. Compression Post (Vertical Strut, Seismic Struts): Rigid member used to provide lateral force bracing of suspension system.
 - 4. Cross Runner, Cross Tee: Cross runner is secondary or cross beams of mechanical ceiling suspension system, usually supporting only acoustical tile. Cross tee is inserted into main runner to form different module sizes. In some suspension systems, however, cross runners also provide support for lighting fixtures, air diffusers and other cross runners.
 - 5. Hanger Wires: Wire employed to suspend acoustical ceiling from existing structure. Standard material is 12 gauge (0.105 inch - 2.70 mm) galvanized, soft annealed steel wire, conforming to ASTM A641/A641M. Heavier gauge wire is available for higher load carrying installations, or situations where hanger wire spacing exceeds 4 feet (1.20 m) on center. Seismic designs or exterior installations subject to wind uplift may require supplemental bracing or substantial hanger devices such as metal straps, rods or structural angles.
 - 6. Heavy-Duty Systems: Primarily used for installations in which the quantities and weights of ceiling fixtures (lights, air diffusers, etc.) are greater than those for ordinary commercial structure.
 - 7. Main Beam, Main Runner, Main Tee: Primary or main beams of type of ceiling suspension system in which structural members are mechanically locked together. Provide direct support for

- cross runners and may support lighting fixtures and air diffusers, as well as acoustical tile. Supported by hanger wires attached directly to existing structure; or installed perpendicular to carrying channels and supported by specially designed sheet metal or wire clips attached to carrying channels.
8. Splay Wires: Wires installed at angle rather than perpendicular to grid.
 9. Stiffening Brace: Used to prevent uplift of grid caused by wind pressure in exterior applications.

C. Reference Standards:

1. American Society of Civil Engineers/Structural Engineering Institute:
 - a. ASCE/SEI 7-10, 'Minimum Design Loads for Buildings and Other Structures'.
2. ASTM International:
 - a. ASTM A641/A641M-09a(2014), 'Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire'.
 - b. ASTM A653/A653M-18, 'Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process'.
 - c. ASTM A1008/A1008M-18, 'Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable'.
 - d. ASTM C635/C635M-17, 'Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings'.
 - e. ASTM C636/C636M-13, 'Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels'.
 - f. ASTM C645-18, 'Standard Specification for Nonstructural Steel Framing Members'.
 - g. ASTM C754-18, 'Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products'.
 - h. ASTM C841-03(2018), 'Standard Specification for Installation of Interior Lathing and Furring'.
 - i. ASTM D610-08(2012), 'Standard Practice for Evaluating Degree of Rusting on Painted Steel Surfaces'.
 - j. ASTM E119-18, 'Standard Test Methods for Fire Tests of Building Construction and Materials'.
 - k. ASTM E580/E580M-17, 'Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions'.
3. International Building Code (IBC) (2018 or most recent edition adopted by AHJ):
 - a. IBC 808.1.1.1, 'Suspended Acoustical Ceiling'.
4. Underwriters Laboratories (UL):
 - a. UL 263: 'Standard for Fire Test of Building Construction and Materials' (14th Edition).
 - b. UL 723, 'Standard for Safety Test for Surface Burning Characteristics of Building Materials' (11th Edition).

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

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.

1.4 SUBMITTALS

A. Action Submittals:

1. Product Data:
 - a. Provide Manufacturer's technical literature on suspension system including listing dimensions, load carrying capacity and standard compliance.
2. Samples:
 - a. Minimum 8 inch (200 mm) long samples of suspension system components, including main runner/tee and cross runner/tee with couplings.

- B. Informational Submittals:
 - 1. Certificates:
 - 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.
 - 2. Manufacturer's Instructions:
 - a. Seismic Design Categories D, E and F:
 - 1) Manufacturer's details and installation instructions for seismic bracing. If requested, provide copy of code requirements applicable to Project.

1.5 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. All system components conform to ASTM standards.
 - 2. Fire-Resistance Rating: UL approved metal suspension system.
 - 3. Seismic Standard: Acoustical ceilings shall be designed and installed to withstand effects of earthquake motions according to following requirements:
 - a. CISCAs Recommendations for Acoustical Ceilings: Comply with CISCAs *'Recommendations for Direct-Hung Acoustical Tile and Lay-in Panel Ceilings-Seismic Zones 0-2'* (Apply to Seismic Categories A & B).
 - b. CISCAs Guidelines for Systems Requiring Seismic Restraint: Comply with CISCAs *'Guidelines for Seismic Restraint of Direct-Hung Suspended Ceiling Assemblies-Seismic Zones 3 & 4'* (Apply to Seismic Categories C, D, E & F).
 - c. Seismic Design Categories D, E and F:
 - 1) Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E580/E580M.
 - 2) Meet seismic bracing requirements of ASCE 7, ASTM C635/C635M and ASTM C636/C636M or equivalent governing standard for project site.
- B. 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 CISCAs (Ceiling and Interior Systems Construction Association).

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. Materials shall be delivered in original, unopened packages with labels intact.
 - 2. Store material in fully enclosed space protected against damage from moisture, direct sunlight, surface contamination, and general damage.

1.7 WARRANTY

- A. Manufacturer Warranty:
 - 1. Manufacturer standard ten (10) years warranty on suspension system including repair or replacement of rusting as defined by ASTM D610.

PART 2 - PRODUCTS

2.1 SYSTEMS

A. Manufacturers:

1. Type One 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 6200.

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 6200.

6. Compression Posts/Struts:

- a. Required for Seismic Design Categories D, E and F.
 - 1) Meet seismic requirements for Project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. 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.

3.2 INSTALLATION

- 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.
 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.
- D. Tolerances:
 1. Main Runners/Tees:
 - a. 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. Cross Runners/Tees:
 - a. 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)**.
 - b. Intersecting runners must be installed to form right angle to supporting members.

3.3 FIELD QUALITY CONTROL

- A. Field Inspections:
 1. Inspect:
 - a. Suspended ceiling system.
 - b. Hanger wires, braces, ties, anchors and fasteners.
- B. Non-Conforming Work:
 1. Remove and replace defective materials at no additional cost to Owner.

END OF SECTION

SECTION 09 2900**GYPSUM BOARD****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install gypsum board as described in Contract Documents, except behind ceramic tile.
 - 2. Furnish and install acoustical sealants as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 07 9219: 'Acoustical Joint Sealants' for quality of acoustical sealants.
 - 2. Section 09 3013: 'Ceramic Tile' for installation of backerboard joint reinforcing.
 - 3. Section 09 9413: 'Interior Textured Finishing'.

1.2 REFERENCES

- A. Definitions:
 - 1. Accessories: Metal or plastic beads, trim, or moulding used to protect or conceal corners, edges, or abutments of the gypsum board construction.
 - 2. Drywall Primer: Paint material specifically formulated to fill the pores and equalize the suction difference between gypsum board surface paper and the compound used on finished joints, angles, fastener heads, and accessories and over skim coatings.
 - 3. Skim Coat: Either a thin coat of joint compound trowel applied, or a material manufactured especially for this purpose and applied in accordance with manufacturer's recommendations, over the entire surface.
 - 4. Texturing: Regular or irregular patterns typically produced by applying a mixture of joint compound and water, or proprietary texture materials including latex base texture paint, to a gypsum board surface previously coated with drywall primer.
- B. Reference Standards:
 - 1. ASTM International:
 - a. ASTM C11-18, 'Standard Terminology Relating to Gypsum and Related Building Materials and Systems'.
 - b. ASTM C475/C475M-17, 'Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board'.
 - c. ASTM C840-18a, 'Standard Specification for Application and Finishing of Gypsum Board'.
 - d. ASTM C1002-18, 'Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs'.
 - e. ASTM C1047-14a, 'Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base'.
 - f. ASTM C1178/C1178M-18, 'Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel'.
 - g. ASTM C1396/C1396M-17, 'Standard Specification for Gypsum Board'.
 - h. ASTM E84-18b, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
 - i. ASTM E119-18b, 'Standard Test Method for Fire Tests of Building Construction and Materials'.
 - 2. Gypsum Association:
 - a. GA-214-15, 'Recommended Levels of Gypsum Board Finish'.
 - b. GA-216-16: 'Application and Finishing of Gypsum Panel Products'.

- c. GA-600-15, 'Fire Reference Design Manual'.
- d. GA-801-2017, 'Handling and Storage of Gypsum Panel Products: A Guide for Distributors, Retailers, and Contractors'.
- 3. International Building Code (IBC) (2018 or latest approved version):
 - a. Chapter 25, 'Gypsum Board And Plaster'.
- 4. Standards Council of Canada / Underwriters Laboratories of Canada:
 - a. CAN/ULC-S102:2018: 'Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies'.
- 5. Underwriters Laboratories, Inc.
 - a. UL 263: 'Test Method for Fire Tests of Building Construction and Materials' (14th Edition).
 - b. UL 723: 'Test for Surface Burning Characteristics of Building Materials; (11th Edition).

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference:
 - 1. Schedule MANDATORY pre-installation conference immediately before installation of gypsum wallboard.
 - 2. In addition to agenda items specified in Section 01 3100, review following:
 - a. Finish requirements necessary for installation of finish materials over gypsum wallboard, and location and installation of ceramic tile backerboard.

1.4 SUBMITTALS

- A. Informational Submittals:
 - 1. Test And Evaluation Reports:
 - a. Fire test results or assembly diagrams and numbers confirming products used will provide required fire ratings with installation configurations used.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. General:
 - 1. Following 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.
- B. Delivery And Acceptance Requirements:
 - 1. Deliver materials in original packages, containers, or bundles bearing brand name, applicable standard designation, and Manufacturer's name.
- C. Storage And Handling Requirements:
 - 1. 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.

1.6 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

2.1 MATERIALS

A. Manufacturers:

1. Manufacturer Contact List:

- a. American Gypsum, Dallas, TX www.americangypsum.com.
- b. CertainTeed Gypsum, Inc; Tampa, FL www.certainteed.com.
- c. Georgia Pacific, Atlanta, GA www.gp.com.
- d. National Gypsum, Charlotte, NC www.nationalgypsum.com.
- e. Pabco Gypsum, Newark, CA www.pabcogypsum.com.
- f. United States Gypsum Co, Chicago, IL www.usg.com.

B. Materials:

1. Interior Gypsum Board:

a. General:

1) Size:

- a) Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2) Class Two Quality Standard:

- a) Core: Fire-resistant rated gypsum core.
- b) Complies with Type X requirements of ASTM C1396/C1396M (Section 5).
- c) Surface paper: Face paper suitable for painting.
- d) Long edges: Tapered edge.
- e) Overall thickness: **5/8 inch (15.9 mm)**.

2. Glass Mat Gypsum Tile Backer:

- a. Product meeting requirements of ASTM C1178/C1178M.
- b. Type X, **5/8 inch (15.9 mm)**.
- c. Square edges.
- d. Category Four Approved Manufacturer. See Section 01 6200 for definitions of Categories:
 - 1) DensShield Fireguard Type X by Georgia Pacific.
 - 2) GlasRoc Tilebacker Type X by CertainTeed.

2.2 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.

2. Gypsum Board Mounting Accessories:

- 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.

b. Control Joint:

- 1) Bent zinc sheet with V-shaped slot, perforated flanges, covered with plastic tape meeting requirements of ASTM C1047.

3. Joint Compound:

- a. Best grade or type recommended by Board Manufacturer and meeting requirements of ASTM C475/C475M.
 - 1) Use Taping Compound for first coat to embed tape and accessories.
 - 2) Use Taping Compound or All-Purpose Compound for subsequent coats except final coat.
 - 3) Use Finishing Compound for final coat and for skim coat.
 4. Joint Reinforcing:
 - a. Paper reinforcing tape acceptable to Gypsum Board Manufacturer.
 5. Fasteners:
 - a. Bugle head screws meeting requirements of ASTM C1002:
 - 1) Gypsum Board:
 - a) Type W: For fastening gypsum board to wood members, of length to penetrate wood framing **5/8 inch (15.9 mm)** minimum.
 - b) 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.
 - 2) Glass Mat Gypsum Tile Backer:
 - a) 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.
- B. Primer / Surfacers On Surfaces To Receive Texturing:
1. Type Two 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.
- C. Primer On Surfaces To Receive Wallcovering:
1. White, self-sizing, water based, all purpose wallcovering primer.
 2. Type Two Acceptable Products:
 - a. Shieldz Universal Pre-Wallcovering Primer by Wm. Zinsser and Company.
 - b. Equal as approved by Architect before application. See Section 01 6200.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification Of Conditions:
1. Examine substrate and verify framing is suitable for installation of gypsum board.
 2. Examine gypsum board before installation. Reject panels that are wet, moisture damaged, and mold damaged.
 3. Notify Architect of unsuitable conditions in writing.
 - a. Do not install board over unsuitable conditions.
 4. Commencement of Work by installer is considered acceptance of substrate.

3.2 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. 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) men.
 - 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.
 - 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.
5. Finishing:
 - a. General:
 - 1) 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.
 - 2) First Coat:
 - a) 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.
 - b) Completely fill gouges, dents, and fastener dimples.
 - c) Allow to dry and sand lightly if necessary, to eliminate high spots or excessive compound.
 - 3) Second Coat:

- a) 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.
- b) Re-coat gouges, dents, and fastener dimples.
- c) Allow to dry and sand lightly to eliminate high spots or excessive compound.
- 4) 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.
- 5) 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.
- a. Finishing Levels: Finish panels to levels indicated below and according to ASTM C840, GA-214 and GA-216:
 - 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 Under Acoustical Tile:
 - a) GA-214 Level 2: 'All joints and interior angles shall have tape embedded in joint compound and wiped with a joint knife leaving a thin coating of joint compound over all joints and interior angles. Fastener heads and accessories shall be covered with a coat of joint compound. Surface shall be free of excess joint compound. Tool marks and ridges are acceptable. Joint compound applied over the body of the tape at the time of tape embedment shall be considered a separate coat of joint compound and shall satisfy the conditions of this level.
 - b) Note: It is critical that gypsum board ceiling be smooth before installing ceiling tile. Drywall joints must be as specified in paragraph above.
 - 3) Gypsum Board Surfaces to Receive: Wall Covering Type A - Section 09 7226: 'Sisal Wall Covering':
 - a) GA-214 Level 3: 'All joints and interior angles shall have tape embedded in joint compound and one additional coat of joint compound applied over all joints and interior angles. Fastener heads and accessories shall be covered with two separate coats of joint compound. All joint compound shall be smooth and free of tool marks and ridges. Coat prepared surface with specified wall covering primer'.
 - 4) Gypsum Board Surfaces to Receive: Acoustic Wall Fabric Type B - Section 09 7216, 'Vinyl-Coated Fabric Wall Covering':
 - 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'.
 - 5) 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'.
 - 6) 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'.

- 7) Painted, Untextured Gypsum Board Surfaces, Except in Mechanical, Storage, And Utility Areas:
 - a) GA-214 Level 5: 'All joints and interior angles shall have tape embedded in joint compound and two separate coats of joint compound applied over 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. A thin skim coat of joint compound trowel applied, or a material manufactured especially for this purpose and applied in accordance with manufacturer's recommendations, shall be applied to the entire surface. The surface shall be smooth and free of tool marks and ridges. Coat prepared surface with specified primer'.
- D. 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.

3.3 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.

3.4 CLEANING

- A. Remove from site debris resulting from work of this Section including taping compound spills.

END OF SECTION

SECTION 09 3013**CERAMIC TILING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install ceramic tile and tile setting materials and accessories as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 09 2900: 'Gypsum Board' for installation of backerboard behind ceramic tile, except for joint reinforcing.
 - 2. Section 22 1319: 'Facility Sanitary Sewer Specialties' for floor drains installed in ceramic tile floors.
- C. Products Installed But not Furnished Under This Section:
 - 1. Interior Ceramic Tile Joint Sealants:
- D. Related Requirements:
 - 1. Section 07 9213: 'Elastomeric Joint Sealants'.

1.2 REFERENCES

- A. Association Publications:
 - 1. American National Standard Specification (ANSI) for the Installation of Ceramic Tile.
 - 2. International Standards Organization (ISO) 13007, 'Classification for Adhesives and Grout'.
 - 3. Tile Council of North America:
 - a. TCNA Handbook, 'Handbook for Ceramic, Glass, and Stone Tile Installation, 2015'.
- B. Definitions:
 - 1. Crack Isolation: Prevention of transfer of cracks from substrate through tile or stone when substrate is subjected to horizontal movement of cracks.
 - 2. Dynamic Coefficient of Friction (DCOF): Measures ratio of forces necessary to keep two surfaces sliding.
 - 3. Epoxy Grout: Mortar system employing epoxy resin and epoxy hardener portions.
 - 4. Grout: Rich or strong cementitious or chemically setting mix used for filling tile joints.
 - 5. ISO 13007 Standards Product Classifications:
 - a. Adhesives:

Types	Classes	Special Characteristics
C = Cementitious (Thin-Set Mortars)	1 = Normal 2 = Improved	F = Fast-Setting T = Slip-Resistant E = Extended Open Time S1 = Deformable S2 = Highly Deformable P1 = Plywood Adhesion P2 = Improved Plywood Adhesion
D = Dispersion (Mastics)	1 = Normal 2 = Improved	F = Fast-Setting T = Slip-Resistant E = Extended Open Time
R = Reaction Resin (Epoxies)	1 = Normal 2 = Improved	T = Slip-Resistant

- 1) Cementitious Adhesive (C): Mixture of hydraulic binding agents (e.g. portland cement), aggregates, and organic additives (e.g. latex polymers, moisture retention additive, etc...) to be mixed with water or latex admix before mixing.
- 2) Dispersion Adhesive (D): Ready-to-use mixture of organic binding agents in the form of an aqueous polymer dispersion, organic additives and mineral fillers - mastic type products.
- 3) Reaction Resin Adhesive (R): Single or multi-component mixture of synthetic resin, mineral fillers and organic additives in which curing occurs by chemical reaction – epoxy or urethane based products.
- 4) Class 1 (1): Adhesive has passed minimum pass level tests that are mandatory for that adhesive type.
- 5) Class 2 (2): Adhesive has passed same tests as Class 1 and/or other applicable tests, but at higher pass levels.
- 6) Fast-Setting (F): Adhesive with accelerated cure time that must achieve minimum strength requirements of fast setting adhesive. This designation does not apply to reaction resin adhesives (R).
- 7) Slip-Resistance (T): Downward movement of a tile applied to combed adhesive layer on vertical surface must be $\leq 0.5\text{mm}$ for a C or D adhesive, and $\leq 5\text{mm}$ for a type R adhesive.
- 8) Extended Open Time (E): Maximum time interval after application at which tiles can be embedded in applied adhesive and meet tensile adhesion strength requirement must be ≥ 30 minutes. This designation does not apply to reaction resin adhesives (R).
- 9) Deformability (S): Capacity of hardened adhesive to be deformed by stresses between tile and substrate without damage to installed surface – to pass S1 requirements an adhesive must be able to deform $\geq 2.5\text{mm}$ but $< 5\text{mm}$; to pass S2 requirements an adhesive must be able to deform $\geq 5\text{mm}$. This designation does not apply to reaction resin adhesives (R).
- 10) Exterior Glue Plywood (P): Adhesive with ability to bond tile or stone to exterior glue plywood substrates (interior only). This designation does not apply to reaction resin adhesives (R) or dispersion adhesives (D).

b. Grouts:

Types	Classes	Special Characteristics
CG = Cementitious Grout	1 = Normal 2 = Improved	F = Fast-Setting A = High Abrasion Resistance W = Reduced Water Absorption
RG = Reaction Resin Grouts	1 = Normal 2 = Improved	Higher performance characteristics than improved cementitious grouts

- 1) Cementitious Grout (CG): Mixture of hydraulic binding agents (e.g. portland cement), aggregates, inorganic and organic additives (e.g. latex polymers, moisture retention additive, etc...).
- 2) Reaction Resin Grout (RG): Single or multi-component mixture of synthetic resin, mineral fillers and organic additives in which curing occurs by chemical reaction – epoxy or urethane based products.
- 3) Class 1 (1): Grout has passed minimum pass level tests that are mandatory for cementitious grouts.
- 4) Class 2 (2): Cementitious grout has passed same tests as Class 1 and/or other applicable tests, but at higher pass levels.
- 5) Fast-Setting (F): Grout with accelerated cure time that must achieve minimum compressive strength requirements under normal conditions within twenty four (24) hours. This designation applies only to cementitious grouts (CG).
- 6) High Abrasion Resistance (A): Capability of grout to resist wear. This designation applies only to cementitious grouts (CG).
- 7) Reduced Water Absorption (W): Grout has lower water absorption rate than standard cementitious grout. This designation applies only to cementitious grouts (CG).
6. Latex/Polymer Modified Portland Cement Mortar: Latex/Polymer modified portland cement mortar is a mixture of portland cement, sand, and special latex/polymer additive that is used as a bond coat for setting tile.
7. Pavers: Unglazed porcelain or natural clay tile formed by dust-pressed method and similar to ceramic mosaics in composition and physical properties but relatively thicker with 6 inch - or more of facial area. (ASTM C242).
8. Sanded Cement Grout: Factory prepared mixture of cement, graded sand, and other ingredients to produce water-resistant, dense, uniformly colored material. Used for joints of **1/8 inch (3 mm)** width or greater.
9. Static Coefficient of Friction (SCOF): Measures ratio of forces necessary to start two surfaces sliding (older measurement of friction replaced by dynamic coefficient of friction (DCOF)).
10. Unsanded Cement Grout: Factory prepared mixture of cement and additives that provide water retentivity. Used for joints of **1/8 inch (3 mm)** or less.

C. Reference Standard:

1. American National Standards Institute:
 - a. ANSI A108/A118/A136.1, 'American National Standards Specifications for the Installation of Ceramic Tile', Version 2013.1 (compilation of standards):
 - 1) Installation Standards:
 - a) A108.01, 'General Requirements: Subsurfaces and Preparation by Other Trades'.
 - b) A108.02, 'General Requirements: Materials, Environmental, and Workmanship'.
 - c) A108.05, 'Installation of Ceramic Tile with Dry-Set Portland Cement Mortar of Latex-Portland Cement Mortar'.
 - d) A108.6, 'Installation of Tile with Chemical Resistant, Water Cleanable Tile-Setting and Grouting Epoxy'.
 - e) A108.10, 'Installation of Grout in Tilework'.
 - f) A108.17, 'Installation of Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone'.
 - 2) Material Specifications:
 - a) A118.1, 'Dry-Set Portland Cement Mortar'.
 - b) A118.3, 'Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive'.

- c) A118.4, 'Latex Portland Cement Mortar'.
 - d) A118.6, 'Cement Grouts for Tile Installation'.
 - e) A118.7, 'High-Performance Polymer Modified Latex/Portland Cement Grouts for Tile Installation'.
 - f) A118.10, 'Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone Installations'.
 - g) A118.12, 'Crack Isolation Membranes for Thin-set Ceramic Tile and Dimension Stone Installations'.
- b. ANSI A137.1, 'National Standard Specifications for Ceramic Tile'.
- 2. ASTM International:
 - a. ASTM A1064/A1064M-17, 'Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete'.
 - b. ASTM C144-11, 'Standard Specification for Aggregate for Masonry Mortar'.
 - c. ASTM C150/C150M-17, 'Standard Specification for Portland Cement'.
 - d. ASTM C206-14, 'Standard Specification for Finishing Hydrated Lime'.
 - e. ASTM C207-06(2011), 'Standard Specification for Hydrated Lime for Masonry Purposes'.
 - f. ASTM C242-15, 'Standard Terminology of Ceramic Whitewares and Related Products'.
 - g. ASTM C373-16, 'Standard Test Method for Water Absorption, Bulk Density, Apparent Porosity, and Apparent Specific Gravity of Fired Whiteware Products'.
 - h. ASTM C482--02(2014), 'Standard Test Method for Bond Strength of Ceramic Tile to Portland Cement Paste'.
 - i. ASTM C501-84(2015), 'Standard Test Method for Relative Resistance to Wear of Unglazed Ceramic Tile by the Taber Abraser'.
 - j. ASTM C648-04(2014), 'Standard Test Method for Breaking Strength of Ceramic Tile'.
 - k. ASTM C847-14a, 'Standard Specification for Metal Lath'.
- 3. International Organization for Standardization:
 - a. ISO 13007-1-2013, ' Ceramic tiles - Grouts and adhesives - Part 1: Terms, definitions and specifications for adhesives'.
 - b. ISO 13007-2-2013, ' Ceramic tiles - Grouts and adhesives - Part 2: Test methods for adhesives'.
 - c. ISO 13007-3-2013, ' Ceramic tiles - Grouts and adhesives - Part 3: Terms, definitions and specifications for grouts'.
 - d. ISO 13007-4-2013, ' Ceramic tiles - Grouts and adhesives - Part 4: Test methods for grouts'.
- 4. Tile Council of North America:
 - a. TCNA B415-15, 'Wood or Metal Studs, Mortar Bed Walls, Mortar Bed Floor, Ceramic Tile'.
 - b. TCNA F111-15, 'On-Ground or Above-Ground Concrete, Unbonded Mortar Bed, Ceramic Tile'.
 - c. TCNA F115-15, 'On-Ground Concrete, Ceramic Tile, Epoxy or Furan Grout'.
 - d. TCNA W221-15, 'Solid Backing, Mortar Bed, Ceramic Tile'.
 - e. TCNA W244c-15, 'Wood or Metal Studs, Cement Backer Board, Ceramic Tile'.
 - f. TCNA W245-15, 'Wood or Metal Studs, Coated Glass Mat Water-Resistant Gypsum Backer Board, Ceramic Tile'.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference:
 - 1. In addition to agenda items specified in Section 01 3100, review following:
 - a. Review installation scheduling, coordination with related work, and placement of tile.
 - b. Review Manufacturer's installation requirements, submittals, and Installers requirements to assure issuance of Manufacturer's system warranty.
 - c. Review surface preparation.
 - d. Review water-proofing and crack isolation membrane requirements.
 - e. Review tile base installation requirements.
 - f. Review floor tile grout thickness requirements.

1.4 SUBMITTALS

- A. Action Submittals:

1. Samples:
 - a. 24 inch (600 mm) square sample on specified tile backer showing all types of tile, grout, and colors specified in this Section. 1/2 of sample board shall show floor tile, 1/4 shall show front tile, and 1/4 shall show wall tile.
 - b. One sample of each type of base tile and trim piece to be used on Project.
- B. Informational Submittals:
 1. Certificates:
 - a. Master grade certificate.
 - 1) Conform to ANSI A137.1.
 2. Manufacturer's Instructions:
 - a. Provide instructions for installation of tile-setting materials.
 3. Source Quality Control Submittals:
 - a. Provide Manufacturer documentation indicating proposed materials will satisfy requirements for Manufacturer's Warranty.
 4. Qualification Statement. See Section 01 4301 for qualifications:
 - 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) 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.

1.5 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. Qualifications:
 1. Installer: Requirements of Section 01 4301 applies, but not limited to following:
 - a. Minimum three (3) years' experience installing specified tile installations.
 - b. Minimum five (5) satisfactorily completed installations of comparable quality, scope, similar size, and complexity in past two (2) years before bidding.
 - c. Upon request, submit documentation.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
 1. Deliver and store packaged materials in their original unopened containers with labels intact until time of use.
- B. Storage and Handling Requirements:
 1. Store and handle materials in a manner to prevent damage or contamination by water, freezing, or foreign matter.
 2. Keep grade seals intact and cartons dry until tile are used.

1.7 FIELD CONDITIONS

- A. Ambient Conditions:
1. Do not apply tile setting materials to surfaces that contain frost.
 2. Keep ambient temperatures of area to receive tile work and surface temperatures of substrates at **50 deg F (10 deg C)** minimum during preparation of mortar bed, laying of tile, and for seventy-two (72) hours after completion of tile work. Use electric heat to prevent discoloration of grout.
 3. Temperature of substrate shall be **60 deg F (15.6 deg C)** and rising for application of epoxy and furan unless otherwise specifically authorized by Manufacturer.
 4. Maintain epoxy at stable temperature between **60 deg F (15.6 deg C)** and **90 deg F (32 deg C)** during curing period.

1.8 WARRANTY

- A. Manufacturer Warranty:
1. Mortar Manufacturer's twenty-five (25) year minimum system warranty on tile-setting materials for surface preparation, setting materials and grouting materials; includes replacement of defective materials and deterioration, including replacement of tile and labor and materials when products purchased are used within their shelf life and installed in accordance to Manufacturers written instructions and industry standard guidelines.

PART 2 - PRODUCTS

2.1 SYSTEMS

- A. Manufacturers:
1. Manufacturer's Contact List:
 - a. Ardex Engineered Cements, Aliquippa, PA www.ArdexAmericas.com.
 - 1) Contact Information: Don Richards (206) 979-0401
[www.Don.richards@ArdexAmericas.com](mailto:Don.richards@ArdexAmericas.com).
 - b. Custom Building Products, Seal Beach, CA www.custombuildingproducts.com.
 - 1) Contact Information: John Gallup (206) 718-6024 johng@cbpmail.net.
 - c. Dal-Tile Corp., Div. of Mohawk Industries, Dallas, TX www.daltile.com.
 - d. Interceramic Inc., Garland, TX www.interceramic.com.
 - e. Laticrete International Inc., Bethany, CT www.laticrete.com.
 - f. Mapei Americas Headquarters, Deerfield Beach, FL www.mapei.com.
 - 1) Contact Information: Bart A. Wilde (801) 467-2060 [www.bawilde@mapei.com](mailto:bawilde@mapei.com).
 - g. Merkrete, by Parex USA, Inc., Anaheim, CA www.merkrete.com.
 - 1) Contact Information: Andy Townes (505) 873-1181 andy.townes@parexusa.com.
 - h. Schuler Systems L.P., Plattsburgh, NY www.schluter.com.
- B. Category Two National Contract Suppliers. See Section 01 6200 for definitions of Categories:
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.
- C. Design Criteria:
1. General:
 - a. Paver Tile: Standard grade porcelain tile, solid color throughout, graded in accordance with ANSI A137.1:
 - 1) Cove Base with external and internal corner pieces shall be standard grade.
 - b. 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. Font Floor And Font Stair Treads: Porcelain mosaic tile with non-slip, non-abrasive surface.
2. Capabilities:
 - a. Paver Tile:
 - 1) Water Absorption when tested in accordance with ASTM C373: 0.1 to 0.5 percent.
 - 2) Abrasive Wear Resistance when tested in accordance with ASTM C501: 275 minimum.
 - 3) Breaking Strength when tested in accordance with ASTM C648: 300 lbs minimum.
 - 4) Bond Strength when tested in accordance with ASTM C482: 200 psi minimum.
 - 5) Coefficient of Friction: 0.42 minimum as measured by DCOF (Dynamic Coefficient of Friction) AcuTest method and requirements as per ANSI A137.1.
- D. Description:
 1. Paver Tile:
 - a. Tile Sizes:
 - 1) Finished floor with slope shown on Contract Documents: 2 inches (200 mm) square.
 - a) Desert Gray Speckle D200 by DalTile.
 2. Ceramic Tile:
 - a. Font Floor Tile And Font Stair Treads:
 - 1) Tile Size: 2 inch (50 mm) square nominal.
 - 2) Category Four Approved Colors. See Section 01 6200 for definitions of Categories:
 - a) Floors And Stair Treads:
 - (1) D037 Pepper White by DalTile.
 - b) Font Stair Risers And Safety Strips:
 - (1) D169 Waterfall by DalTile.
 - b. Floor Tile:
 - 1) Tile Size: 2 inch (50 mm) square nominal.
 - 2) Category Four Approved Colors. See Section 01 6200 for definitions of Categories:
 - a) Desert Gray Speckle D200 by DalTile.
 - c. Font Wall Tile:
 - 1) Walls: 6 inch by 6 inch (150 mm by 150 mm).
 - 2) Ceramic Tile Base:
 - a) 6 inch (150 mm) high, A3602 bullnose base.
 - 3) Category Four Approved Colors. See Section 01 6200 for definitions of Categories:
 - a) Font Walls:
 - (1) 0100 White by DalTile.
 - d. Wall Tile:
 - 1) Walls: 6 inch by 6 inch (150 mm by 150 mm).
 - 2) Ceramic Tile Base:
 - a) 6 inch (150 mm) high, A3602 bullnose base.
 - 3) Category Four Approved Colors. See Section 01 6200 for definitions of Categories:
 - a) Room Walls:
 - (1) 0100 White by DalTile.
 - b) Accent Color:
 - (1) X114 Desert Gray by DalTile.
 - E. Materials:
 1. Wall Tile:
 - a. Category Four Approved Products. See Section 01 6200 for definition of Categories:
 - 1) Semi-Gloss or Matte by Dal-Tile.
 2. Floor Tile:
 - a. Category Four Approved Products. See Section 01 6200 for definition of Categories:
 - 1) Porcelain mosaic floor tile by DalTile.
 3. 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 118.11.
 - b) Meet ANSI installation specification requirements of ANSI A108.5.
 - c) Expansion joints complies with TCA method EJ171.
 - 2) Type Two 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.
4. Metal Trim:
 - a. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Tile / Carpet Junction: Schluter-RENO-AETK.
 - 2) Font Stair Nosing: Schluter-TREP-B, **one inch (25 mm)**, color G or HB as selected by Architect.
 - 3) Over Expansion Joints In Slabs: Schluter DILEX-BWS, color G, PG, or HB as selected by Architect.
5. 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 and paver cove base inside corners.
 - 2) Ceramic and paver tile joints.
 - 3) Termination joints in fonts.
6. Backer Board Joint Reinforcing: **2 inch (50 mm)** wide glass fiber mesh tape.
7. 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 118.4, ANSI 118.11, 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) Category Four Approved Products. See Section 01 62 00 for definitions of Categories:
 - a) MAPEI: Ultraflex 3.
 - d. Latex/Polymer Modified Portland Cement Mortar For Walls:
 - 1) Design Criteria:
 - a) Meet ANSI material specification requirements of ANSI 118.4, ANSI 118.11, 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) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) MAPEI: Ultraflex 3.
 - e. Floor Grout (Epoxy):
 - 1) Design Criteria:
 - a) Meet ANSI material specification requirements of ANSI 118.3.
 - b) Meet ANSI installation specification requirements of ANSI A108.6 and ISO material specification ISO13007 RG.
 - 2) Approved Color:
 - a) MAPEI: No. 27 Silver.

- 3) Approved Color (Font Floor only):
 - a) MAPEI: No. 27 Silver.
- 4) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) MAPEI: Kerapoxy (sanded).
- 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 108.10 or ISO material specification ISO13007 C2ES1P2.
 - 2) Color:
 - a) MAPEI: No. 00 White.
 - 3) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) MAPEI: Keracolor-U Unsanded Polymer-Modified Grout.
- g. Waterproofing Membrane:
 - 1) Design Criteria:
 - a) Meet ANSI installation specification requirements of ANSI 108.10.
 - b) ANSI installation specification requirements not required.
 - 2) Category Four Approved Products. See Section 01 6200 for definitions for Categories:
 - a) Troweled applied, cement based:
 - (1) MAPEI: Mapelastic 315.
 - b) Liquid applied, latex based:
 - (1) MAPEI: Mapelastic AquaDefense.
- h. Crack Isolation Membrane:
 - 1) Design Criteria:
 - a) Meet ANSI installation specification requirements of ANSI 118.12.
 - b) ANSI installation specification requirements not required.
 - 2) Category Four Approved Products. See Section 01 6200 for definitions for Categories:
 - a) Flexible, thin, load-bearing, fabric-reinforced:
 - (1) MAPEI: Mapeguard 2, and Primer SM.
 - b) Liquid applied, latex based:
 - (1) MAPEI: Mapelastic AquaDefense.
- 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.

F. Mixes:

1. Mortar Beds:

	Portland Cement	Dry Sand	Damp Sand	Hydrated Lime*
Floor Mix	One Part	5 Parts	4 Part	1/10 Part
Wall Mix	One Part	--	5-1/2 to 7 Parts	1/2 Part
Font	One Part **	--	4 Part	--
Showers	One Part **	--	4 Part	--

* Optional

** Use waterproofing admixture. Mix dry then add minimum amount of water.

PART 3 - EXECUTION:

3.1 INSTALLERS

A. Acceptable Installers:

1. Meet Quality Assurance Installer Qualifications as specified in Part 1 of this specification.

3.2 EXAMINATION

- A. Verification Of Conditions:
 - 1. Examine substrates where tile will be installed for compliance with requirements for installation tolerances and other conditions effecting performance of installed tile.
 - 2. Verify tile substrate is well cured, dry, clean, and free from oil or waxy films, and curing compounds.
 - 3. Notify Architect in writing if surfaces are not acceptable to install tile:
 - a. Do not lay tile over unsuitable surface.
 - b. Commencing installation constitutes acceptance of surfaces and approval of existing conditions.

3.3 PREPARATION

- A. Surface Preparation:
 - 1. Allow concrete to cure for twenty-eight (28) days minimum before application of mortar bed.
 - 2. Repair and clean substrate in accordance with installation standards and manufacturer's instructions.

3.4 INSTALLATION

- 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 installation methods:
 - a. Flush Concrete Slabs with crack isolation membrane: TCNA F115.
 - b. Mortar Bed on Concrete Slab: TCNA F111 with reinforcing.
 - c. Font: TCNA B414 with waterproof membrane.
 - d. Framed Walls: TCNA W245 with waterproof membrane.
 - e. Tile Cove Base: TCNA Flush style.
- 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 if possible.
 - 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.

3.5 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.

3.6 CLEANING

- A. If one has been used, remove grout release and clean tile surfaces so they are free of grout residue and foreign matter:
 - 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.

3.7 PROTECTION

- A. 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.
- B. Newly tiled floors shall not be walked on nor worked on without using kneeling boards or equivalent protection of tiled surface.

- C. 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

SECTION 09 5116**ACOUSTICAL TILE CEILINGS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install acoustical tile on backerboard as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 09 2226: 'Metal Suspension System' for Gypsum Board.
 - 2. Section 09 2900: 'Gypsum Board'.
 - 3. Section 09 5116: 'Interior Lighting'.

1.2 REFERENCES

- A. Association Publications:
 - 1. The Ceilings & Interior Systems Construction Association (CISCA), 405 Illinois Avenue, 2B, St Charles IL. www.cisca.org.
 - a. '*Ceiling Systems Handbook*': Recommendations for direct hung acoustical tile installation.
 - b. '*Production Guide*': Practical reference for ceiling systems and estimating costs.
- B. Definitions:
 - 1. Absorption: Materials that have capacity to absorb sound. Absorption is the opposite of reflection.
 - 2. Ceiling Attenuation Class (CAC): Rates ceiling's efficiency as barrier to airborne sound transmission between adjacent closed offices. Shown as minimum value, previously expressed as CSTC (Ceiling Sound Transmission Class). Single-figure rating derived from normalized ceiling attenuation values in accordance with classification ASTM E413, except that resultant rating shall be designated ceiling attenuation class. (Defined in ASTM E1414.) Acoustical unit with high CAC may have low NRC.
 - 3. Class A: Fire classification for product with flame spread rating of no more than 25 and smoke developed rating not exceeding 50, when tested in accordance with ASTM E84 or UL 723.
 - 4. Flame Spread: The propagation of flame over a surface.
 - 5. Flame Spread Index: Comparative measure, expressed as a dimensionless number, derived from visual measurements of the spread of flame versus time for a material tested in accordance with ASTM E84 or UL 723.
 - 6. Light Reflectance (LR): Percentage of light a surface reflected by ceiling surface expressed in decimal form.
 - 7. Noise Reduction Coefficient (NRC): Average sound absorption coefficient measured at four frequencies: 250, 500, 1,000 and 2,000 Hertz expressed to the nearest integral multiple of 0.05. Rates ability of ceiling or wall panel or other construction to absorb sound. NRC is fraction of sound energy, averaged over all angles of direction and from low to high sound frequencies that is absorbed and not reflected.
 - 8. Smoke-Developed Index: Comparative measure, expressed as a dimensionless number, derived from visual measurements of smoke obscuration versus time for a material tested in accordance with ASTM E84 or UL 723.
 - 9. Sound Absorption: Property possessed by materials and objects, including air, of converting sound energy into heat energy. Sound wave reflected by surface always loses part of its energy. Fraction of energy that is not reflected is called sound absorption coefficient of reflecting surface. For instance, if material reflects 80 percent of sound energy, then sound absorption coefficient would be 20 percent (0.20).

10. Surface Burning Characteristic: Rating of interior and surface finish material providing indexes for flame spread and smoke developed, based on testing conducted according to ASTM Standard E84 or UL 723.
11. Textured Pattern: Granular or raised (fine, coarse, or a blend), felted or matted surface as an integral part of the basic product or superimposed on the product surface.

C. Reference Standards:

1. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE):
 - a. ASHRAE Standard 62.1-2013, 'Ventilation for Acceptable Indoor Air Quality'.
2. ASTM International;
 - a. ASTM D1779-98(2017), 'Standard Specification for Adhesive for Acoustical Materials'.
 - b. ASTM E84-18b, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
 - c. ASTM E795-16, 'Standard Practices for Mounting Test Specimens During Sound Absorption Tests'.
 - d. ASTM E1264-14, 'Standard Classification for Acoustical Ceiling Products'.
 - e. ASTM E1414/E1414-16, 'Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum'.
 - f. ASTM E1477 - 98a(2017), 'Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers'.
3. International Building Code (IBC) (2018 or latest approved Edition):
 - a. Chapter 8, 'Interior Finishes':
 - 1) Section 803, 'Wall And Ceiling Finishes':
 - a) 803.1.1, 'Interior Wall and Ceiling Finish Materials'.
 - b) 803.1.2, 'Room Corner Test for Interior Wall or Ceiling Finish Materials'.
4. National Fire Protection Association:
 - a. NFPA 101: 'Life Safety Code' (2018 Edition).
 - b. NFPA 265: 'Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Textile Coverings on Full Height Panels and Walls' (2015 Edition).
5. Underwriters Laboratories Inc.:
 - a. UL 723, 'Standard for Safety Test for Surface Burning Characteristics of Building Materials' (Tenth Edition).

1.3 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.

1.4 SUBMITTALS

A. Action Submittals:

1. Samples:
 - a. One (1) sample of each variant of specified tile series.

B. Informational Submittals:

1. Certificates:
 - a. Installer(s):
 - 1) 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.
 - a) Certificate is valid for two (2) years from date printed on Certificate before recertification is required.

2. Test And Evaluation Reports:
 - a. If requested by Owner, provide copies of Quality Assurance requirements for 'Class A' flame spread rating and 'Room-Corner Test'.
 3. Manufacturer Installations:
 - a. Published installation recommendations.
 4. Qualification Statement:
 - a. Installer(s):
 - 1) Provide Qualification documentation unless waived by Owner.
- C. Closeout Submittals:
1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Warranty Documentation:
 - 1) Include final, executed copy of warranty.
 - b. Record Documentation:
 - 1) Manufacturers Documentation:
 - a) Manufacturer's literature on tile and adhesive.
 - b) Color and pattern selection.
 - 2) Installer(s) 'Certificate of Completion - Duratile' submitted at time of bid.
- D. Maintenance Material Submittals:
1. Extra Stock Materials:
 - a. Provide Owner with six (6) cartons of each type of tile with same dye lot code.

1.5 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
1. 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.
 - a. Surface-Burning Characteristics:
 - 1) Ceiling tile 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.
 2. 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.
 - a. Room Corner Tests:
 - 1) ASTM E84, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
 - 2) IBC 803.2.1, 'Room Corner Test for Interior Wall or Ceiling Finish Materials'.
 - 3) NFPA 265: 'Room Corner Test for Interior Wall or Ceiling Finish Materials'.
 - 4) UL 723, 'Standard for Safety Test for Surface Burning Characteristics of Building Materials'.
- B. Qualifications:
1. Installer: Requirements of Section 01 4301 applies, but not limited to following:
 - a. Minimum five (5) years satisfactorily completed projects of comparable quality, similar size, and complexity including a minimum of three (3) years of experience in glue-up ceiling tile installations and shall have satisfactorily completed glue-up installation(s) within in past three (3) years before bidding.
 - b. Review, understand, and comply Installer Qualifications and submitted 'Duratile' published installation recommendations provided by Manufacturer:
 - 1) Contact Armstrong CSA customer service center at (800) 442-4212 to obtain and review compliance package on Duratile prior to bidding.
 - 2) This requirement may be waived by Owner, if Installer has previously complied with Installer Qualification requirements and can document at least two (2) satisfactorily completed projects of comparable size using Armstrong 12 inch x 12 inch (300 mm x 300 mm) ceiling tile for glue-up within past three (3) years prior to bidding.

- 3) Installer shall note complete compliance with Qualification requirements on submitted bid form.
- 4) Submit qualification documentation unless waived by Owner.
- c. Agree to complete and pass 'Duratile Personal Learning Module' (Certificate required for all Installer(s) for Church projects). Certification valid for two (2) years:
 - 1) Go to <http://www.armstrong.com/commceilingsna/#>.
 - 2) Click on My Armstrong Upper Right hand Corner.
 - 3) First time users: Click on 'Register' button and provide all appropriate information for username and password (you must register as a contractor to have access to 'ELearning System').
 - 4) Under My Armstrong Functions (left hand side), click on 'ELearning System'.
 - 5) Click on 'Duratile Video'.
 - 6) Watch video and take Quiz (10 questions). Passing grade required for certificate.
 - 7) Print Certificate.
 - 8) Certificate must be submitted with Bid.
 - 9) Submit 'Certificate of Completion - Duratile'. Required for all projects and may not be waived by Owner.

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. Store materials where protected from moisture, direct sunlight, surface contamination, and damage.
2. Store acoustic tile 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 tiles carefully to avoid chipping edges or damage. Use no soiled, scratched, or broken material in the Work.

1.7 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. Temperature at time of setting tile shall be 50 deg F (10 deg C) minimum and 100 deg F (38 deg C) maximum.

1.8 WARRANTY

A. Manufacturer Warranty:

1. Provide Manufacturer's ten (10) year limited system warranty for the following:
 - a. Manufacturer's warranty to be free from defects in materials and factory workmanship.
 - b. Manufacturer's warranty against sagging and warping.
 - c. Manufacturer's warranty against mold/mildew, and bacterial growth.

PART 2 - PRODUCTS**2.1 SYSTEM****A. Manufacturers:****1. Manufacturer Contact List:**

- a. Armstrong World Industries, Strategic Accounts, Lancaster, PA www.ceiling.com.
 - 1) For pricing and ordering of tile, contact Sherry Brunt, Phyllis Miller, or Beth Rinehart at (800) 442-4212, or Armstrongcsa@armstrong.com.
 - 2) For Strategic Account information, contact Deborah Pickens at (480) 695-9053 dlpickens@armstrong.com.
- b. Franklin International, Inc., Columbus, OH www.titebond.com.

B. Materials:**1. Description:**

- a. Size: **3/4 inch (19 mm)** thick minimum by **12 inches (300 mm)** square.
- b. Color: White.
- c. Grid Face: Tile glue-up.
- d. Surface Finish: Factory-applied.
- e. Wet-formed high density mineral fiber.

2. Design Criteria:

- a. Meet requirements of ASTM E1264, Type III (mineral base with painted finish), Form 2 (water felted), Pattern CE (perforated, small holes – lightly textured), Fire Class A.
- b. Acoustics:
 - 1) Noise Reduction Coefficient (Rating expressed according to ASTM E1284 requirements:
 - a) NRC rating: 60 minimum.
 - 2) CAC rating: 35 minimum.
- c. Anti Mold / Mildew:
 - 1) Resistance against growth of mold/mildew.
- d. Durable:
 - 1) Impact-resistant.
 - 2) Scratch-resistant.
- e. Tongue and Groove.
- f. Finish:
 - 1) Abuse-resistant/durable, factory applied vinyl latex paint.
- g. Fire Performance:
 - 1) Panels meet ASTM E84 or UL 723 Type 1 surface burning characteristics.
- h. High Recycled Content (HRC): Classified as containing greater than 50 percent total recycled content.
- i. Light Reflectance (LR): 0.86 Average (Range of 0.84 to 0.88).
- j. Sag Resistance:
 - 1) Resistance to sagging in high humidity conditions up to, but not including, standing water and outdoor applications.
- k. Texture: Embossed texture with fine fissuring and small perforations with natural variation in texture and color appearance between tile.
- l. VOC Emissions:
 - 1) Low formaldehyde: Contributing less than 13.5 ppb in typical conditions per ASHRAE Standard 62, 'Ventilation for Acceptable Indoor Air Quality'.

3. Acoustic Tile:

- a. Category Three Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Durable Item No. MN80377 by Armstrong.

C. Accessories:**1. Adhesive:**

- a. Description:
 - 1) For use on acoustical ceiling tiles.
- b. Design Criteria:
 - 1) Meet requirements of ASTM D1779.

- 2) Meet NFPA Class A fire rating when tested in accordance with ASTM E84.
- 3) Fast grab and 'no sag' installation.
- 4) Water cleanup.
- 5) Not recommended for use on tiles larger than 12 inch x 12 inch (305 mm x 305 mm).
- c. Type Two Acceptable Products:
 - 1) Titebond No. 2704 Solvent Free Acoustical Ceiling Tile Adhesive by Franklin International.
 - 2) Highest quality of adhesive from manufacturer recommended by Tile Manufacturer as approved by Architect before use. See Section 01 6200.
2. Edge Molding:
 - a. Steel 'U' molding with baked enamel finish.
 - b. Type Two Acceptable Products:
 - 1) 7843 Series by Armstrong.
 - 2) Equal as approved by Architect before installation. See Section 01 6200.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification Of Conditions:
 1. Inspect for defects in backing and support that are not acceptable.
 - a. Examine areas around HVAC diffusers and light fixtures for tile installation problems.
 - b. 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).
 - c. Examine substrate for any problems that will compromise adhesion of ceiling tile.
 2. Notify Architect in writing of unacceptable conditions.
 3. Do not apply ceiling tile until defects in backing and support are corrected.

3.2 PREPARATION

- A. Surface Preparation:
 1. Follow Manufacturer recommendations for surface preparation:
 - a. Substrate must be clean, free of grease and dirt, sound, smooth, even and level before applying tile to surface.
 - 1) Do not install new ceiling tile over old glue globs or bad substrate with any surface finish that is incompatible with tile adhesive.
 - b. Painted Surfaces: Avoid applying tile to newly painted ceiling.
 - c. Materials shall be dry and clean at time of application.

3.3 INSTALLATION

- A. Special Techniques:
 1. Installation shall be in accordance with Manufacturer's recommendations:
 - a. Do not install tile when room temperature exceeds or below recommended ambient conditions.
 - b. Tile is directional tile and must be installed in same direction of pattern running parallel to long dimension of each room.
 - c. Remove loose dust from back of tile and ceiling where adhesive is to be applied.
 - d. Prime 3 inch (75 mm) minimum circle near each corner by buttering very thin coat of adhesive.
 - e. Apply daub of adhesive to each corner. Daubs will be of sufficient size to form a circle 2-1/2 to 3 inches (63 to 75 mm) in diameter and 1/8 to 1/4 inch (3 to 6 mm) thick when tile is pressed firmly in place. Do not apply daubs so far in advance of installation that adhesive skins over.
 - f. Do not bend tile during installation.

2. Tile Layout:
 - a. Lay out tile symmetrically about center lines of room.
 - b. Lay out so tiles at room perimeters are at least 1/2 full tile size.
 - c. Leave tile in true plane with straight, even joints.
 - d. Tile joints shall be straight and in alignment, and exposed surface flush and level.
 - e. Furnish and install specified molding wherever tile has exposed edges or abuts walls, columns, and other vertical surfaces, except at curves of 3 inch (75 mm) radius or smaller.
 - f. Cut around penetrations that are not to receive moldings cleanly with sharp knife and at a slight angle away from cutout.
3. Ceiling mounted items:
 - a. Locate light fixtures, speakers, and mechanical diffusers and grilles symmetrically in room and centered on tile centers or tile joints insofar as possible, unless shown otherwise.
 - b. Keep method of locating ceiling mounted items as consistent as possible throughout building.
 - c. Ceiling mounted item location method within each room shall always be consistent.

3.4 FIELD QUALITY CONTROL

- A. Non-Conforming Work:
 1. Acoustical Tile. The following have been identified by the Manufacturer as tile defects, should not be installed, and will be replaced at no charge to Owner. Manufacturer will replace any material that does not meet product specifications. Installer to call 1 (800) 442-4212 immediately to report any tile discrepancies:
 - a. Obvious Tile Defects:
 - 1) Gross surface defects or damage.
 - 2) Gross damage to edges and corners.
 - 3) Bevels without paint.
 - b. Size Measurement:
 - 1) Tiles measure 12 inches (305 mm), plus or minus 1/32 inch (0.8 mm), measured across center of two (2) parallel sides.
 - c. Squareness Measurement:
 - 1) Measure two (2) diagonals of an individual ceiling tile.
 - 2) Diagonal measurements need to be within 1/16 inch (1.6 mm) of each other. No more than 1/16 inch (1.6 mm) difference.
 - d. Warp:
 - 1) Tiles specification is plus or minus 0.050 inch (1.27 mm) as measured in the center of tile.
 2. 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.

3.5 ADJUSTING

- A. 'Touch-up' minor abraded surfaces.

3.6 CLEANING

- A. Remove from site debris connected with work of this Section.

END OF SECTION

SECTION 09 6813**TILE CARPETING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But Is Not Limited To:
 - 1. Coordination, sequencing, and scheduling for installation of Owner-Furnished carpet tiles and carpet base used in entry vestibules using walk-off carpet tile as described in contract documents and including following:
 - a. Schedule Pre-Installation Conference held in conjunction with Section 09 6816.
 - b. Maintain Building Ambient Conditions including normal levels of humidity, lighting, heating, and air conditioning for acceptability for beginning floor preparation and carpet installation.
 - c. Protection of carpet after installation of carpeting as required.
- B. Products Furnished But Not Installed Under This Section:
 - 1. Carpet Tiles.
- C. Related Requirements:
 - 1. Section 01 1200: 'Multiple Contract Summary'. Owner will furnish and install carpet tiles and carpet base. This Section establishes quality of materials and installation for information of Contractor, Architect, and Owner's Representatives.
 - 2. Section 01 3100: 'Project Management and Coordination' for pre-installation conference.
 - 3. Section 09 0503: 'Flooring Substrate Preparation' for:
 - a. Floor substrate preparation.
 - b. Pre-installation conference for Sections under 09 6000 heading 'Flooring'.
 - 4. Section 09 6816: 'Sheet Carpeting' for:
 - a. Installation of Carpet Tile and Carpet Base:
 - b. Cleaning and Disposal requirements.

1.2 REFERENCES

- A. Association Publications:
 - 1. The Carpet and Rug Institute Inc. (CRI), Dalton, GA www.carpet-rug.org:
 - a. CRI Indoor Air Quality (IAQ):
 - 1) CRI Green Label Plus Certification.
- B. Reference Standards:
 - 1. The Carpet and Rug Institute (CRI):
 - a. CRI 104, 'Standard For Installation of Commercial Carpet' (Sept 2015).
 - b. CRI TM-102, 'School Carpet Minimum Average Specifications'.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate completion of flooring installation with other trades.
- B. Pre-Installation Conference:
 - 1. Participate in MANDATORY pre-installation conference as specified in Section 09 0503 and held jointly with Section 09 6816 pre-installation conference.
 - 2. Schedule pre-installation conference after Concrete Moisture testing and 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 in Section 01 3100 and Section 09 0503, 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.

1.4 SUBMITTALS

- A. Closeout Submittals:
1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Warranty Documentation:
 - 1) Copy of Warranty.
 - 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 Pre-installation 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 carpet tiles equivalent to 15 percent of number installed as attic stock.
 - b. Tie securely and wrap in protective cover.

1.5 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.
- B. Qualifications: Section 01 4301 applies, but is not limited to following:
1. Carpet Manufacturer Qualifications:
 - a. Not less than five (5) years of production experience, whose published literature clearly indicates general compliance of products with requirements of this section.
 - b. Category One Approved Carpet Manufacturers:
 - 1) Approval subject to agreement process approval.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. 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.
- B. 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.

1.7 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.
 - 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%.
 - 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.

1.8 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. If carpet defect or installation defect continues to appear after two (2) separate notices for correction from Owner, replace carpet where defects have occurred.
 - e. If Carpet Manufacturer follows installation requirements of Section 09 0503 'Floor Substrate Preparation' Carpet Manufacture 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. Modular Carpeting:
 - 1) General:
 - a) Appearance Retention to be provided with Special Warranty requirements if not already included in Standard Warranty.
 - 2) Meetinghouse, Mission Office, S&I Module, and O&M / R&I:

- a) Owner Carpet Program Product: Provide fifteen (15) year minimum or Carpet Manufacturer's better Warranty on carpet system.

PART 2 - PRODUCTS

2.1 OWNER-FURNISHED PRODUCTS

- A. Category One Approved Manufacturers. See Section 01 6200 for definitions of Categories:
 1. Lees, Division of Mohawk Carpets, Glasgow, VA:
 - a. Contact Information: Help Line (800) 523-5555 or (801) 397-5626.
 2. Mannington Commercial Carpets, Calhoun, GA:
 - a. Contact Information: Help Line Voice Mail (800) 241-2262, ext 8045 or Mannington Installation Services, email lds@mannington.com or (855) 466-2664.
 3. Tandus Centiva, Dalton, GA www.tandus-centiva.com.
 - a. Contact Information: Tracy Riddle - cell (801) 580-5147 fax (866) 861-7522
Tracy.Riddle@Tarkett.com.
- B. Materials:
 1. Carpet Tiles (walk-off) Vestibules only:
 - 1) Size: 18 inch or 24 inch (457 mm or 609 mm) square, at Manufacturer's option.
 - 2) Category One Approved Manufacturer and Color / Patterns. See Section 01 6200 for definitions of Categories:
 - a) Mannington, Entry Guard, Color: Black.
 - b) Mohawk: StepUp Modular DD762: Color: 508 Mineral.
 - c) Tandus Centiva: Abrasive Action II, Color: Winter Gray 19103.
 2. Carpet Base (entry vestibules using walk-off carpet tile):
 - a. 4-1/2 inch (115 mm) wide base without cushion backing.
 - 1) Top edge of base serged with 1-1/4 inch (32 mm) polyester binding fabric.
 - 2) Roll edges of binding fabric under and sew along top edge of carpet cove base.
 - b. Carpet:
 - 1) Category One Approved Products. See Section 01 6200 for definitions of Categories
 - a) Mannington: Ultrabac RE, Color: Black.
 - b) Bigelow Commercial (Mohawk): Spectrum V30, Color: 7234 Ebony Domino.
 - c) Tandus Centiva: Abrasive Action II, Color: Winter Gray 19103.

PART 3 - EXECUTION

3.1 APPROVED INSTALLER

- A. Same Installer of Section 09 6816: 'Sheet Carpeting' shall install Section 09 6813: 'Tile Carpeting'.

3.2 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. Concrete Slab:
 - a. Variation In Grade: 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(12 mm).
 - b. Testing Procedure: Place ends of straightedge on 3/8 inch(9 mm) high shims. 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(12 mm) diameter steel rod will not fit under straightedge anywhere along 10 foot(3 meter) length.

- c. Notify Facilities Manager in writing if floor surface is not acceptable to install carpet. Do not lay carpet over unsuitable surface. Commencing installation constitutes acceptance of floor and approval of existing conditions.

3.3 PREPARATION

A. Flooring Preparation:

1. 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:
 - a. Concrete floor slab patching:
 - 1) Cracks, chips and joints must be properly patched or repaired.
 - b. 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).
2. Vacuum and damp mop floor areas to receive flooring before flooring installation.

B. Carpet Accessories:

1. Sundry items, such as adhesives, shall be conditioned to building ambient conditions before use.

3.4 INSTALLATION

A. Carpet:

1. General:
 - a. Install carpet and carpet base in accordance with CRI Carpet Installation Standard and manufacturer's written instructions supplied with product.
 - b. Install carpet under edge of metal thresholds where possible. Use specified carpet accessories at exposed edges.

B. Carpet Base:

1. Precut base so seams occur only at inside corners.
2. Scribe base to floor.
3. Spread adhesive over back side of base up to bottom of serging on edge or apply three 3/16 inch (4.76 mm) minimum diameter beads of adhesive placed one inch apart on back of base with top bead placed 2 inch (50 mm) down from serged edge of base and spread adhesive over back surface of base up to bottom edge of serging.
 - a. Bird's mouth finish should only be required when door frame is flush with wall.
 - b. If bird's mouth is required, terminate at door frames or vertical trim with 45 degree angle, bird mouth cut so serged edge turns down to contact frame or trim.
4. Do not allow adhesive beyond edge of base. Remove excess adhesive.
5. Do not use staples, nails, screws or other mechanical fasteners.
6. Set carpet base on brick walls at height either above or below horizontal mortar joint line.

3.5 FIELD QUALITY CONTROL

A. Field Tests:

1. See Section 09 0503.02-FM 'Flooring Substrate Preparation' for Field Testing for Alkalinity and Concrete Moisture of concrete slab.

B. Field Inspections:

1. Unacceptable carpet after installation shall include but not be limited to:

- a. Delaminating carpet from backings.
 - b. Fiber loss less than specified.
 - c. Edge raveling.
 - d. Fuzzing of carpet fibers.
 - e. Pilling of carpet fibers.
 - f. Appearance retention less than control samples attached to Agreement.
 - g. Dye bleeding.
 - h. Zippering fibers in carpet.
 - i. Color streaking.
 - j. Irregular tufts of fiber.
 - 2. Unacceptable workmanship shall include but not be limited to:
 - a. Improper floor preparation before installation.
 - b. Failure of adhesive to completely adhere carpet to floor resulting in bubbles, ridges, or ripples where carpet has separated from floor.
 - c. Failure to properly install carpet next to walls and door frames to eliminate gaps or puckering of carpet.
 - d. Use of unspecified carpet.
 - e. Carpet base ends not finished to terminate at door frames or vertical trim shall have 45 degree angle 'birdsmouth' finish.
 - f. Adhesive exposed on carpet, on carpet base, beyond edges of carpet base, and on other surfaces of building.
 - g. Carpet base that is not scribed to fit against floor with no gaps.
 - h. Carpet base attached by means other than acceptable carpet base adhesive.
- C. Non-Conforming Work:
- 1. Basis of Acceptable Carpeting: Source Quality Control Testing:
 - a. Carpet products not meeting Design Criteria and Source Quality Control Testing of this specification will be considered unacceptable carpeting.
 - 2. Unacceptable Carpeting:
 - a. Unacceptable carpeting will be rejected and shall be repaired or replaced at no additional cost to Owner. Owner's Representative will determine reasonable location of acceptable transition points for removal of unacceptable carpet.

3.6 CLEANING

- A. General:
- 1. Carpet Installer's Responsibility:
 - a. Clean all exposed surfaces of adjoining areas of adhesive spatter before it sets.
 - b. Carpeting:
 - 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) Clean and repair of all damaged surfaces to their original condition from carpet installation.
- C. Waste Management:
- 1. Carpet Installer's Responsibility:
 - a. All work areas are to be kept clean, clear and free of debris at all times.
 - b. Provide adequate waste receptacles and dispose of materials including all rubbish, wrapping paper, scraps, and trimmings from building and property in approved manner as specified in Section 01 7400 unless pre-arrangements have been made with Owner and estimated costs are included on estimate and Purchase Order (PO).

3.7 PROTECTION**A. Protection of Carpeting:****1. Owner Representative'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 from abuse, vandalism, or damage occurring after installation is complete.
- d. Protect carpet adequately from soil, dust, moisture and other contaminants after carpet installation.

END OF SECTION

SECTION 09 6816**SHEET CARPETING: Back Cushion, Direct Glue****PART 1 - GENERAL****1.1 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. Pre-Installation Conference held in conjunction with Section 09 6813.
 - b. Maintain Building Ambient Conditions including normal levels of humidity, lighting, heating, and air conditioning for acceptability for beginning floor preparation and carpet installation.
 - c. Protection of carpet after installation of carpeting as required.
- B. Products Installed But Not Furnished Under This Section:
 - 1. Carpet Tile.
- C. Related Requirements:
 - 1. Section 01 1200: 'Multiple Contract Summary' for 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 3111: 'Cast-In-Place Structural Concrete' for provision of acceptable concrete substrate.
 - 3. Section 09 0503: 'Flooring Substrate Preparation' for:
 - a. Floor substrate preparation.
 - b. Pre-installation conference for Sections under 09 6000 heading 'Flooring'.
 - 4. Section 09 6813: 'Tile Carpeting' for:
 - a. Tile carpeting and carpet base used in entry vestibules using walk-off carpet tile.

1.2 REFERENCES

- A. Association Publications:
 - 1. The Carpet and Rug Institute (CRI), Dalton, GA www.carpet-rug.org. Standard for Installation Specification of Commercial Carpet:
 - a. CRI Indoor Air Quality (IAQ):
 - 1) CRI Green Label Plus Certification.
- B. Reference Standards:
 - 1. The Carpet and Rug Institute (CRI):
 - a. CRI 104, 'Standard For Installation of Commercial Carpet' (Sept 2015).
 - b. CRI TM-102, 'School Carpet Minimum Average Specifications'.

1.3 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 0503 and held jointly with Section 09 6813 pre-installation conference.
 - 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 3100 and Section 09 0503, 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.

1.4 SUBMITTALS

- A. Closeout Submittals:
1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Warranty Documentation:
 - 1) Copy of Warranty.
 - 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 excess pieces of carpet, 6 feet square (1 800 sq mm) or larger and 25 lineal feet (7.620 m) minimum of carpet cove base.
 - b. Roll up and tie securely.

1.5 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.
- B. Qualifications: Section 01 4301 applies, but is not limited to following:
1. Carpet Installer Qualifications:
 - a. Certified CFI Master or Contract II grade installer or FCIB certified.
 - b. Not less than five (5) years of experience in installation of commercial carpet tile of type, quantity and installation methods similar to work of this section.
 - c. Qualified and approved by Carpet Manufacturer.
 2. Carpet Manufacturer Qualifications:

- a. Not less than five (5) years of production experience, whose published literature clearly indicates general compliance of products with requirements of this section.
- b. Category One Approved Carpet Manufacturers:
 - 1) Approval subject to agreement process approval.

1.6 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.

1.7 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%.
 - 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.

1.8 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, stairs, rostrum and platform ('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 0503 'Floor Substrate Preparation' Carpet Manufacture 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.
 - 2) Meetinghouse, Mission Office, and O&M / R&I:
 - a) Owner Carpet Program Product: Provide twenty (20) year minimum or Carpet Manufacturer's better Warranty on carpet system.

PART 2 - PRODUCTS

2.1 OWNER-FURNISHED PRODUCTS

- A. Category One Approved Manufacturers. See Section 01 6200 for definitions of Categories:
 - 1. Materials supplied for carpet installation shall be complete package from specified Carpet Manufacturer:
 - a. Lees, Division of Mohawk Carpets, Glasgow, VA:
 - 1) Contact Information: Help Line (800) 523-5555 or (801) 397-5626.
 - b. 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.
 - c. Tandus Centiva: Dalton, GA www.tandus-centiva.com.
 - 1) Contact Information: Tracy Riddle - cell (801) 580-5147 fax (866) 861-7522
Tracy.Riddle@Tarkett.com.
- B. Materials:
 - 1. Carpet:
 - a. Category One Approved Manufacturer and Interior Color Scheme.
 - 1) Match existing
 - 2. Carpet Base:
 - a. 4-1/2 inch (115 mm) wide base without cushion backing:
 - 1) Top edge of base serged with 1-1/4 inch (32 mm) polyester binding fabric.
 - 2) Roll edges of binding fabric under and sew along top edge of carpet cove base.
 - b. Carpet:
 - 1) Category One Approved Products. See Section 01 6200 for definitions of Categories:
 - a) Mannington: Ultrabac RE, Color: Black.
 - b) Bigelow Commercial (Mohawk): Spectrum V30, Color: 7234 Ebony Domino.
 - c) Tandus Centiva: Abrasive Action II, Color: Winter Gray 19103.

2.2 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

3.1 APPROVED INSTALLER

- A. Same installer of Section 09 6816: 'Sheet Carpeting' shall install Section 09 6813: 'Tile Carpeting'.

3.2 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.

3.3 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.
 - 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 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.

3.4 INSTALLATION

A. Carpet:

1. General:
 - a. Install carpet and carpet base in accordance with 'CRI Carpet Installation Standard' and Manufacturer's written instructions supplied with product.
 - b. Adhesion of carpet cushion (or secondary backing) to floor substrate and adhesion of carpet primary and secondary backings shall be continuous on floor surface so there are no bubble, ridges, or any separation of carpet from backings or backing from floor substrate caused by failure of carpet, backings or cushion, and adhesives as a system.
 - c. Install carpet under edge of metal thresholds where possible. Use specified carpet accessories at exposed edges.
2. Seaming Requirements:
 - a. Seal seams in accordance with Carpet Manufacturer's instructions and according to CRI Carpet Installation Standard (2009) as applicable. Seam carpet base only at inside corners.
 - b. No seam separation in carpet and no more observable seams from any standing position than that which is unavoidable using best seaming materials and practices available at time of installation.
 - c. Lay rooms parallel to respective Corridors. Seam to permit best use of available carpet.
 - d. Quarter turning allowed only at cross-Corridors longer than **24 feet (7.315 m)**.
 - e. Use single or double seams at doorways (single seams preferred). Run nap of pieced carpet in same direction.

B. Carpet Base:

1. Precut base so seams occur only at inside corners.
2. Scribe base to floor.
3. Spread adhesive over back side of base up to bottom of serging on edge or apply three **3/16 inch (4.76 mm)** minimum diameter beads of adhesive placed one inch apart on back of base with top bead placed **2 inch (50 mm)** down from serged edge of base and spread adhesive over back surface of base up to bottom edge of serging.
 - a. Bird's mouth finish should only be required when door frame is flush with wall.
 - b. If bird's mouth is required, terminate at door frames or vertical trim with 45 degree angle, bird mouth cut so serged edge turns down to contact frame or trim.
4. Do not allow adhesive beyond edge of base. Remove excess adhesive.
5. Do not use staples, nails, screws or other mechanical fasteners.

3.5 FIELD QUALITY CONTROL

A. Field Inspections:

1. Carpeting:
 - a. Unacceptable carpet after installation shall include but not be limited to:
 - 1) Delaminating carpet from backings.
 - 2) Fiber loss less than specified.
 - 3) Edge raveling.
 - 4) Fuzzing of carpet fibers.
 - 5) Pilling of carpet fibers.
 - 6) Appearance retention less than control samples attached to Agreement.
 - 7) Dye bleeding.

- 8) Zippering fibers in carpet.
 - 9) Color streaking.
 - 10) Irregular tufts of fiber.
 - b. Unacceptable workmanship shall include but not be limited to:
 - 1) Improper floor preparation before installation.
 - 2) Failure of adhesive to completely adhere carpet to floor resulting in bubbles, ridges, or ripples where carpet has separated from floor.
 - 3) Seams that do not comply with specified requirements:
 - a) Raveled or untrimmed seams.
 - b) Seams not sealed, level, straight, or even.
 - c) Open seams.
 - d) Seams visibly open when viewed by Project Manager from standing position.
 - 4) Sequence rolls, commercial match issues created by rolls being installed out of sequence will require correction or replacement.
 - 5) Failure to properly install carpet next to walls and door frames to eliminate gaps or puckering of carpet.
 - 6) Use of unspecified carpet.
 - 7) Carpet base ends not finished to terminate at door frames or vertical trim shall have 45 degree angle 'birdsmouth' finish.
 - 8) Adhesive exposed on carpet, on carpet base, beyond edges of carpet base, and on other surfaces of building.
 - 9) Carpet base that is not scribed to fit against floor with no gaps.
 - 10) Carpet base attached by means other than acceptable carpet base adhesive.
- B. Non-Conforming Work:
- 1. Carpeting:
 - a. Basis of Acceptable Carpeting: Source Quality Control Testing:
 - 1) Carpet products not meeting Design Criteria and Source Quality Control Testing of this specification will be considered unacceptable carpeting.
 - b. Unacceptable Carpeting:
 - 1) Unacceptable carpeting will be rejected and shall be repaired or replaced at no additional cost to Owner. Owner's Representative will determine reasonable location of acceptable transition points for removal of unacceptable carpet. Minimum replacement size shall be:
 - a) Between nearest existing seams.
 - b) Between natural transition points or 12 feet (3.6 meters) of running length.

3.6 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 7400.
 - 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).

3.7 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.

END OF SECTION

SECTION 09 7226**SISAL WALL COVERING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnishing and installing wall covering 'Type A' (Sisal) as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 06 4512: 'Architectural Woodwork Wood Trim' for wood trim for sisal wall covering.
 - 2. Section 09 2900: 'Gypsum Board' for priming of gypsum board.

1.2 REFERENCES

- A. Definitions:
 - 1. Class A: Fire classification for product with flame spread rating of no more than 25 and smoke developed rating not exceeding 50, when tested in accordance with ASTM E84 or UL 723.
 - a. Flame Spread: The propagation of flame over a surface.
 - b. Flame Spread Index: The numerical value assigned to a material tested in accordance with ASTM E84 or UL 723.
 - c. Smoke-Developed Index: The numerical value assigned to a material tested in accordance with ASTM E84 or UL 723.
 - d. Surface Burning Characteristic: Rating of interior and surface finish material providing indexes for flame spread and smoke developed, based on testing conducted according to ASTM Standard E84 or UL 723.
- B. Reference Standards:
 - 1. ASTM International:
 - a. ASTM E84-18, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
 - 2. International Building Code (IBC) (2015 or latest approved edition):
 - a. Chapter 8, 'Interior Finishes':
 - 1) Section 803, 'Wall And Ceiling Finishes':
 - a) 803.1.3, 'Room Corner Test for Textile Wall Coverings and Expanded Vinyl Wall Coverings'.
 - b) 803.1.4, 'Acceptance Criteria for Textile and Expanded Vinyl Wall Coverings Tested to ASTM E84 or UL 723'.
 - 3. National Fire Protection Association:
 - a. NFPA 101: 'Life Safety Code' (2015 Edition).
 - b. NFPA 265: 'Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Textile Coverings on Full Height Panels and Walls', (2015 Edition).
 - 4. Underwriters Laboratories, Inc.:
 - a. UL 723: 'Standard for Safety Test for Surface Burning Characteristics of Building Materials'; (2010 - Tenth Edition).

1.3 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Manufacturer's literature or cut sheet.
 - b. Maintenance instructions.
 - c. Color and pattern selection.

- B. Informational Submittals:
 - 1. Test And Evaluation Reports:
 - a. Copies of Quality Assurance requirements for 'Class A' flame spread rating and 'Room-Corner Test'.
 - 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) Cleaning and maintenance instructions.
 - b. Record Documentation:
 - 1) Manufacturers Documentation:
 - a) Manufacturer's literature or cut sheets.
 - b) Color and pattern selections.

1.4 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Fire-Test-Response Characteristics: As determined by testing identical wall coverings 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.
 - a. Surface-Burning Characteristics:
 - 1) Wall covering 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.
 - 2. Passage of 'Room-Corner Test' as recognized by AHJ, is required for system. Adhesive cited in test literature is required for installation of wall covering on Project.
 - a. Room Corner Tests:
 - 1) ASTM E84, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
 - 2) IBC 803.1.3, 'Room Corner Test for Textile Wall Coverings and Expanded Vinyl Wall Coverings'.
 - 3) IBC 803.1.4, 'Acceptance Criteria for Textile and Expanded Vinyl Wall Coverings Tested to ASTM E84 or UL 723'.
 - 4) NFPA 265, 'Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Textile Coverings on Full Height Panels and Walls'.
 - 5) UL 723, 'Standard for Safety Test for Surface Burning Characteristics of Building Materials'.
- B. Qualifications:
 - 1. Installer: Requirements of Section 01 4301 applies, but not limited to following:
 - a. Minimum three (3) years experience in wall covering installations.
 - b. Minimum five (5) years satisfactorily completed projects of comparable quality, similar size, and complexity in past three (3) years before bidding.
 - c. Agree to view 'No-Flame Sisal Wall Covering Recommended Installation Procedures' provided by Owner found on internet in AEC Webpage under Training in Menu tab. Contact Architect for access to video. This requirement may be waived by Owner, if Installer has viewed video before or can document at least two (2) satisfactorily completed projects of comparable size using sisal wall coverings in past three (3) years before bidding.
 - d. Upon request, submit documentation and video verification.

1.5 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 at temperatures below 90 deg F (32 deg C) and above 50 deg F (10 deg C). Keep from freezing.
2. Keep container tightly closed in well-ventilated area, and store upright when not in use.
3. Shelf life: One (1) year minimum - Unopened containers.

1.6 FIELD CONDITIONS

A. Ambient Conditions:

1. Apply when the temperature is between 50 deg F (10 deg C) minimum and 100 deg F (38 deg C) maximum and relative humidity is less than seventy-five (75) percent.
2. Provide good ventilation.

1.7 WARRANTY

A. Manufacturer Warranty:

1. Provide five (5) year warranty against manufacturing defects.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer Contact List:

1. Design Materials Inc, Kansas City, KS www.dmikc.com.
2. Fibreworks, Louisville, KY www.fibreworks.com.

2.2 DESCRIPTION

- A. Colors: Match existing.

2.3 MATERIALS

A. Sisal Wall Covering:

1. 100 percent fire-treated sisal yarn.
2. 1/4 inch (6 mm) pile height, 48 oz/sq yd (1 627 grams/sq meter) minimum. Sisal to be installed full height on walls shall be furnished in 9 or 13 foot (2.75 or 3.96 meters) wide goods.
3. Reversible weave type, without backing.

2.4 ACCESSORIES

A. Wall Covering Adhesive:

1. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a. 257 Sisal Adhesive by Fibreworks.
 - b. Sisal Adhesive No. 1-422 by Design Materials.

B. Seam Cement:

1. Type Two Acceptable Products:
 - a. 8415 Glue-Down Carpet Seam Adhesive by Roberts Consolidated Industries, Div QEP, Henderson, NV www.robertsconsolidated.com.

- b. Equal as recommended by Wall Covering Manufacturer with approval of Architect before installation. See Section 01 6200.

PART 3 - EXECUTION

3.1 INSTALLERS

- A. Acceptable Installers:
 - 1. Meet Quality Assurance Installer Qualifications as specified in Part 1 of this specification.

3.2 EXAMINATION

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

3.3 INSTALLATION

- A. Apply wall covering in accordance with Manufacturer's instructions, available on DVD from Owner through Architect. See Quality Assurance Installer Qualifications as specified in Part 1 of this specification.
- B. Using specified adhesive, glue continuously to surface to be covered with wall covering. Apply adhesive in accordance with Manufacturer's recommendations.
- C. Run 'ribs' in weaving horizontally (panel style) when installing wall covering full height. If sisal installed only as wainscoting, 'ribs' may be installed vertically. Install wall covering so it extends to within **1/8 inch (3 mm)** of floor slab.
- D. Carry sisal around corners approximately **6 inch (152 mm)** making no outside corner cuts.

END OF SECTION

SECTION 09 9001**COMMON PAINTING AND COATING REQUIREMENTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
- Common procedures and requirements for field-applied painting and coating.
- B. Related Requirements:
- Section 05 0503: 'Shop-Applied Metal Coatings' for quality of shop priming of steel and iron.
 - Section 07 9213: 'Elastomeric Joint Sealants' for quality of Elastomeric Joint Sealants.
 - Sections under 09 9000 heading 'Paints and Coatings'.
 - Pre-Installation conferences held jointly with Section 09 9001.
 - Divisions 22 and 23: Painting of plumbing and HVAC identification, refrigerant line insulation, and duct interiors.

1.2 REFERENCES

- A. Definitions:
- Damage Caused By Others: Damage caused by individuals other than those under direct control of Painting Applicator (MPI(a), PDCA P1.92).
 - Gloss Levels:
 - Specified paint gloss level shall be defined as sheen rating of applied paint, in accordance with following terms and values, unless specified otherwise for a specific paint system.

Gloss Level '1'	Traditional matte finish - flat	0 to 5 units at 60 degrees to 10 units maximum at 85 degrees.
Gloss Level '2'	High side sheen flat - 'velvet-like' finish	10 units maximum at 60 degrees and 10 to 35 units at 85 degrees.
Gloss Level '3'	Traditional 'eggshell-like' finish	10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees.
Gloss Level '4'	'Satin-like' finish	20 to 35 units at 60 degrees and 35 units minimum at 85 degrees.
Gloss Level '5'	Traditional semi-gloss	35 to 70 units at 60 degrees.
Gloss Level '6'	Traditional gloss	70 to 85 units at 60 degrees.
Gloss Level "7"	High gloss	More than 85 units at 60 degrees.

- Properly Painted Surface:
 - Surface that is uniform in appearance, color, and sheen and free of foreign material, lumps, skins, runs, sags, holidays, misses, strike-through, and insufficient coverage. Surface free of drips, spatters, spills, and overspray caused by Paint Applicator. Compliance will be determined when viewed without magnification at a distance of **5 feet (1.50 m)** minimum under normal lighting conditions and from normal viewing position (MPI(a), PDCA P1.92).
- Latent Damage: Damage or conditions beyond control of Painting Applicator caused by conditions not apparent at time of initial painting or coating work.

B. Reference Standards:

- The latest edition of the following reference standard shall govern all painting work:

- a. MPI(a), 'Architectural Painting Specification Manual' by Master Painters Institute (MPI), as issued by local MPI Accredited Quality Assurance Association having jurisdiction.
- b. MPI(r), 'Maintenance Repainting Manual' by Master Painters Institute (MPI), as issued by local MPI Accredited Quality Assurance Association having jurisdiction.

1.3 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 2900 to review gypsum board finish preparation.
 2. In addition to agenda items specified in Section 01 3100, 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'.

1.4 SUBMITTALS

- A. Action Submittals:
 1. Product Data:
 - a. Include following information for each painting product, arranged in same order as in Project Manual.
 - 1) Manufacturer's cut sheet for each product indicating ingredients and percentages by weight and by volume, environmental restrictions for application, and film thicknesses and spread rates.
 - 2) Provide one (1) copy of 'MPI Approved Products List' showing compliance for each MPI product specified.
 - a) MPI Information is available from MPI Approved Products List using the following link: <http://www.paintinfo.com/mpi/approved/index.shtml>.
 - 3) Confirmation of colors selected and that each area to be painted or coated has color selected for it.
 2. Samples: Provide two 4 inch by 6 inch (100 mm by 150 mm) minimum draw-down cards for each paint or coating color selected for this Project.
- B. Informational Submittals:
 1. Manufacturer Instructions:
 - a. Manufacturer's substrate preparation instructions and application instruction for each painting system used on Project.
 2. Qualification Statement:
 - a. Applicator:
 - 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. 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.

D. Maintenance Materials Submittals:

1. Extra Stock Materials:

- a. Provide painting materials in Manufacturer's original containers and with original labels in each color used. Label each can with color name, mixture instructions, date, and anticipated shelf life.
- b. Provide one (1) quart of each finish coat and one (1) pint of each primer and of each undercoat in each color used.

1.5 QUALITY ASSURANCE

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. Qualifications:

1. Applicator: Requirements of Section 01 4301 applies, but not limited to following:
 - a. Minimum five (5) years' experience in painting installations.
 - b. Minimum five (5) satisfactorily completed projects of comparable quality, similar size, and complexity in past three (3) years before bidding.
 - c. Maintain qualified crew of painters throughout duration of the Work.
 - d. Upon request, submit documentation.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery And Acceptance Requirements:

1. Deliver specified products in sealed, original containers with Manufacturer's original labels intact on each container.
2. Deliver amount of materials necessary to meet Project requirements in single shipment.
3. Notify Architect two working days before delivery of coatings.

B. Storage And Handling Requirements:

1. Store materials in single place.
2. Keep storage area clean and rectify any damage to area at completion of work of this Section.
3. Maintain storage area at 55 deg F (13 deg C) minimum.

1.7 FIELD CONDITIONS

A. Ambient Conditions:

1. Perform painting operations at temperature and humidity conditions recommended by Manufacturer for each operation and for each product for both interior and exterior work.
2. Apply painting systems at lighting level of 540 Lux (50 foot candles) minimum on surfaces to be painted.
 - a. Inspection of painting work shall take place under same lighting conditions as application.
 - b. 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

2.1 SYSTEMS

A. 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. Where required to meet LEED (Leadership in Energy and Environmental Design) program requirements, use only MPI listed materials having an "L" rating designation.

B. 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.

PART 3 - EXECUTION

3.1 APPLICATORS

A. Approved Applicators:

1. Meet Quality Assurance Applicator Qualifications as specified in Part 1 of this specification.

3.2 EXAMINATION

A. 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.

B. 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.

C. 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.

3.3 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.
 - c. On existing work where ceiling is to be painted, speakers and grilles are already installed, and ceiling color is not being changed, mask off metal grilles installed on ceiling speakers. If ceiling color is being changed, remove metal grilles and paint, and mask off ceiling speakers.

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.

3.4 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.

1. Finish casework and wood trims that are specified to be installed under Section 06 2001 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 behind speaker grilles incorporating grille cloth with flat black paint.

- 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 9213.
- 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.

3.5 FIELD QUALITY CONTROL

- A. 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.

3.6 CLEANING

- A. General:
 - 1. 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.
- B. 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.

END OF SECTION

SECTION 09 9112**EXTERIOR PAINTED FERROUS METAL****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Preparing and painting new exterior ungalvanized iron and steel surfaces as described in Contract Documents.
 - 2. Preparing and painting following existing exterior ungalvanized iron and steel surfaces as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 09 9001: 'Common Painting And Coating Requirements':
 - a. Pre-installation conference for Sections under 09 9000 heading 'Paints and Coatings'.
 - b. 'Attachment: Paint Color Schedule' for O&M / R&I Projects.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conferences:
 - 1. Participate in pre-installation conference as specified in Section 09 9001.

PART 2 - PRODUCTS**2.1 SYSTEM**

- A. Manufacturers:
 - 1. Category Four Approved Products and Manufacturers. See Section 01 6200 for definitions of Categories:
 - a. Products listed in edition of MPI Approved Product List current at time of bidding and later are approved.
- B. Description:
 - 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.
- C. Design Criteria:
 - 1. Systems specified are in addition to prime coats provided under other Sections of Project Manual.
 - 2. Finish Requirements: Use MPI Premium Grade finish requirements for work of this Section.
 - 3. Gloss / Sheen Level Required: Gloss Level 5.
- D. Materials:
 - 1. All paints and coatings.
 - a. Primer Coat: MPI Product 107, 'Primer, Rust-Inhibitive, Water Based'.
 - b. Finish Coats: MPI Product 163, 'Light Industrial Coating, Exterior, Water Based, Semi-Gloss (MPI Gloss Level 5).

PART 3 - EXECUTION**3.1 APPLICATION**

- A. General: See appropriate paragraphs of Section 09 9001.
- B. 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.
- C. Existing Painted Surfaces:
 - 1. Remove deteriorated and chalked existing paint and rust down to sound substrate by scraping or power tools.
 - 2. Clean existing sound painted surfaces as well as scraped and sanded existing painted surfaces as recommended by Paint Manufacturer. If all traces of rust cannot be removed, apply rust blocker recommended by Paint Manufacturer before applying primer coat.
 - 3. Spot prime bare metal surfaces followed by a prime coat over entire surface to be painted.
 - 4. Lightly sand entire surface.
 - 5. Clean surface as recommended by Paint Manufacturer.
 - 6. Apply specified finish coats.

END OF SECTION

SECTION 09 9113**EXTERIOR PAINTED GALVANIZED METAL****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Preparing and painting new exterior exposed galvanized metal surfaces as Described in Contract Documents.
 - 2. Preparing and painting following existing exterior exposed galvanized metal surfaces as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 09 9001: 'Common Painting And Coating Requirements':
 - a. Pre-installation conference for Sections under 09 9000 heading 'Paints and Coatings'.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conferences:
 - 1. Participate in pre-installation conference as specified in Section 09 9001.

PART 2 - PRODUCTS**2.1 SYSTEM**

- A. Manufacturers:
 - 1. Category Four Approved Products and Manufacturers. See Section 01 6200 for definitions of Categories.
 - 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.
- B. Description:
 - 1. 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.
 - 2. 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.
- C. Performance:
 - 1. Design Criteria:
 - a. New Surfaces: MPI Premium Grade finish requirements.
 - b. Deteriorated Existing Surfaces: MPI Premium Grade finish requirements.
 - c. Sound Existing Surfaces: MPI Custom Grade finish requirements.
 - d. Gloss / Sheen Level Required: Gloss Level 5.
- D. Materials:
 - 1. Polyurethane:
 - a. Vinyl Wash Primer Coat: MPI Product 80: 'Primer, Vinyl Wash'.
 - b. Finish Coats:
 - 1) Epoxy MPI Product 101: 'Primer, Epoxy, Anti-Corrosive, for Metal'.

- 2) Polyurethane MPI Product 72: 'Polyurethane, Two-Component, Pigmented, Gloss (MPI Gloss Level 6-7)'.
2. Latex:
 - a. Waterborne Primer Coat: MPI Product 134: 'Primer, Galvanized, Water Based'.
 - b. Finish Coats: MPI Product 11: 'Latex, Exterior Semi-Gloss (MPI Gloss Level 5)'.

PART 3 - EXECUTION

3.1 APPLICATION

- A. General: See appropriate paragraphs of Section 09 9001.
- B. New Surfaces:
 1. Clean 'passivated' or 'stabilized' galvanized steel as specified in SSPC-SP1.
 2. 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.
 3. Apply prime coat.
 4. Apply finish coats.
- C. Existing Painted Surfaces:
 1. Remove deteriorated and chalked existing paint and rust deposits down to sound substrate by sanding, scraping, or wire brushing.
 2. Clean existing sound painted surfaces as well as scraped and sanded existing painted surfaces as recommended by Paint Manufacturer.
 3. Apply prime coat.
 4. Apply finish coats.
- D. Existing Unpainted Surfaces:
 1. Wirebrush or power wash as necessary to remove 'white rust'.
 2. Apply prime coat.
 3. Apply finish coats.

END OF SECTION

SECTION 09 9123**INTERIOR PAINTED GYPSUM BOARD, PLASTER****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Preparing, priming, and finish painting new interior gypsum board and plaster surfaces as described in Contract Documents.
 - 2. Preparing and painting following existing interior gypsum board and plaster surfaces as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 09 2900: 'Gypsum Board' for:
 - a. Priming new interior gypsum board surfaces to receive sheet wall covering system or texturing.
 - b. Pre-installation conference.
 - 2. Section 09 9001: 'Common Painting And Coating Requirements':
 - a. Pre-installation conference for Sections under 09 9000 heading 'Paints and Coatings'.
 - b. 'Attachment: Paint Color Schedule' for O&M / R&I Projects.
 - 3. Section 09 9413: 'Interior Textured Finishing' for textured finishes.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conferences:
 - 1. Participate in pre-installation conference as specified in Section 09 2900.
 - a. In addition to agenda items specified in Section 01 3100 and Section 09 2900, review following:
 - 1) Review finish level requirements of gypsum wallboard as specified in Section 09 2900.
 - 2. Participate in pre-installation conference as specified in Section 09 9001.

PART 2 - PRODUCTS**2.1 SYSTEM**

- A. Manufacturers:
 - 1. Category Four Approved Manufacturers and Products. See Section 01 6200 for definitions of Categories.
 - 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.
- B. Description:
 - 1. Rest Rooms, And Font Rooms:
 - a. New Surfaces: Use MPI(a) INT 9.2F Waterborne Epoxy Finish system.
 - b. Previously Finished Surfaces: Use MPI(r) RIN 9.2E Waterborne Epoxy Finish system.
 - 2. All Other:
 - a. New Surfaces: Use MPI(a) INT 9.2B Latex Finish system.
 - b. Previously Finished Work: Use MPI(r) RIN 9.2B Latex Finish system.
- C. Performance:

1. Design Criteria:
 - a. New Surfaces: MPI Premium Grade finish requirements.
 - b. Deteriorated Existing Surfaces: MPI Premium Grade finish requirements.
 - c. Sound Existing Surfaces: MPI Custom Grade requirements.
 - d. Gloss / Sheen Required:
 - 1) Rest Rooms: Gloss Level 6.
 - 2) Font Room: Gloss Level 6.
 - 3) Remaining Painted Surfaces: Gloss Level 5.
- D. Materials:
 1. Primers:
 - a. MPI Product 50, 'Primer Sealer, Latex, Interior'.
 2. Finish Coats:
 - a. Rest Rooms, And Font Room:
 - 1) Buildings with only Gypsum Board surfaces in rooms:
 - a) MPI Product 115, 'Epoxy-Modified Latex, Interior, Gloss (MPI Gloss Level 6)'.
 - b. Remaining Painted Surfaces:
 - 1) MPI Product 141, 'Latex, Interior, High Performance Architectural, Semi-Gloss (MPI Gloss Level 5)'.

PART 3 - EXECUTION

3.1 APPLICATION

- A. General: See appropriate paragraphs of Section 09 9001.
- B. New Surfaces:
 1. Primer: Apply primer to be covered with other paint coats with roller only, or with spray gun and back-rolled.
- C. Existing Painted Surfaces:
 1. 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.
 2. 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.
 3. Spackle and tape cracks. Sand to smooth finish and spot prime.
 4. Sand or chemically etch existing painted surface as required to prepare surface to accept new paint.
 5. Re-clean surface.
 6. Apply primer coat.
 7. Apply finish coats.

END OF SECTION

SECTION 09 9324**INTERIOR CLEAR-FINISHED HARDWOOD****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Preparing and finishing of new interior clear finished hardwood as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 06 2210: 'Miscellaneous Wood Trim'.
 - 2. Section 06 4114: 'Wood-Veneer-Faced Architectural Cabinets'.
 - 3. Section 06 4512: 'Architectural Woodwork Wood Trim'.
 - 4. Section 08 1429: 'Interior Flush Wood Doors'.
 - 5. Section 09 9001: 'Common Painting And Coating Requirements':
 - a. Pre-installation conference for Sections under 09 9000 heading 'Paints and Coatings'.

1.2 REFERENCES

- A. Reference Standards:
 - 1. Kitchen Cabinet Manufacturers Association / American National Standards Institute:
 - a. ANSI/KCMA A161.1-2000 (R2005) 23-Jan-2001 'Recommended Performance and Construction Standards for Kitchen and Vanity Cabinets.'

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conferences:
 - 1. Participate in pre-installation conference as specified in Section 09 9001.
 - 2. In addition to agenda items specified in Section 01 3100 and Section 09 9001, review following:
 - a. Review control sample(s).

1.4 SUBMITTALS

- A. Action Submittals:
 - 1. Samples:
 - a. Interior Hardwood for Transparent Finish:
 - 1) Requirements for samples are specified in Related Requirement Sections listed above.
 - b. Design Criteria:
 - 1) Sample will be used as performance standard for evaluating finish provided.
- B. Informational Submittals:
 - 1. Test And Evaluation Reports:
 - a. Before beginning finish work, submit Finish Manufacturer's literature or certification that finish material meets requirements of ANSI / KCMA A161.1.

PART 2 - PRODUCTS**2.1 SYSTEM**

- A. Materials:
 - 1. Design Criteria:
 - a. See appropriate paragraphs of Section 09 9001.
 - 2. Stain: MPI 90, 'Stain, Semi-Transparent, for Interior Wood'.
 - 3. Clear Finish Coats:
 - a. Field Finished:
 - 1) Chemcraft International Inc:
 - a) First, Second, And Third Coats: 20 Sheen Opticlear Pre-Catalyzed Lacquer.
 - 2) ICI Dulux / Trinity:
 - a) First Coat: ICE Vinyl Sanding Sealer.
 - b) Second And Third Coats: ICI Pre-Catalyzed Lacquer.
 - 3) Lilly / Valspar:
 - a) First, Second, And Third Coats: 20 Sheen Pre-Catalyzed Lacquer 587E208.
 - 4) Sherwin-Williams:
 - a) First Coat: T67F3 Vinyl Sealer.
 - b) Second And Third Coats: T77F38 Sherwood Pre-Catalyzed Lacquer DRE.
 - b. Mill Finished: Architectural Woodwork finished in a mill may use one (1) coat of Vinyl Sealer and two (2) coats of Conversion Varnish or three (3) coats of Conversion Varnish from one (1) of the approved Finish Manufacturers, as recommended by Finish Manufacturer.
 - c. Products meeting testing requirements for finishes of ANSI / KCMA A161.1 may be used upon approval of submission by Architect before use. See Section 01 6200.
 - 4. Color:
 - a. Design Criteria:
 - 1) Finish to match existing.

PART 3 - EXECUTION**3.1 APPLICATION**

- A. General:
 - 1. See appropriate paragraphs of Section 09 9001.
 - 2. Sand entire exposed surface of item to be finished lightly with 120 to 150 non-stearated sandpaper and clean before applying dye or stain.
 - 3. Apply stain in accordance with Manufacturer's recommendations and as necessary to attain correct color.
 - 4. Scuff sand with 220 non-stearated sandpaper between application of application stain and first finish coat.
 - 5. If wood is finished before installation, finish cut ends and other unfinished, exposed surfaces same as previously finished surfaces after installation of wood.
- B. Where back-priming is required, apply one coat of finish material.
- C. Architectural Woodwork Door Surfaces (cabinetry doors only):
 - 1. Finish tops, bottoms, and edges before faces.
 - 2. Finish architectural woodwork doors with no hardware applied to doors.

END OF SECTION

SECTION 09 9413**INTERIOR TEXTURED FINISHING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and apply texturing on walls and ceilings as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 09 2900: 'Gypsum Board' for priming.
 - 2. Section 09 9001: 'Common Painting And Coating Requirements' for:
 - a. Pre-installation conference for Sections under 09 9000 heading 'Paints and Coatings'.
 - 3. Section 09 9123: 'Interior Painted Gypsum Board, Plaster' for finish painting.

1.2 REFERENCES

- A. Definitions:
 - 1. Drywall Texture: Compound rolled, sprayed, or troweled onto sheetrock after taping and floating of joints is complete. Uses same material as joint compound, but thinned down with water and applied to wall surface:
 - a. Light Orange Peel: Sprayed texture leaves light splatter on walls. Resembles peel of orange. If done with fine spray, can be one of the lightest, least noticeable of the texture styles.
 - b. Light Skip Trowel - Texture is applied to ceilings with trowel. Trowel marks may be left on surface to give a rustic, hand crafted look.
 - c. Smooth - Smooth application of texture over sheetrock wall that feathers out sheetrock joints, and creates even, non-textured wall.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conferences:
 - 1. Participate in pre-installation conference as specified in Section 09 9001.
 - 2. In addition to agenda items specified in Section 01 3100 and Section 09 9001, review following:
 - a. Review control samples.

1.4 SUBMITTALS

- A. Action Submittals:
 - 1. Samples:
 - a. Light Orange Peel Texture:
 - 1) Provide minimum of three (3) 24 inch (600 mm) square control samples on primed gypsum wallboard of 'light orange peel' texture to show possible variations.
 - b. Light Skip Trowel Texture:
 - 1) Provide minimum of three (3) 24 inch (600 mm) square control samples on primed gypsum wallboard of 'light orange peel' texture to show possible variations.

1.5 QUALITY ASSURANCE

- A. 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.

PART 2 - PRODUCTS

2.1 SYSTEM

- A. Manufacturers:
 1. Manufacturer Contact List:
 - a. National Gypsum, Charlotte, NC www.nationalgypsum.com.
 - b. U S Gypsum Co, Chicago, IL www.usg.com.
- B. Materials:
 1. Class Two Quality Standards: See Section 01 6200.
 - a. ProForm Perfect Spray EM/HF by National Gypsum.
 - b. Sheetrock Wall & Ceiling Texture by U S Gypsum.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Location:
 1. Walls:
 - a. Light Orange Peel Texture:
 - 1) All areas except those listed in following paragraph.
 - b. Smooth:
 - 1) Restrooms. Mechanical Rooms, Storage Rooms, and other Utility Areas.
 2. Ceilings:
 - a. Light Orange Peel Texture:
 - 1) Corridor transition into Foyers (sides and bottoms of headers).
 - 2) High Council Rooms Areas where there is exposed gypsum board (includes soffit and fascia of coffered area at perimeter).
 - b. Light Skip Trowel Texture:
 - 1) Foyers (including soffits and fascias of light cove).
 - 2) Vestibules.
 - 3) All other locations not indicated elsewhere.
 - c. Smooth Finish (no applied texture) to be applied to the following ceilings:
 - 1) Font.
 - 2) Mechanical Rooms.
 - 3) Restrooms.
- B. Finishing:
 1. Light Orange Peel Texture:
 - a. After gypsum board is taped and sanded, apply texture. Closely match samples accepted by Architect.
 - 1) After wall has been textured, apply priming and finish paint as specified in Section 09 9123.
 2. Skip Trowel Texture:
 - a. After gypsum board is taped and sanded, 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. Smooth:
 - a. No applied texture is required. Apply priming and paint as specified in Section 09 9123.

END OF SECTION

SECTION 10 1113**FIXED CHALKBOARDS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Installed But Not Furnished Under This Section:
 - 1. Chalkboards and specified hardware: Visual Display Board Type 1.
- B. Related Requirements:
 - 1. Section 01 6400: Owner will furnish Chalkboards. PART 2 of this Section establishes quality of materials for information of Contractor, Architect, and Owner's Representatives.
 - 2. Section 06 1100: 'Wood Framing' for blocking.
 - 3. Section 06 2001: 'Common Finish Carpentry Requirements' for installation.

1.2 REFERENCES

- A. Association Publications:
 - 1. Porcelain Enamel Institute, Inc., Norcross, GA www.porcelainenamel.com.
 - a. PEI-1002, *Manual and Performance Specifications for Porcelain Enamel Writing Surfaces (Whiteboards and Chalkboards)* 2002.

1.3 SUBMITTALS

- A. Informational Submittals:
 - 1. Manufacturer Instructions:
 - a. Published installation instructions.
 - b. Printed cleaning instructions.
- B. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Operations and Maintenance Data:
 - 1) Maintenance instructions.
 - 2) Printed cleaning instructions.
 - b. Warranty Documentation:
 - 1) Manufacturer Warranty.
 - c. Record Documentation:
 - 1) Manufacturer's documentation:
 - a) Manufacturer's product literature.
 - b) Color selections.

1.4 WARRANTY

- A. Manufacturer Warranty:
 - 1. Letter from Manufacturer certifying Contract Documents have been complied with and guarantee against faulty workmanship and materials for five years.

PART 2 - PRODUCTS

2.1 OWNER-FURNISHED PRODUCTS

- A. Category Two Approved Manufacturers. See Section 01 6200 for definitions of Categories:
 - 1. ADP Lemco Corporation, Draper, UT www.adplemco.com.
- B. Fixed Chalkboard:
 - 1. Color: Dark Gray.
 - 2. Mounting Hardware: Suitable for wall conditions.
- C. Fixed Chalkboard:
 - 1. Face:
 - a. Face shall be steel, 28 ga (0.4 mm) minimum, coated two sides with fused ground coat, and finished one side with vitreous porcelain enamel designed for use with chalk.
 - b. Coating shall meet requirements of PEI-1002.
 - 2. Core:
 - a. Core shall be mat-formed particleboard.
 - 1) 3/8 inch (9.5 mm) thick medium-density or
 - 2) 1/2 inch (12.7 mm) thick low-density minimum.
 - 3. Backing:
 - a. Backing shall be 0.005 inch (0.13 mm) minimum aluminum foil.
 - 4. Trim:
 - a. Extruded 6063-T5 alloy aluminum with satin etched, natural aluminum anodized finish.
 - b. Extrusions shall match thickness of units without wedging.
 - c. Round all sharp edges.
 - d. 2 inch (50 mm) high map rail.
 - 5. Map Clips:
 - a. Manufacturer's standard.
 - b. Provide map clips on chalkboards as follows:
 - 1) 60 Inches (1 500 mm) And Shorter: Two clips.
 - 2) Over 60 Inches (1 500 mm): Four clips.
 - 6. Color: Dark Gray.
 - 7. Mounting Hardware: Suitable for wall conditions.
- D. Fabrication:
 - 1. Prefabricate units at factory and ship to Project site in one piece, except for chalk trays.
 - 2. Units shall be of first quality and lamination done by approved standards of industry.
 - 3. Furnish printed cleaning instructions with each shipment.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Mount boards square and level.
 - 1. Shim as necessary to provide permanent installation and smooth operation.
 - 2. Anchor boards securely to wall following Manufacturer's written installation instructions.
 - 3. Anchor concealed hangers with screws at 24 inches (600 mm) on center.
- B. Mounting fasteners shall penetrate framing lumber or blocking 1-1/2 inch (38 mm) minimum. Use toggle bolts or expansion bolts in masonry walls.
- C. After attaching map clips, apply permanently attached end cap or screw to prevent removal of map clips.

END OF SECTION

SECTION 10 1116**FIXED MARKERBOARDS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Installed But Not Supplied Under This Section:
 - 1. Markerboard units: Visual Display Board Type 3.
- B. Related Requirements:
 - 1. Section 01 6400: Owner will furnish Markerboards. PART 2 of this Section establishes quality of materials for information of Contractor, Architect, and Owner's Representatives.
 - 2. Section 06 1100: 'Wood Framing' for blocking.
 - 3. Section 06 2001: 'Common Finish Carpentry Requirements' for installation.

1.2 REFERENCES

- A. Association Publications:
 - 1. Porcelain Enamel Institute, Inc., Norcross, GA www.porcelainenamel.com.
 - a. PEI-1002, *Manual and Performance Specifications for Porcelain Enamel Writing Surfaces (Whiteboards and Chalkboards)* 2002.

1.3 SUBMITTALS

- A. Informational Submittals:
 - 1. Manufacturer Instructions:
 - a. Published installation instructions.
 - b. Printed cleaning instructions.
- B. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Operations and Maintenance Data:
 - 1) Maintenance instructions.
 - 2) Printed cleaning instructions.
 - b. Warranty Documentation:
 - 1) Manufacturer Warranty.
 - c. Record Documentation:
 - 1) Manufacturer's documentation:
 - a) Manufacturer's product literature.

1.4 WARRANTY

- A. Manufacturer Warranty:
 - 1. Letter from Manufacturer certifying Contract Documents have been complied with and guarantee against faulty workmanship and materials for five (5) years.

PART 2 - PRODUCTS**2.1 OWNER FURNISHED PRODUCTS**

- A. Category Two Approved Manufacturers. See Section 01 6200 for definitions of Categories:
 - 1. ADP Lemco Corporation, Draper, UT www.adplemco.com.
- B. Fixed Markerboard:
 - 1. Coatings shall meet requirements of PEI-1002:
 - a. All Rooms:
 - 1) Coatings shall be for marker use.
 - 2. Color: White.
 - 3. Mounting Hardware: Suitable for wall conditions.
- C. Fabrication:
 - 1. Prefabricate units at factory and ship to jobsite in one piece, except for marker trays.
 - 2. Units shall be of first quality and lamination done by approved standards of industry.
 - 3. Furnish printed cleaning instructions with each shipment.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Mount boards square and level.
 - 1. Shim as necessary to provide permanent installation and smooth operation.
 - 2. Anchor boards securely to wall following Manufacturer's printed installation instructions.
 - 3. Anchor concealed hangers with screws at **24 inches (600 mm)** on center.
- B. Mounting fasteners shall penetrate framing lumber or blocking **1-1/2 inch (38 mm)** minimum. Use toggle bolts or expansion bolts in masonry walls.
- C. After attaching map clips, apply permanently attached end cap or screw to prevent removal of map clips.

END OF SECTION

SECTION 10 1123**FIXED TACKBOARDS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Installed But Not Supplied Under This Section:
 - 1. Tackboards and specified hardware: Visual Display Board Type 2.
- B. Related Requirements:
 - 1. Section 01 6400: Owner will furnish Markerboards. PART 2 of this Section establishes quality of materials for information of Contractor, Architect, and Owner's Representatives.
 - 2. Section 06 1100: 'Wood Framing' for blocking.
 - 3. Section 06 2001: 'Common Finish Carpentry Requirements' for installation.

1.2 REFERENCES

- A. Reference Standard:
 - 1. ASTM International:
 - a. ASTM E84-18b, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
 - 2. Federal Specifications and Standards:
 - a. FS CCC-W-408D Wall Covering, Vinyl-Coating / 14 Jan 1994 (amended 18 Dec 2003).

1.3 SUBMITTALS

- A. Informational Submittals:
 - 1. Manufacturer Instructions:
 - a. Published installation instructions.
 - b. Printed cleaning instructions.
- B. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Operations and Maintenance Data:
 - 1) Maintenance instructions.
 - 2) Printed cleaning instructions.
 - b. Warranty Documentation:
 - 1) Manufacturer Warranty.
 - c. Record Documentation:
 - 1) Manufacturer's documentation:
 - a) Manufacturer's product literature.
 - b) Color selection.

1.4 WARRANTY

- A. Manufacturer Warranty:
 - 1. Letter from Manufacturer certifying Contract Documents have been complied with and guarantee against faulty workmanship and materials for five years.

PART 2 - PRODUCTS**2.1 OWNER FURNISHED PRODUCTS**

- A. Manufacturer:
 - 1. Category Two Approved Manufacturers. See Section 01 6200 for definitions of Categories:
 - a. ADP Lemco Corporation, Draper, UT www.adplemco.com.
- B. Fixed Tackboard:
 - 1. Color:
 - a. Sterling.
 - b. Mounting Hardware: Suitable for wall conditions.
- C. Fabrication:
 - 1. Prefabricate units at factory and ship to jobsite in one piece.
 - 2. Units shall be of first quality and lamination done by approved standards of industry.
 - 3. Furnish printed cleaning instructions with each shipment.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Mount boards square and level.
 - 1. Shim as necessary to provide permanent installation.
 - 2. Anchor boards securely to wall following Manufacturer's printed installation instructions.
 - 3. Anchor concealed hangers with screws at **24 inches (600 mm)** on center.
- B. Mounting fasteners shall penetrate framing lumber or blocking **1-1/2 inch (38 mm)** minimum. Use toggle bolts or expansion bolts in masonry walls.
- C. After attaching map clips, apply permanently attached end cap or screw to prevent removal of map clips.

END OF SECTION

SECTION 10 1495**MISCELLANEOUS INTERIOR SIGNAGE****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Installed But Not Furnished Under This Section:
 - 1. Owner-furnished interior signs.
- B. Related Requirements:
 - 1. Section 01 6400: Owner will furnish designated interior signs. This Section establishes quality of materials and installation for information of Contractor, Architect, and Owner's Representatives.

PART 2 - PRODUCTS**2.1 OWNER FURNISHED PRODUCTS**

- A. Category Two Approved Distributors. See Section 01 6200 for definitions of Categories:
 - 1. Standard Interior Signs:
 - a. Visual Identity Office:
 - 1) Contact Information:
 - a) 50 E. North Temple St. Rm. 2350, Salt Lake City, UT 84150-3232.
 - b) Phone: 1-801-240-1302.
 - c) Fax: 1-801-240-5997.
 - d) vidoffice@ldschurch.org.
 - b. Room Signs: Molded clear acrylic sub-surface graphics sign with set-screw to attach to included mounting bracket.
 - 1) Provide tactile / braille features in signage.
 - c. Cabinet Door Signs: Flat clear acrylic sub-surface graphics sign with mounting adhesive in position.
 - d. Color:
 - 1) Background: Blue.
 - 2) Lettering: White.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Install interior signs square and plumb:
 - 1. Room Signs:
 - a. Install bracket using two screws. Use proper anchor for substrate.
 - b. Attach sign to bracket using set-screw.
 - c. Mount signs as described in Contract Drawings.
 - 2. Cabinet Signs:
 - a. Remove adhesive protective layer.
 - b. Position sign correctly and apply to door.
 - c. Roll sign to secure to door, taking care not to damage sign.
 - d. Mount signs as described in Contract Drawings.

END OF SECTION

SECTION 10 2113**METAL TOILET COMPARTMENTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install metal toilet compartments as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 06 1100: 'Wood Framing' for blocking in wood framing for compartment installation and door bumper.
 - 2. Section 10 2813: 'Commercial Toilet Accessories'.

1.2 REFERENCES

- A. Reference Standards:
 - 1. ASTM International:
 - a. ASTM A484/A484M-18a, 'Standard Specification for General Requirements for Stainless Steel Bars, Billets, and Forgings'.

1.3 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Color selection.
- B. Closeout Submittals:
 - 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 or cut sheet.
 - b) Color selection.

1.4 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 and handle in compliance with Manufacturer's instructions and recommendations.

1.5 WARRANTY

- A. Manufacturer Warranty:
 - 1. Manufacturer's standard warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Type One Acceptable Manufacturers:
1. Accurate Partitions Inc, Lyons, IL www.accuratepartitions.com.
 2. AMPCO Products Inc, Miami, FL www.ampco.com.
 3. Columbia Partitions, Columbia, SC www.psisc.com.
 4. Flush-Metal Partition Corp, Maspeth, NY www.flushmetal.com.
 5. Global Steel Products Corp, Eastanollee, GA www.globalpartitions.com.
 6. Hadrian Inc, Mentor, OH www.hadrian-inc.com.
 7. Knickerbocker Partitions Corp, Freeport, NY www.knickerbockerpartition.com.
 8. Metpar, Westbury, NY www.metpar.com.
 9. Equal as Approved by Architect before bidding. See Section 01 6200.

2.2 MANUFACTURED UNITS

- A. Toilet And Miscellaneous Partitions:
1. Floor-mounted, overhead-braced.
 2. Panels:
 - a. Galvanized bonderized steel sheets (minimum 0.00015 inch (0.004 mm) zinc coating).
 - b. Edges bound interlocked with drawn molding welded on corners.
 - c. Corners welded and ground smooth.
 - d. Sound deadening honeycomb core.
 - e. Provide wood blocking on all panels that have grab bars.
 - f. Gauge:
 - 1) Doors: 22 ga (0.08 mm) minimum.
 - 2) Panels: 22 ga (0.08 mm) minimum.
 - 3) Pilasters: 22 ga (0.08 mm) minimum.
 - 4) Screens: 22 ga (0.08 mm) minimum.
 3. Posts:
 - a. 20 ga (one mm) minimum of same construction and finish as panels.
 4. Headrails:
 - a. Aluminum.
 - b. 20 ga (one mm) minimum of same construction and finish as panels.
 - c. Anti-grip design.
 5. Plinths:
 - a. 20 ga (one mm) Type 304 stainless steel, Number 4 finish.
 - b. 3 inch (76 mm) minimum high, secured with concealed clips.
 - c. All fasteners used to attach Plinths, Posts and Pilasters to the floor shall be Type 304 stainless steel.
 6. Anchorages and fasteners:
 - a. Concealed: Non-corrosive, protective finish.
 - b. Tamper resistant Torx Head with pin screws.
 7. Hardware:
 - a. Each door:
 - 1) Gravity type hinges with double handed, nylon bottom cam, adjustable for partial door closing position, bottom hinge finished flush with door bottom.
 - 2) Sliding or concealed door bolt with emergency access.
 - 3) Door strike and keeper with rubber bumper.
 - 4) Coat hook / door bumper.
 - b. Finish: Chrome plated.
 - c. Meet requirements of ASTM B86, Alloy AG 40A.
- B. Urinal Partition:
1. Basic construction same as panels above, floor mounted.
 2. Width to be 16 inches (400 mm) minimum.

- a. Partition maximum width shall not encroach into required accessibility clear floor space.

2.3 FINISHES

- A. Finish And Color:
 - 1. Powder-coated paint finish.
 - 2. Class One Color Quality Standards. See Section 01 6200.

- a. Flush-Metal: **White**
61 White

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification Of Conditions:
 - 1. Field verify dimensions.
 - 2. Verify that necessary blocking has been installed in framed walls for partition installation and for place where coat hook / door bumper will strike wall.

3.2 INSTALLATION

- A. Install pilasters rigid, plumb, and level. Maintain proper door openings. Anchor pilaster to floor with Type 304 stainless steel fasteners embedded **2 inches (50 mm)** into concrete slab below setting bed.
- B. Secure panels to walls with two stirrup brackets minimum attached near top and bottom of each panel. Use fasteners of length to provide **one-inch (25 mm)** embedment into blocking or masonry.
- C. Secure overhead brace to face sheets with two fasteners minimum per face. Set door tops parallel with brace. Set door bottom **12 inches (300 mm)** above floor.
- D. Plinth to be level with and snug to floor.

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 the Owner.
 - 2. Replace damaged or severely scratched materials with new materials at no additional cost to the Owner.

3.4 ADJUSTING

- A. Lubricate hardware as recommended by Manufacturer.
- B. Set hinges on out-swinging doors to return to nearly closed position.
- C. Perform final adjustments to pilaster leveling devices, door hardware, and other operating parts of partition assembly just before Substantial Completion.

3.5 CLEANING

- A. Remove protective masking. Clean exposed surfaces of partitions, hardware, fittings, and accessories.
- B. Touch-up minor scratches and other finish imperfections using materials and methods recommended by Manufacturer.

END OF SECTION

SECTION 10 2813**COMMERCIAL TOILET ACCESSORIES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Included But Is Not Limited To:
 - 1. Selected accessories for Rest Rooms, Font, and Dressing Areas:
 - a. Bench.
 - b. Grab Bars.
 - c. Mirrors.
 - d. Sanitary Napkin Disposal Container.
 - e. Single Robe Hook.
- B. Related Requirements:
 - 1. Section 06 1100: 'Wood Framing' for blocking.
 - 2. Section 06 2001: 'Common Finish Carpentry Requirements' for installation.
- C. Products Furnished But Not Installed Under This Section:
 - 1. Selected accessories for Rest Rooms:
 - a. Automatic touchless towel dispensers.
 - b. Soap dispensers.
 - c. Toilet tissue dispensers.
- D. Related Requirements:
 - 1. Section 01 1200: 'Multiple Contract Summary' soap dispensers, paper towel dispensers, and toilet tissue dispensers furnished and installed by Owner (FM Group).

1.2 REFERENCES

- A. Association Publications:
 - 1. United States Access Board:
 - a. Americans with Disabilities Act (ADA):
 - 1) ADA Standards:
 - a) ADA Accessibility Guidelines (ADAAG) (2004 or latest version).
- B. Reference Standards:
 - 1. ASTM International:
 - a. A153/A153M-16a, 'Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware'.
 - b. ASTM A653/A653M-17, 'Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process'.
 - c. ASTM A666-15, 'Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar'.
 - d. ASTM C1036-18, 'Standard Specification for Flat Glass'.
 - e. ASTM F446-85(2009), 'Standard Consumer Safety Specification for Grab Bars and Accessories Installed in the Bathing Area'.
 - 2. International Code Council / American National Standards Institute:
 - a. ICC/ANSI A117.1-2017, 'Accessible and Usable Buildings and Facilities'.
 - 3. International Standard Organization:
 - a. ISO 25537:2008, 'Glass in Building - Silvered Flat Glass Mirror'.

1.3 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Manufacturer's product data sheets indicating operating characteristics, materials and finishes.
 - b. Mounting requirements and rough-in dimensions.
 - 2. Shop Drawings:
 - a. Schedule showing items used, location where installed, and proper attaching devices for substrate.
- B. Informational Submittals:
 - 1. Manufacturers' Instructions:
 - a. Provide operation, care and cleaning instructions.
- C. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Operations and Maintenance Data:
 - 1) Bench:
 - a) Manufacturer's service and parts manual.
 - b. Warranty Documentation:
 - 1) Final, executed copy of Warranty for each product.
 - c. Record Documentation:
 - 1) Manufacturers documentation:
 - a) Manufacturer's literature or cut sheets.

1.4 QUALITY ASSURANCE

- A. Source Limitations:
 - 1. For products listed together in same Part 2 articles, obtain products from single source from single manufacturer.

1.5 WARRANTY

- A. Manufacturer Warranty:
 - 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

2.1 OWNER FUNISHED PRODUCTS

- A. Category One Approved Products (Furnished and Installed by Owner):
 - 1. Automatic Touchless Towel Dispensers:
 - a. Mount Towel Dispenser in 'Recessed Waste Receptacle Cabinet'.
 - b. Category One Approved Products. See Section 01 6200 for definitions of Categories: Georgia-Pacific enMotion model no. 59460:
 - 1) Size: 14.8 inches (376 mm) wide x 9.75 inches (248 mm) deep x 16.75 inches (425 mm) high.
 - 2) Power source: battery.
 - 3) Color: splash blue.

2. Soap dispensers.
3. Toilet tissue dispensers.

2.2 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.

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. Bench:
 - 1) Type Two Acceptable Product:
 - a) Bradley: Bariatric Shower Seat Model 958
 - b) Equal as approved by Architect before installation. See Section 01 6200.
 - b. 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) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 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.
 - c. 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) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 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.
 - d. 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) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 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.
- e. 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) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 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.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with ADA Accessibility Guidelines and installation heights as shown on Contract Drawings.
- B. Assemble fixtures and associated fittings and trim in accordance with manufacturer's instructions.
- C. Install using mounting devices proper for base structure.
- D. Install equipment level, plumb, and firmly in place in accordance with manufacturer's rough-in drawings.
- E. Where possible, mount like items in adjoining compartments back-to-back on same partition.
- F. Bench:
 1. Secure unit to wall as per Manufacturer instructions.
- G. 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.

3.2 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.

3.3 CLEANING

- A. Clean unit surfaces, and leave in ready-to-use condition.

3.4 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.

3.5 CLOSEOUT ACTIVITIES

- A. Turn over keys, tools, maintenance instructions, and maintenance stock to Owner.

END OF SECTION

SECTION 11 9116**BAPTISMAL FONT MIRROR****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install mirror for font viewing, with installation brackets and hardware, as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 06 1100: 'Wood Framing' for installation of wall blocking for font angle brackets.

1.2 REFERENCES

- A. Reference Standards:
 - 1. ASTM International:
 - a. ASTM C1036-16, 'Standard Specification for Flat Glass'.

1.3 QUALITY ASSURANCE

- A. Certifications:
 - 1. Attach label to mirror showing strength, grade, thickness, type, and quality.

PART 2 - PRODUCTS**2.1 ASSEMBLY**

- A. Materials:
 - 1. Glass (Mirror):
 - a. Meet requirements of ASTM C1036, Type I, Class I - Clear, Quality - q2 Mirror or q1 Mirror select.
 - b. Thickness: 5/32 inch (4 mm) minimum (Double Strength).
 - c. Size: 60 inches (1 500 mm) wide by 42 inches (1 050 mm) high.
 - 2. Backing:
 - a. Sheathing: 23/32 inch (18 mm) thick minimum exterior APA rated plywood.
 - b. Back Frame: 1 by 6 inch: (25 mm by 150 mm) Hardwood.
 - 3. Channel Frame:
 - a. Stainless steel, Type 304, with No. 4 polished finish.
 - 4. Fasteners: Stainless steel.
 - 5. Brackets: Stainless steel, Type 304, with No. 4 polished finish.
- B. Fabrication:
 - 1. Coordinate with Construction Drawings:
 - a. Apply back frame to plywood and seal. Install brackets.
 - b. Mount mirror against plywood with suitable mirror setting mastic applied over complete surface and install channel frame with mechanical attachment.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Verification Of Conditions:
 - 1. Verify wall blocking installed in correct location for angle brackets.
 - 2. Notify Architect and Owner in writing if wall blocking not in correct location for angle brackets.
 - a. Do not install font mirror until deficiency in wall blocking have been corrected.

3.2 INSTALLATION

- A. Install completed assembly as detailed as shown with Construction Drawings.

END OF SECTION

SECTION 11 9119**BAPTISMAL FONT RAILING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install glass railing for font viewing, with installation brackets and hardware, as described in Contract Documents.

1.2 REFERENCES

- A. Reference Standards:
 - 1. ASTM International:
 - a. ASTM C1048-18, 'Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass'.

1.3 SUBMITTALS

- A. Informational Submittals:
 - 1. Qualification Statement:
 - a. Installer:
 - 1) Provide Qualification documentation if requested by Architect or Owner.

1.4 QUALITY ASSURANCE

- A. Certifications:
 - 1. Attach label to glass showing kind, class, and quality.
- B. Qualifications:
 - 1. Installer: Requirements of Section 01 4301 applies, but not limited to following:
 - a. Minimum two (2) satisfactorily completed installations of comparable quality, scope, similar size, and complexity in past two (2) years before bidding.
 - b. Upon request, submit documentation.

PART 2 - PRODUCTS**2.1 ASSEMBLY**

- A. Materials:
 - 1. Glass:
 - a. Meet requirements of ASTM C1048, Kind FT, Class 1, Quality Q4.
 - b. Thickness: **1/2 inch (13 mm)** minimum for openings up to **7 foot-6 inch (2 230 mm)**.
 - 2. Fasteners:
 - a. Side:
 - 1) No. 12 SDSF Screws at **6 inch (150 mm)** on center at wood or steel stud walls.
 - 2) **1/4 inch (6.35 mm) x 4 inch (100 mm)** Screw Anchors at **6 inches (150 mm)** on center (pre-drill holes).
 - b. Bottom:

- 1) **1/4 inch (6.35 mm) x 8 inch (200 mm)** Screw Anchors at **18 inches (450 mm)** on center at masonry or concrete (pre-drill holes).
3. Glass Clamps (Bottom Mount):
 - a. Round-nosed stainless steel, Type 304.
 - b. Match finish of existing side clamps.
 - c. Locate clamps **18 inches (450 mm)** maximum from corner edges and **36 inches (900 mm)** maximum spacing between clamps.
 - d. Category Four Approved Products. See Section 01 6200 for definition of Categories.
 - 1) Z-Series by C. R. Laurence Co, Los Angeles, CA www.crlaurence.com.
 - 2) G10 Series by Taco Metals Inc, Miami, FL www.tacometals.com.
4. Glass Railing Channel:
 - a. **5/8 inch (16 mm) x 5/8 inch (16 mm)** for **1/2 inch (13 mm)** glass thickness.
 - 1) **20 gauge (1.0 mm)** Stainless steel, Type 304 brushed finish.

PART 3 - EXECUTION:

3.1 INSTALLERS

- A. Class Two Acceptable Installers. See Section 01 6200 for definition of Categories.
 1. Use specified product or equal product from any Installer.
 2. Products used shall conform to Contract Document requirements.
 3. Qualifications Requirements. See Section 01 4301.
- B. Locations:
 1. Utah:
 - a. Jones Paint & Glass, Provo, UT: Contact Brian Clark (374) 6711.
 - b. Midwest D-Vision Solutions, South Salt Lake, UT: Contact Jeff Pulver (801) 377-4355.
 - c. Mollerup Glass, Salt Lake City, UT: Contact Brent (801) 397-1177.
 - d. Tyler Glass & Mirror, Tyler TX: Contact Shannon (903) 597-6396.
 - e. Western Glass, Ogden, UT: Contact Kaylee (801) 394-1661.

END OF SECTION

SECTION 12 2200**CURTAINS AND DRAPES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To
 - 1. Furnish and install draperies, curtains, and hardware as described in Contract Documents.

1.2 REFERENCES

- A. Definitions:
 - 1. Approved Agency: An established and recognized agency that is regularly engaged in conducting tests of furnishing inspection services, where such agency has been approved by the building official.
 - 2. Flame-proofing: Process of treating materials chemically so that they will not support combustion.
 - 3. Flame Spread. The propagation of flame over a surface.
 - 4. Flammable Material: Material capable of being readily ignited from common sources of heat or at a temperature of 600 deg F (316 deg C) or less.
 - 5. 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.
- B. Reference Standards:
 - 1. International Building Code (IBC) (2018 or most recent edition adopted by AHJ):
 - a. Chapter 8, 'Interior Finishes':
 - 1) Section 806, 'Decorative Materials And Trim':
 - a) 806.4, 'Acceptance Criteria And Reports'.
 - 2. National Fire Protection Association:
 - a. NFPA 289, 'Standard Method of Fire Test for Individual Fuel Packages' (2019 or most recent edition adopted by AHJ).
 - b. NFPA 701, 'Standard Methods of Fire Tests for Flame Propagation of Textiles and Films, (2019 or most recent edition adopted by AHJ).

1.3 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Flame-proofing literature.
 - 2. Samples:
 - a. 24 inch (600 mm) wide and 48 inch (1 200 mm) high sample including all specified elements of finished curtains, including flame retardant certification tag. Do not fabricate Project drapes until sample has been reviewed and approved by Architect.
 - b. Submit sample with Product Data submittal. Sample will serve as standard by which to evaluate Project curtains.
- B. Informational Submittals:
 - 1. Certificates:
 - a. Certificate from approved agency showing compliance to IBC 806.4 requirements.
 - 2. Qualification Statement:
 - a. Fabricator / 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) Operating and maintenance instructions.
 - b. Record Documentation:
 - 1) Manufacturers documentation:
 - a) Fabric Supplier's literature or cut sheets on fabric.
 - b) Curtain Rod Manufacturer's literature or cut sheets.
 - c) Color and style selection.
 - d) Certificate of compliance from approved agency.

1.4 QUALITY ASSURANCE**A. Regulatory Agency Sustainability Approvals:**

1. Meet requirements of IBC 806.4 'Acceptance Criteria And Reports':
 - a. Where required to exhibit improved fire performance, curtains, draperies, fabric hangings and similar combustible decorative materials suspended from walls or ceilings shall be tested by an approved agency and meet the flame propagation performance criteria of Test 1 or 2, as appropriate, of NFPA 701, or exhibit maximum heat release rate of 100 kW when tested in accordance with NFPA 289, using 20 kW ignition source. Reports of test results shall be prepared in accordance with test method used and furnished to building official upon request.
2. Attach permanent tag to each panel attesting to flame retardant quality of material used.

B. Qualifications:

1. Fabricator / Installer: Requirements of Section 01 4301 applies, but not limited to following:
 - a. Minimum three (3) satisfactorily completed installations of comparable quality, scope, similar size, and complexity in past two (2) years before bidding.
 - b. Upon request, submit documentation.

PART 2 - PRODUCTS**2.1 ASSEMBLIES****A. Manufacturers / Suppliers:**

1. Carole, Augusta, GA www.carolefabrics.com.
2. Charles Samulsen, New York City, NY www.csamelson.com.
3. Conso / Wright, West Warren, MI www.conso.com.
4. Coral, Div Charles Samelson, New York City, NY www.coralofchicago.com.
5. Fred Krieger & Co. Inc., Jericho, NY www.fredkriegerfabrics.com.
6. Graber Div of Springs Industries, Montgomery, PA www.graberblinds.com.
7. Hanes Fabric Co, Conover, NC www.hanesfabric.com.
8. InterSpec, Allenwood, NJ (800) 526-2800 or (732) 938-4114.
9. Kirsch Co, Freeport, IL www.kirsch.com.
10. Rockland Industries Inc, Baltimore, MD www.roc-lon.com.
11. Rowley Co, Gastonia, NC. www.rowleyco.com.

B. Materials:

1. Design Criteria:
 - a. Curtains and draperies must meet flame propagation performance requirements as specified in Quality Assurance in Part 1 of this specification.
2. Fabric:
 - a. Casements: MATCH EXISTING Color and Pattern
3. Crinoline / Buckram:
 - a. Heavy or Extra Heavy grade, 4 inches (100 mm) wide, woven permanent goods.
 - b. Type Two Acceptable Products:

- 1) BW74 by R H Rowley Co.
 - 2) 61421 by Conso.
 - 3) Equal as approved by Architect before use. See Section 01 6200.
 4. Drapery Hooks: Stainless steel, standard 1-1/2 inch (38 mm) hook with pointed hook top.
 5. Drapery Rods:
 - a. Outside Mount:
 - 1) Rods shall be sufficient width, window width plus 1/3, to allow drape to stack clear of window opening but no wider. This requirement may be modified as follows:
 - a) Where Drawings detail differently.
 - b) Where wall, cabinets, mechanical equipment, or other obstruction requires modification.
 - c) Where symmetry of room would indicate desirability of exception.
 - b. Traverse rods shall include wall or floor mounted tension pulleys for endless cord operation.
 - c. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - 1) Kirsch:
 - a) 'Super Fine': Less than 15 feet (4.57 m) long.
 - b) 'Architrac': 15 feet (4.57 m) long and longer.
 - 2) Graber Super Heavy Duty 600 Series by Springs Industries.
- C. Fabrication:
1. Double top and bottom hems unless specifically specified otherwise.
 2. Provide necessary weights at seam and side hems.
 3. Fullness shall be minimum of 2-1/2 times width of space covered by drape.
 4. Space pleats 4 inches (100 mm) maximum center of pleat to center of pleat.
 5. Drapes shall have:
 - a. Fabric inspected over back-lite table for flaws.
 - b. Straight, even blind-stitched side and bottom hems.
 - c. Seams hidden beside pleats.
 - d. Joined seams serged and overcast with no puckering.
 - e. 4 inch (100 mm) double bottom hems and headings.
 - f. 1-1/2 inches (38 mm) double side hem.
 - g. 2 inch (50 mm) overlap, total of 4 inches (100 mm) on pair.
 - h. Stack-off of 1/3 of window width.
 - i. Specified woven, permanent crinoline / buckram used in heading.
 - j. Seams match up on bottom hems.
 - k. Corners of bottom hems closed with hand stitching.
 - l. Pleats evenly spaced to size.
 - m. Straight edge across top after pleating.
 - n. Straight, even folds.
 - o. Polyester thread matching fabric color for seams and hems.

PART 3 - EXECUTION

3.1 FABRICATORS

- A. Acceptable Fabricators:
1. Meet Quality Assurance Fabricator / Installer Qualifications as specified in Part 1 of this specification.

3.2 INSTALLATION

- A. Install tracks, wall or ceiling mount, with mounting device head no larger than No. 6, to yield direct withdrawal strength of 25 lbs (11 kg) minimum.
- B. Support spacing to be as recommended in Manufacturer's literature.

3.3 CLEANING

- A. Tracks to be free of marring, scratches, and foreign material.

END OF SECTION

DIVISION 22: PLUMBING

22 0500 COMMON WORK RESULTS FOR PLUMBING

- 22 0501 COMMON PLUMBING REQUIREMENTS
- 22 0529 HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT
- 22 0553 IDENTIFICATION FOR PLUMBING PIPES AND EQUIPMENT
- 22 0719 PLUMBING PIPING INSULATION

22 1000 PLUMBING PIPES AND PUMPS

- 22 1116 DOMESTIC WATER PIPING
- 22 1313 FACILITY SEWERS
- 22 1319 FACILITY SANITARY SEWER SPECIALTIES

22 3000 PLUMBING EQUIPMENT

- 22 3413 INSTANTANEOUS, TANKLESS, GAS DOMESTIC WATER HEATERS

22 4000 PLUMBING FIXTURES

- 22 4213 COMMERCIAL WATER CLOSETS AND URINALS
- 22 4216 COMMERCIAL LAVATORIES AND SINKS
- 22 4240 FONT FAUCETS, SUPPLIES, AND TRIM

END OF TABLE OF CONTENTS

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:
 - 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 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.
- B. Storage And Handling Requirements:
 1. In addition to requirements specified in Division 01, stored material shall 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.
 - 2. Use domestic made pipe and pipe fittings on Project, except non-domestic made cast iron pipe and fittings by MATCO-NORCA 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:
 - 1. Meet Quality Assurance Installer Qualifications as specified in Part 1 of this specification.

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 to be 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 shall suit 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 to be 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.
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.

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

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. 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) Type Two Acceptable Products:
 - (1) Swivel Ring Hanger: Anvil Fig. 69.
 - (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) Type Two 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) Type Two 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) Type Two 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) Type Two Acceptable Products:
 - a) Anvil Fig. 261.
 - b) Equals by Cooper B-Line.
- f. Steel Deck Bracket:
 - 1) Class Two Quality Standard: Equal to Unistrut P1000 with clamp nut, minimum 6 inch length.

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 Unistrut 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 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) Support PEX pipe at 32 inches minimum on center.
 - 4) 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. Attach Unistrut to structural steel roof supporting structure. Spacing and support as described above.
- e. Insulate hangers for copper pipe from piping by means of at least two layers of Scotch 33 plastic tape.

END OF SECTION

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 and Valve Tags:
 - a. Equipment & Valve Identification:
 - 1) Black formica, with white reveal when engraved.
 - 2) Lettering to be 3/16 inch (5 mm) high minimum.
 - 2. Paint:
 - a. One Coat Primer:
 - 1) 6-2 Quick Drying Latex Primer Sealer over fabric covers.
 - 2) 6-205 Metal Primer under dark color paint.
 - 3) 6-6 Metal Primer under light color paint.
 - b. Finish Coats: Two coats 53 Line Acrylic Enamel.
 - c. Performance Standard: Paints specified are from Pittsburgh Paint & Glass (PPG), Pittsburgh, PA www.pittsburghpaints.com or PPG Canada Inc, Mississauga, ON (800) 263-4350 or (905) 238-6441.
 - d. Type Two Acceptable Products. See Section 01 6200.
 - 1) Paint of equal quality from following Manufacturers may be submitted for Architect's approval before use. Maintain specified colors, shades, and contrasts.
 - a) Benjamin Moore, Montvale, NJ www.benjaminmoore.com or Toronto, ON (800) 304-0304 or (416) 766-1176.
 - b) ICI Dulux, Cleveland, OH or ICI Paints Canada Inc, Concord, ON www.dulux.com.
 - c) Sherwin Williams, Cleveland, OH www.sherwin-williams.com.
 - 3. 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.




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. Painting:
 - 1. Only painted legends, directional arrows, and color bands are acceptable.
 - 2. 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 (7.6 m) on long continuous lines.
 - e. Stenciled symbols shall be one inch high and black.
- C. Pipe Markers:
 - 1. Wrap pipe marker around pipe with 1/2 inch 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 maximum on long, continuous runs.
- D. Valve Tags:
 - 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.

3.2 ATTACHMENTS

- A. Schedules:
 - 1. Pipe Identification Schedule:
 - a. Apply stenciled symbols as follows:

Pipe Use	Abbreviation	Direction of Flow
Domestic Cold Water	CW	
Domestic Hot Water	HW	
Domestic Hot Water Circulate	HWC	

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.
- 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) Type One 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.
 - 2) Performance Standard: Zeston by Johns-Manville.
 - 3) Type One 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) Category Four Acceptable Products. See Section 01 6200 for definition of Categories:
 - a) SS Tubolit by Armacell.
 - b) ImcoLock by Imcoa.
 - c) Nomalock or Therma-Cel by Nomaco.
 - b. Joint Sealant:
 - 1) Category Four Acceptable Products. See Section 01 6200 for definition of Categories:
 - a) Armacell 520.
 - b) Nomaco K-Flex R-373.
3. Pex Piping, Above And Below Grade:
- a. Insulation:
 - 1) 1/2 inch thick.
 - 2) Category Four Acceptable Products. See Section 01 6200 for definition of Categories:
 - a) SS Tubolit by Armacell.
 - b) ImcoLock by Imcoa.
 - c) Nomalock or Therma-Cel by Nomaco.
 - b. Joint Sealant:
 - 1) Category Four Acceptable Products. See Section 01 6200 for definition of Categories:
 - a) Armacell 520.
 - b) Nomaco K-Flex R-373.

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. Adhere 'factory applied vapor barrier jacket lap' smoothly and securely at longitudinal laps with white vapor barrier adhesive. 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.
 - b. Cover insulation with one piece fitting cover secured by stapling or taping ends to adjacent pipe covering.
 - 1) Alternate Method: 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. Provide 16 ga by 6 inch long galvanized shields at each pipe hanger to protect pipe insulation from crushing by clevis hanger.
 - 6. 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

SECTION 22 1116**DOMESTIC WATER PIPING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install potable water piping and connect to existing lines complete with necessary valves, connections, and accessories inside building as described in Contract Documents. Field verify existing piping as required.
- B. Related Requirements:
 - 1. Section 22 0501: 'Common Piping Requirements'.
 - 2. Section 22 0719: 'Plumbing Piping Insulation'.

1.2 REFERENCES

- A. Reference Standards:
 - 1. American National Standards Institute / American Society of Sanitary Engineers:
 - a. ANSI/ASSE 1017-2009, 'Performance Requirements for Temperature Actuated Mixing Valves for Hot Water Distribution Systems'.
 - b. 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'.
 - 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'.
 - b. NSF/ANSI 61-2017, 'Drinking Water System Components - Health Effects'.
 - c. NSF/ANSI 372-2016, 'Drinking Water System Components - Lead Content'.

1.3 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Manufacturer's Literature:
 - 1) PEX pipe and PEX pipe fittings.
- B. Informational Submittals:

1. Test And Evaluation Reports:
 - a. Written report of sterilization test.

1.4 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.

1.5 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. Cash Acme, Cullman, AL www.cashacme.com
 - b. Cla-Val Company, Costa Mesa, CA or Cla-Val Canada Ltd, Beamsville, ON www.cla-val.com.
 - c. Conbraco Industries Inc, Matthews, NC www.conbraco.com or Conbraco (Honeywell Ltd), Scarborough, ON (416) 293-8111.
 - d. Hammond Valve, New Berlin, WI www.hammondvalve.com.
 - e. 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.
 - f. Harris Products Group, Cincinnati, OH www.harrisproductsgroup.com.
 - g. Honeywell Inc, Minneapolis, MN www.honeywell.com.
 - h. Leonard Valve Co, Cranston, RI www.leonardvalve.com.
 - i. Milwaukee Valve Co, New Berlin, WI www.milwaukeevalve.com.
 - j. Nibco Inc, Elkhart, IN www.nibco.com.
 - k. Rehau, Leesburg, VA www.rehau-na.com.
 - l. Sloan Valve Co, Franklin Park, IL www.sloanvalve.com.
 - m. Spence Engineering Co, Walden, NY www.spenceengineering.com.
 - n. Uponor Inc, Apple Valley, MN www.uponor-usa.com.
 - o. Viega ProPress, Wichita, KS www.viega-na.com.
 - p. Watts Regulator Co, Andover, MA www.wattsreg.com.
 - q. Wilkins (Zurn Wilkins), Paso Robles, CA www.zurn.com.
 - r. 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.
- 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) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) `Raupex by Rehau.
 - b) Wirsbo Aquapex by Uponor.
 - c) ViegaPEX by Viega.
 - d) Zurn PEX by Zurn PEX.
- 3. Fittings:
 - a. For Copper Pipe: Wrought copper.
 - b. For PEX Pipe:
 - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 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.
- 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 BA9-5 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. 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. Class One Quality Standard: Nibco T585 or S585.
 - 1) Equal by Conbraco 'Apollo,' Hammond, Milwaukee, or Watts.
 - 6. Mixing Valve For Font: **MV-2**
 - 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 20 GPM (75.71 LPM) with maximum 10 psi (69 kPa) pressure drop. Perform to minimum flow of 3.0 GPM (11.36 LPM) in accordance with ASSE 1017.
 - d. Set for 100 deg F (38 deg C) Font Service.

- e. Match Construction Drawings for connection sizes.
- f. Class One Quality Standard: Powers LFMM431. See Section 01 6200.
- g. Acceptable Manufacturers: Acorn, Leonard, Powers, Sloan, Symmons, and Watts.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. 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 in presence of Architect/Engineer 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.

3.3 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

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. International Code Council:
 - a. ICC IPC-2018, 'International Plumbing Code'.

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. PVC 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. Runs shall be 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: Piping and joints shall be clean and installed 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 so pipe is uniformly supported 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 shall be 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. Install piping so cleanouts may be installed 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.

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 so they will not pierce roof near edge or valley. Vent line terminations shall be:**

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 shall be same size as vent pipe, except no smaller than 2 inches (50 mm) in diameter.
 - b. Vents shall terminate 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

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.siuoxchief.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 strainer.
 - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) Josam: 30000-50-Z-5A.
 - b) J. R. Smith: 2010-A.
 - c) Mifab: F-1100-C.
 - d) Sioux Chief: 832.
 - e) Wade: 1100.
 - f) Watts: FD-200-A.

g) Zurn: Z-415.

D. Accessories:

1. Drain Accessories:

a. Floor Drains:

- 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 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 3413**INSTANTANEOUS, TANKLESS, GAS DOMESTIC WATER HEATERS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install gas-fired tankless water heaters as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 01 4543: 'Font Water Adjusting & Balancing'.
 - 2. Section 22 0501: 'Common Plumbing Requirements'.
 - 3. Section 22 1116: 'Domestic Water Piping'.
 - 4. Section 23 1123: 'Facility Natural Gas Piping'.
 - 5. Section 23 5135: 'Air Piping'.

1.2 REFERENCES

- A. Reference Standards:
 - 1. ASTM International:
 - a. ASTM D1785-15, 'Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120'.
 - b. ASTM D2564-12(2018), 'Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems'.
 - c. ASTM D2661-14, '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'.
 - 2. 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. 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 Warranty:
 - 1. Direct Vent Water Heater:
 - a. 10 year factory warranty on heat exchanger and 3 years on other parts.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

- 1. Manufacturer Contact List:
 - a. ACT, Inc, Costa Mesa, CA, (800) 200-1956 www.gothotwater.com
 - b. Enovative Group, Venice, CA www.enovativegroup.com.
- B. Design Criteria:
 - 1. All (wetted) drinking water products, components, and materials used in drinking water systems must meet NSF International Standards for Lead Free.
- C. Direct Vent **WH-2**
 - 1. Sealed combustion type, AGA rated, factory assembled and tested.
 - 2. Rated at 4.6 GPM **14.8 LPM** water flow with rise of 80 deg F **27 deg C**.
 - 3. Include isolation valves.
 - 4. Safety Features:
 - a. Built-in freeze protection.
 - b. Spark ignition and sensor system.
 - c. In-line fusing.
 - d. Pressure relief valve.
 - e. High Limit switch.
 - f. Vent pressure switch.
 - g. Modulating / Proportional gas valve.
 - 5. Integral Solid State Controls:
 - a. Monitor incoming and outgoing temperature with factory-installed themisters.
 - b. Sense and control flow rate to maintain set point temperature.
 - c. Control air / gas mixture input to maintain thermal combustion efficiency.
 - 6. Remote controller with wall mounting bracket.
 - 7. Provide vent package, including all venting materials, connections, and direct vent termination kit for complete vent installation as recommended by manufacturer.
 - 8. All domestic water wetted components must be Lead Free and certified to NSF Lead Free standards.
 - 9. Category Four Approved Products. See Section 01 6200 for definition of Categories:
 - a. Meetinghouse with Font:
 - 1) Model RTC-199 by HTP, Inc., New Bedford, MA www.htproducts.com:
 - a) Attn: Michael Lundquist 801-487-5700 ml@lundquistsales.com.
 - 2) NPE 240A(Pb) or NPE 240S by Navien, Irvine CA, www.NavienAmerica.com.
 - a) Attn: Holly Stubbs at McGregor & Associates 801-860-4997 or holly@mcgregor-assoc.com.
 - 3) Model NCC199CDV or EZ111DV by Noritz, distributed by Franklin James Company, Sandy, UT.
 - a) Attn: Mark Evans, cell (801) 558-3142 mark@franklinjames.com.
 - 4) Model RU 199i by Rinnai, Peachtree City, GA, www.rinnai.us:
 - a) Attn: Colin Schmidt at MJM Associates Inc., Herriman, UT (801) 631-6794, (email) cschmidt@mjmassoc.com.
 - 5) Model T-H3-DV by Takagi, Irvine, CA www.takagi.com.

2.2 ACCESSORIES

- A. Recirculation Pump and Circulation Pump Control:

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. Category Four Approved Products
 - a. RO55A AutoHot Controller with 55 series pump, temperature sensor, and push button activator by Enovative Group. Include HM-S-17A hard wired motion sensors.
 - b. ACT1 with pump, temperature sensor, control box, and hard-wired button by ACT, Inc. Include HWMSRB-O hard wired motion sensors.
- B. PVC Flue Piping (Instantaneous Tankless Water Heaters):
1. Flue:
 - a. Air Piping: Schedule 40 pipe and fittings meeting requirements of ASTM D1785, ASTM D2661, or ASTM D2665.
 - b. Piping Primer And Cement.
 - a) Meet requirements of ASTM D2564.
- C. Stainless Steel Flues (Instantaneous Tankless Water Heaters):
1. Flue:
 - a. Design Criteria:
 - 1) Double wall, factory-fabricated Category III type.
 - 2) AL-29-4C stainless steel inner conduit and Type 430 stainless steel outer jacket.
 - 3) Inspection cap, condensate drain, and roof flashing. Provide horizontal, vertical, and roof support.
 - 4) Seal joints as recommended by Flue Manufacturer.
 - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Saf-T Vent C1 by Heat-Fab.
 - 2) Fasnseal W2 by Protech Systems.
 - 3) Z-Vent III by Z-Flex (US).

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Water Heaters:
1. Water heaters shall each have relief valve sized to match heat input and set to relieve at 120 psi (827 kPa).
 2. Install temperature-pressure relief valve on hot water heater and pipe discharge directly above funnel of floor drain.
 3. Provide mixing valve at water heater installation as specified in Section 22 1116.
- B. Vent:
1. Vent package and direct vent termination to be installed per Manufacturer's recommendations.
 2. PVC Flue Piping:
 - a. General:
 - 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 (0.95 mm) sheet metal straps as detailed on Drawings.
 - 2) Support horizontal sections of pipe in accordance with requirements of Section 23 0501. Anchor securely to structure, not allowing pipe to sway.
 3. Stainless Steel Flues (Instantaneous Tankless Water Heaters):

- a. General:
 - 1) Height of flue above roof shall be as shown on Drawings unless local code requires it be higher.
 - 2) Length of horizontal flues or flue connectors shall not be longer than 75 percent of height of vertical flue between point at which horizontal flue enters vertical flue to top of vertical flue. In no case shall horizontal run exceed 15 feet (4.57 m).
 - 3) Every portion of flue connector shall have rise of one inch (25 mm) per 1 foot (300 mm) minimum from appliance to vertical flue.

3.2 ADJUSTING

- A. Adjust gas input pressure to be between 6 and 7 inches (150 and 180 mm) of water column at regulator inlet. Adjust burner manifold pressure to 4.3 inches (110 mm) of water column on down stream side of gas regulator.

END OF SECTION

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. Bemis Manufacturing Co, Sheboygan Falls, WI www.bemismfg.com.
 - c. Beneke by Sanderson Plumbing Products, Columbus, MS www.sppi.com.
 - d. Church Seat Co, Sheboygan Falls WI www.churchseats.com.
 - e. Gerber Plumbing Fixtures LLC, Woodridge, IL www.gerberonline.com.
 - f. Kohler Co Plumbing Div, Kohler, WI www.us.kohler.com.
 - g. McGuire Manufacturing Co, Cheshire, CT www.mcguiremfg.com.
 - h. Olsonite Corp, Newnan, GA www.olsonite.net or Olsonite Co Ltd, Tilbury, ON (519) 682-1240.

- i. Toto U.S.A., Inc., Morrow, GA www.totousa.com
 - j. 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 With Tank:
 - 1) HET (High-Efficiency Toilet) - Handicap Accessible Fixture: **WC-2**
 - a) Water usage of 1.28 gallons (4.8 liters) per flush.
 - b) 18 inch (450 mm) maximum rim height.
 - c) MaP Score of 1000 grams.
 - d) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (1) American Standard: Cadet Pro Right Height Elongated 215AA.104.
 - (2) Gerber: Avalanche WS-21-818.
 - (3) Kohler: Highline K-3949.
 - (4) Toto: 'ADA Drake' CST744EL.
 - 2. Water Closet Accessories:
 - a. Seats:
 - 1) Provide split front type with check hinge.
 - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 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.
 - b. Supply Pipe And Stop:
 - 1) Provide chrome plated quarter-turn brass ball valve, 12 inch (300 mm) braided stainless steel riser, and chrome-plated steel flange.
 - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) McGuire: BV2166CC.
 - b) Zurn: Z8804.

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'.
- C. Provide each individual fixture supply with accessible chrome-plated stop valve with hand wheel.

- D. Mounting:
 - 1. Water Closets:
 - a. ADA Accessible: Install with flush actuator located on wide side of stall.
- E. 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.

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.cecossinks.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. Standard and ADA Accessible Self Supporting Lavatories: **L-1**
 - 1) Size 20 by 18 inches (500 by 430 mm) nominal.

- 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) American Standard: Lucern 0355.012.
 - b) Kohler: Greenwich K-2032.
- 3) Carrier / Support:
 - a) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (1) Josam: 17100.
 - (2) Jay R. Smith: 0700.
 - (3) Mifab: MC-41.
 - (4) Wade: 520-M36.
- b. Lavatory Fittings:
 - 1) Faucet and Grid Strainer For Standard and ADA Accessible Sinks:
 - a) Design Criteria:
 - (1) Meet NSF International Standards for Lead Free.
 - b) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (1) American Standard: Monterrey Two-Handle Centerset Lavatory Faucet with Vandal-Resistant Wrist Blade handles and grid strainer drain 5502.170.
 - (2) Chicago: 802-317CP with K7715 strainer.
 - (3) Delta: 2529HDF.
 - (4) Gerber: CO-44-412.
 - (5) Kohler: K-7404-5A with K-13885 strainer.
 - (6) Moen: 8215 with 14750 grid strainer.
 - (7) Speakman: SC 3074.
 - (8) T & S: B-0890 with B-0899 Grid Strainer.
 - (9) Zurn: Z-81104 with McGuire 155A grid strainer.
 - 2) Flow Control Fitting:
 - a) Design Criteria:
 - (1) Meet NSF International Standards for Lead Free.
 - b) Accessories:
 - (1) Provide vandal-proof type in place of aerator. Flow shall be 0.5 gpm.
 - c) Category Four Approved Product. See Section 01 6200 for definitions of Categories:
 - (1) Omni L-200 Series by Chromomite Laboratories.
 - 3) 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) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (1) McGuire: BV2165CC.
 - (2) Zurn: Z8804 LRQ-PC.
 - 4) 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) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (1) Dearborn.
 - (2) Engineered Brass Company (EBC).
 - (3) Keeney Manufacturing.
 - (4) McGuire.
 - (5) Zurn.
 - 5) Safety Covers for ADA 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) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (1) Trapwrap by Brocar Products Inc.
 - (2) Pro Wrap by McGuire Products.
 - (3) Lav Guard 2 by TrueBro.
 - (4) Pro Extreme by Plumberex.
- 6) Thermostatic Mixing Valves:
 - a) Point of use application. ASSE 1070 approved.
 - b) Adjustable from 80 degrees F. to 120 degrees F. Valve to keep maximum hot water discharge temperature at 110 degrees F. at 0.5 gpm flow.
 - c) Integral checks at both hot and cold water inlets.
 - d) Mount below sink as required being out of sight.
 - e) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - (1) Powers – LFe480.
 - (2) Watts – LFUSG-B.
 - (3) Approved Equal – Submit for prior approval.

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. Unless otherwise noted, provide each individual fixture supply with chrome-plated stop valve with hand wheel.
- E. Install fixtures with accessible stop or control valve in each hot and cold water branch supply line.
- F. Install Point-Of –Use thermostatic mixing valves below each lavatory. Mount up high as required to be out of site.
- 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 4240**FONT FAUCETS, SUPPLIES, AND TRIM****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install miscellaneous plumbing specialties for font as described in Contract Documents including:
 - a. Font valve box.
 - b. Temperature gauge.
 - c. Font fittings.
- B. Related Requirements:
 - 1. Section 22 0501: 'Common Plumbing Requirements'.
 - 2. Section 22 1116: 'Domestic Water Piping' for ball valves'.
 - 3. Section 22 3413: 'Instantaneous, Tankless, Gas Domestic Water Heaters'.

PART 2 - PRODUCTS**2.1 SYSTEM**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. American Standard Plumbing, Piscataway, NJ www.americanstandard.com or American Standard Division of Wabco-Standard Ltd, Toronto, ON www.americanstandard.ca.
 - b. Cooper B-Line, Highland, IL www.bline.com.
 - c. Dearborn Brass, Cleveland, OH www.dearbornbrass.com.
 - d. Eljer Plumbingware, Dallas, TX or Eljer Mfg Canada Inc, Mississauga, ON www.eljer.com.
 - e. Hoffman Engineering, Anoka, MN www.hoffmanonline.com
 - f. HO Trerice, Oak Park, MI www.hotco.com.
 - g. Jones Stephens Corp, Moody, AL www.plumbest.com.
 - h. Josam Co, Michigan City, IN www.josam.com.
 - i. Jay R. Smith Manufacturing Co, Montgomery, AL www.jrsmith.com.
 - j. Kohler Co Plumbing Div, Kohler WI www.us.kohler.com.
 - k. Marsh Instruments, Newell, WV www.marshbellofram.com.
 - l. Plumbing Products Co / Trim To The Trade, Thousand Palms, CA www.trimtothetrade.com.
 - m. Wade Div Tyler Pipe, Tyler, TX www.wadedrains.com.
 - n. Weiss Instruments Corp, Holtsville, NY www.weissinstruments.com.
- B. Components:
 - 1. Font Valve Box (match size indicated on Contract Drawings):
 - a. 18 inches (455 mm) tall by 12 inches wide (305mm) 4 inches (102 mm) deep electrical equipment cabinet flush with removal trim and hinged locking door
 - b. Type Two Acceptable Products:
 - 1) Model 18124 TCF, less wood panel, by Cooper B-Line.
 - 2) Model ATC18124F, less wood panel, by Hoffman Engineering.
 - 3) Equal as approved by Architect before installation. See Section 01 6200.
 - 2. Font Fittings:
 - a. Supply Outlet: **FS-1**
 - 1) Chrome plated, 1/2 inch (12.7 mm) tapping, 5 inches (125 mm) long.
 - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) 8888.056 by American Standard.

- b) K-6854 by Kohler.
- b. Temperature Gauge:
 - 1) Range 30 to 180 deg F (minus one to 82 deg C), 3-1/2 inch (89 mm) diameter dial, 1/2 inch (12.7 mm) MNPT connection by 5-3/8 inches (137 mm) immersion length.
 - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) 3375 by Marsh.
 - b) 3-1/2 V80030 with bulb 5-3JC1 by HO Trerice.
 - c) 3BM25 by Weiss.
- c. Traps:
 - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) Z-1000 by Tubular Brass Plumbing Products
 - b) .08150 by Josam.
 - c) W-2425-T by Wade.
 - d) 7220 by J. R. Smith.
- d. Drain And Overflow: **FO-1 & FD-2**
 - 1) 2 inch (50 mm) IPS Roman tube drain complete with bolts, 'O' ring, and top.
 - 2) 1-1/2 inch (38 mm) IPS overflow drain complete with grill, crown, and screws.
 - 3) Polished chrome finish.
 - 4) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) 4T-6420 by Plumbing Products / Trim To The Trade.

PART 3 - EXECUTION: Not Used

END OF SECTION

DIVISION 23: HEATING, VENTILATING, AND AIR-CONDITIONING

23 0500 COMMON WORK RESULTS FOR HVAC

- 23 0501 COMMON HVAC REQUIREMENTS
- 23 0529 HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT
- 23 0553 IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT
- 23 0713 DUCT INSULATION
- 23 0719 HVAC PIPING INSULATION
- 23 0933 ELECTRIC AND ELECTRONIC CONTROL SYSTEM FOR HVAC

23 1000 FACILITY FUEL SYSTEMS

- 23 1123 FACILITY NATURAL GAS PIPING

23 2000 HVAC PIPING AND PUMPS

- 23 2300 REFRIGERANT PIPING
- 23 2600 CONDENSATE DRAIN PIPING

23 3000 HVAC AIR DISTRIBUTION

- 23 3001 COMMON DUCT REQUIREMENTS
- 23 3114 LOW-PRESSURE METAL DUCTS
- 23 3300 AIR DUCT ACCESSORIES
- 23 3401 EXHAUST FANS
- 23 3713 DIFFUSERS REGISTERS AND GRILLES
- 23 3714 LOUVERS AND VENTS
- 23 3723 HVAC GRAVITY VENTILATORS

23 4000 HVAC AIR CLEANING DEVICES

- 23 4100 AIR FILTERS

23 5000 CENTRAL HEATING EQUIPMENT

- 23 5135 AIR PIPING
- 23 5417 GAS-FIRED FURNACES

23 6000 CENTRAL COOLING EQUIPMENT

- 23 6214 COMPRESSOR UNITS: AIR CONDITIONING (5 TONS OR LESS)

END OF TABLE OF CONTENTS

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 07 8400: 'Firestopping' for quality of Penetration Firestop Systems to be used on Project and submittal requirements.
 - 3. Section 07 9213: 'Elastometric Joint Sealant' for quality of sealants used at building exterior.
 - 4. Section 07 9219: 'Acoustical Joint Sealants' for quality of acoustical sealants.
 - 5. Sections Under 09 9000 Heading: Painting of mechanical items requiring field painting.
 - 6. Section 26 2913: Magnetic starters and thermal protective devices (heaters) not factory mounted integral part of mechanical equipment.
 - 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.

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.
 - c. Drawing of each temperature control panel identifying components in panels and their function.

- d. Other shop drawings required by Division 23 trade Sections.
- 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 Home 'Prestige' controls 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.
 - d. Equipment Start-Ups:
 - 1) Include copies of equipment start-up checklists required in individual Sections of Division 23.

1.3 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Perform work in accordance with applicable provisions of 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:
 - 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 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.
 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 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:
 - 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.
- C. Unforeseen Conditions:
 - 1. Relocate/or remove and reinstall ducts, piping, grilles, dampers, louvers, fixtures or any other mechanical equipment or devices which are encountered during demolition which conflict with the new construction or which are to accommodate the new construction. Any equipment, piping, grilles, dampers, louvers or fixtures to remain shall be reinstalled at the completion of this work.

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.
 - 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.
 - 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 of straight run.
 - 2) Provide 12 inch 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 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.

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.

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.

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: Four hours.
 - 2) Temperature Control: Four hours. (refer to Section 23 0933 for Training Requirements)
 - 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

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. 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.

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. Class Two Quality Standard Approved Manufacturers. See Section 01 6200:
 - a. Anvil International, Portsmouth, NH www.anvilintl.com.
 - b. Cooper B-Line, Highland, IL www.cooperbline.com.
 - 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

- 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

- 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. Class Two 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) Class Two Quality Standard: Anvil Figure 261.
 - e. Concrete Inserts:
 - 1) Suitable for special nuts size 3/8 inch through 7/8 inch with yoke to receive concrete reinforcing rods, and with malleable iron lugs for attaching to forms.
 - 2) Class Two Quality Standards:
 - a) Standard Inserts: Anvil Figure 282.
 - 3) Class One Quality Standards:
 - a) Continuous Inserts: Unistrut P-3200 series.
 - b) Acceptable Manufacturers: Hilti, Thomas & Betts.
 - c) Equal as approved by Architect before installation. See Section 01 6200.
 - f. Equipment Support Channel:
 - 1) Class One Quality Standard: Unistrut P1000.
 - 2) Acceptable Manufacturers: Hilti, Thomas & Betts.
 - 3) Equal as approved by Architect before installation. See Section 01 6200.
 - g. Swivel Attachment:
 - 1) Class One Quality Standard: Unistrut EM3127.
 - 2) Acceptable Manufacturers: Hilti, Thomas & Betts.
 - 3) Equal as approved by Architect before installation. See Section 01 6200.

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.

END OF SECTION

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 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. Category Four Approved Products and Manufacturers. See Section 01 6200 for definitions of Categories:
 - 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.
 - 2) Previously Finished Surfaces: Use MPI(r) RIN 5.1B Waterborne Light Industrial Finish system.
 - 3. Performance Requirements:
 - a. New Surfaces: MPI Premium Grade finish requirements.
 - b. Deteriorated Existing Surfaces: MPI Premium Grade finish requirements.
 - c. Sound Existing Surfaces: MPI Custom Grade finish requirements.
 - d. 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.

PART 3 - EXECUTION

3.1 APPLICATION

A. Labels:

1. Identify following items with specified labels fastened to equipment with screws (unless noted otherwise):
 - a. Thermostats (attach label to wall directly above or below thermostat).
 - b. New Furnaces.
 - c. New Condensing Units.
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. Existing 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. Leave equipment in like-new appearance.
4. Only painted legends, directional arrows, and color bands are acceptable.
5. 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 (38 mm) or 3 inch (76 mm) thick fiberglass with factory-laminated, reinforced aluminum foil scrim kraft facing and density of 0.75 lb / per cu ft (12 kg / per cu m).
 - 2. Thermal Conductivity: 0.27 BTU in/HR SF deg F at 75 deg F (24 deg C) maximum.
 - 3. Type One 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 (38 mm) thick on rectangular outside air ducts and combustion air ducts.
 - 2) 1-1/2 inches (38 mm) thick on all round ducts.
 - b. Outside Building Insulation Envelope:
 - 1) 3 inch (76 mm) thick on round supply and return air ducts.

- 2) 1-1/2 inch (38 mm) thick on rectangular, acoustically lined, supply and return air ducts.
2. Wrap insulation tightly on ductwork with circumferential joints butted and longitudinal joints overlapped minimum 2 inches (50 mm).
 - a. Do not compress insulation except in areas of structural interference. Minimum thickness at corners shall be one inch (25 mm) thick.
 - b. Remove insulation from lap before stapling.
 - c. Staple seams at approximately 16 inches (400 mm) 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

SECTION 23 0719**HVAC PIPING INSULATION****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install insulation on above ground refrigerant piping and fittings as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 23 0501: 'General HVAC Requirements'.
 - 2. Section 23 2300: 'Refrigerant Piping'.

1.2 DELIVERY, STORAGE, AND HANDLING

- A. Storage And Handling Requirements:
 - 1. Keep materials and work dry and free from damage.
 - 2. Replace wet or damaged materials at no additional cost to Owner.

PART 2 - PRODUCTS**2.1 ASSEMBLIES**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Armacell, Mebane, NC www.armacell.com.
 - b. Nitron Industries, Thousand Oaks, CA www.nitronindustries.com.
 - c. Nomac, Zebulon, NC www.nomaco.com.

- B. Materials:
 - 1. Refrigeration Piping System:
 - a. Thickness:

Pipe Size, Outside Diameter	Insulation Thickness
One inch and smaller	1/2 Inch
1-1/8 to 2 inch	3/4 Inch

- 1) One inch sheet for fittings as recommended by Manufacturer.
 - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) AP Armaflex 25/50 by Armacell.
 - b) Nitrolite by Nitron Industries. White only for exterior.
 - c) Nomaco K-Flex.
 - b. Joint Sealer:
 - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) Armacell 520 by Armacell.
 - b) Namaco K-Flex R-373.
 - c. Insulation Tape:
 - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) Armaflex AP Insul Tape by Armacell.
 - b) FT182 Tape by Nitron Industries.

- c) Elastomeric Foamtape by Nomac K-Flex.
- d. Exterior Finish:
 - 1) For application to non-white, exterior insulation.
 - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) WB Armaflex Finish by Armacell.
 - b) R-374 Protective Coating by Nomaco K-Flex.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before application of insulating materials, brush clean surfaces to be insulated and make free from rust, scale, grease, dirt, moisture, and any other deleterious materials.
- B. Use drop cloths over equipment and structure to prevent adhesives and other materials spotting the work.

3.2 INSTALLATION

- A. Refrigeration System Piping System:
 - 1. General:
 - a. Install insulation in snug contact with pipe.
 - 1) Insulate flexible pipe connectors.
 - 2) Insulate liquid line upstream of thermal expansion valves with insulating tape.
 - 3) Insulate fittings with sheet insulation and as recommended by Manufacturer.
 - b. Slip insulation on tubing before tubing sections and fittings are assembled keeping slitting of insulation to a minimum.
 - c. Do not install insulation on lines through clamp assembly of pipe support. Butt insulation up against sides of clamp assembly.
 - d. Stagger joints on layered insulation. Seal joints in insulation.
 - e. Install insulation exposed outside building so 'slit' joint seams are placed on bottom of pipe.
 - f. Paint exterior exposed, non-white insulation with two coats of specified exterior finish.
 - 2. System Requirements:
 - a. Condensing Units: Install insulation on above ground refrigerant suction piping and fittings, including thermal bulb and liquid line upstream of thermal expansion valve.

3.3 FIELD QUALITY CONTROL

- A. Non-Conforming Work:
 - 1. Method of installing insulation shall be subject to approval of Architect. Sloppy or unworkmanlike installations are not acceptable.

3.4 CLEANING

- A. Leave premises thoroughly clean and free from insulating debris.

END OF SECTION

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.
 - 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.
 - 1) Primary Contact: Chris Brinkerhoff, (801) 550-3344, chris.brinkerhoff@honeywell.com.
 - b. Insul_Guard, Salt Lake City, UT:
 - 1) Primary Contact: Dan Craner, (801) 518-3733, insul_guard@comcast.net.
 - c. System Sensor, St Charles, IL www.systemsensor.com.
 - d. Zimmerman Technologies, Renton, WA:
 - 1) Primary Contact: Tracy Zimmerman, (425) 255-1906, zimmtech@yahoo.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) CO2 (Carbon Dioxide) sensors will open ventilation dampers only when CO2 exceeds 1000 ppm.
 - g) LCBS Connect devices access via internet Chrome browser via gateway.
 - h) 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.
 - l) Dehumidification setting range 40 to 80% RH.
 - b. Honeywell TrueZone panel enabled device(s):
 - 1) General Requirements: Zone Panel:
 - a) Work in conjunction with LCBS Connect.
 - b) Control multiple zones on single fan coil unit (gas fired furnace with air conditioning or air handling unit with heat pump).
 - c) Keypad programming & checkout.

- d) Work with conventional, heat pump or dual fuel applications.
- e) Push wire terminals.

2) Dampers:

- a) Zone damper powered by 24VAC circuit from zone panel.
- b) Zone damper adjustable range stops for consistent bleed setting.
- c) Zone damper LED indicator lights (red closed, green open/ 3 wire applications).
- d) Zone damper terminals have push terminals.

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
 - b) Wall Cover Plate: Honeywell. 50002883-001.
 - c) Discharge Air / Return Air Sensors: Honeywell C7041B2005 20k ohms.
 - d) Outdoor Air Sensor: Honeywell C7041F2006.
 - e) Indoor Air Sensor: Sylk bus network; Honeywell TR40
 - f) Averaging sensor: Sylk bus network; Honeywell TR40
 - b. Internet Gateway Module(s): One (1) module per thirty (30) controllers.
 - 1) Category Four Approved Product. See Section 01 6200 for definitions of Categories:
 - a) LCBS Connect Gateway Module: Honeywell LGW1000.(existing).
2. Zone panel and Components:
 - a. Zone Panel: Honeywell TrueZone HZ322.
 - b. Zone Panel Transformer: AT175F1023.
 - c. Zone Discharge Air Temperature Sensor: Honeywell C7735A1000.
 - d. Zone Damper(s): Honeywell ARD (damper size) TZ round damper.
 - e. Zone Damper(s): Honeywell ZD (damper size) TZ rectangular damper.
3. 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. Category Four Approved Product. See Section 01 6200 for definitions of Categories:
 - 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.
4. Transformer:
 - a. 120 / 24 V, 50VA Honeywell AT150F.
 - b. 120 / 24 V, 75VA Honeywell AT175F.
5. Damper Actuators:
 - a. Electric type equipped for Class I wiring.
 - b. Shall not consume power during UNOCCUPIED cycle or use chemicals or expandable media.
 - c. Have built in spring return.
 - d. Category Four Approved Product. See Section 01 6200 for definitions of Categories:
 - 1) Honeywell MS8105A1030.
6. Conductors:
 - a. Color-coded and No. 16 and No. 12 AWG Type TWN, TFN, or THHN, stranded.
 - b. Thermostat 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) Class Two Quality Standard. See Section 01 6200:
 - a) CAT 4, 22 gauge (0.025 in), twisted pair, non-plenum and non-shielded cable.
7. CO₂ (Carbon Dioxide) Return Air Sensor:
 - a. Duct mount with display.

- b. Category Four Approved Product. See Section 01 6200 for definitions of Categories:
 - 1) Honeywell: C7232B1006.
- 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 thermostat 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.
 - 5. Sensor Averaging:
 - a. Controller shall control zone HVAC equipment by averaging temperature in spaces containing wall module and averaging sensors.
 - 6. Systems with CO₂ (Carbon Dioxide) sensor to control minimum, spring return type, outdoor ventilation air damper:
 - a. Damper shall open in controller Occupied Mode only when CO₂ sensor setpoint of 1000 ppm is reached. Damper shall close if CO₂ level drops below 900 ppm.
 - b. Damper shall remain closed in controller 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.

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 from lighting, motors, or low voltage switching cables.
- C. Zone Panel:
 - 1. Zone panel shall be mounted by mechanical equipment with associated LCBS module in close proximity but mounted 24 inches (610 mm) apart.
 - 2. Zone panel shall be mounted at eye level and accessible for visual inspection.
 - 3. Install discharge air sensor 6 feet (1.80 m) downstream from a/c coil.
 - 4. Install OA sensor in fresh air duct.
 - 5. TOD relay for fresh air damper which is not part of zone panel shall be mounted in close proximity to panel and clearly labeled such.
 - 6. Zone panel shall be programmed for appropriate amount of zones and control.
 - 7. Zone dampers shall use three (3) wires for LED damper display.
 - 8. Power for zone transformer shall come from mechanical equipment for service switch disconnect.

9. Zone dampers shall have actuation component positioned such as for visual damper position inspection.
 10. Set minimum zone damper position to 16 percent or setting number 1.
- D. Safety Controls:
1. Fresh air dampers shall close on fan shut-down, power failure, open fan motor disconnect switch, and when thermostat is in UNOCCUPIED mode.
- E. Mount damper actuators and actuator linkages external of airflow. Make certain dampers operate freely without binding or with actuator housing moving.

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 except for Bishop and Stake area which shall be set to two (2) hours.
 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.
 13. Set each zone to applicable Holiday scheduling for General & Stake Conferences.
- B. For systems with TrueZONE Zone Panel:
1. Contractor responsible for fully functioning zoning system connected to LCBS controller system.
 2. Contractor responsible to configuring of zone panel.
 3. Contractor responsible to coordinate Network start up with assistance from air balancer.

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 |

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
 17. MENU/ Holiday-Event Scheduler / Custom Events/ Create new event.
 - a. Eastern Time Zone:
 - 1) First Sunday in April: Occupied Chapel from 11:30 am – 6:00 pm / every year.
 - 2) First Sunday in April: Unoccupied all other zones for all day / every year.
 - 3) First Sunday in October: Occupied Chapel from 11:30 am – 6:00 pm / every year.
 - 4) First Sunday in October: Unoccupied all other zones for all day / every year.
 - b. Central Time Zone:
 - 1) First Sunday in April: Occupied Chapel from 10:30 am – 5:00 pm / every year.
 - 2) First Sunday in April: Unoccupied all other zones for all day / every year.
 - 3) First Sunday in October: Occupied Chapel from 10:30 am – 5:00 pm / every year.
 - 4) First Sunday in October: Unoccupied all other zones for all day / every year.
 - c. Mountain Time Zone:
 - 1) First Sunday in April: Unoccupied all zones for all day / every year.
 - 2) First Sunday in April: Unoccupied all zones for all day / every year.
 - 3) First Sunday in October: Unoccupied all zones for all day / every year.
 - 4) First Sunday in October: Unoccupied all zones for all day / every year.
 - d. Pacific Time Zone
 - 1) First Sunday in April: Occupied Chapel from 8:30 am – 3:00 pm / every year.
 - 2) First Sunday in April: Unoccupied all other zones for all day / every year.
 - 3) First Sunday in October: Occupied Chapel from 8:30 am – 3:00 pm / every year.
 - 4) First Sunday in October: Unoccupied all other zones for all day / every year.
- B. Zone Panel Configuration:
1. Configuration:
 - a. Conventional or Heat pump.
 - b. Cooling stages: (match equipment).
 - c. Heat stages: (match equipment).

- d. RF enabled: (NO).
 - e. Zones Installed: (match number of zones).
 - f. Heat Staging Control: (percent Zones).
- 2. Advanced Configuration:
 - a. Heat Fan Control (HVAC).
 - b. Purge Time: (2 minutes).
 - c. Fan in Purge (HVAC):
 - d. Purge Dampers: (Unchanged).
 - e. Changeover delay: (15 minutes).
 - f. DA temperature Sensor: (Yes).
 - g. DA temperature High Limit (140 degree).
 - h. DA Low Limit: (35 degree).
 - i. DAT MSTG Inhibit (Yes).
 - j. MSTG OT Lockout (No).
- 3. Save Changes.

3.6 CLOSEOUT ACTIVITIES

- 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 Stake and General Conference, 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

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 LCBSCConnect 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: _____

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 as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 23 0501: 'Common HVAC Requirements'.
 - 2. Section 23 0553: 'Identification for HVAC Piping and Equipment'.

1.2 REFERENCES

- A. Reference Standards:
 - 1. 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-11a, 'Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service'.
 - 2. 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 IFGC International Fuel Gas Code.

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 MegaPressG, Wichita, KS www.viega-na.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 And Fittings:
 - a. Black carbon steel, butt welded, Schedule 40 pipe meeting requirements of A53/A53M.
 - b. Welded forged steel fittings meeting requirements of ASTM A234/A234M or standard weight malleable iron screwed or all MegaPressG fittings.

2. Valves:
 - a. 125 psi (862 kPa) bronze body ball valve, UL listed.
 - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 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.
3. Flexible Connector:
 - a. Type 304 stainless steel corrugated tube coated for corrosion protection.
 - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Dormont Supr-Safe.
 - 2) BrassCraft Procoat.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Steel pipe installed through air plenums, in walls, and pipes 2-1/2 inches (64 mm) and larger shall have welded fittings and joints. Other steel pipe may have screwed, MegaPressG, or welded fittings.
 1. Install MegaPressG fittings according to Manufacturer's recommendations and with Manufacturer's recommended tools.
- B. On lines serving gas-fired equipment, install gas valves adjacent to equipment outside of equipment cabinet and easily accessible.
- C. Install 6 inch (150 mm) long minimum dirt leg, with pipe cap, on vertical gas drop serving each gas-fired equipment unit.
- D. Use fittings for changes of direction in pipe and for branch runouts.
- E. 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

SECTION 23 2300**REFRIGERANT PIPING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install piping and specialties for refrigeration systems as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 23 0501: 'Common HVAC Requirements'.
 - 2. Section 23 0719: 'Refrigerant Piping Insulation'.
 - 3. Section 23 6213: 'Compressor Units: Air Conditioning (5 Ton or less)'.

1.2 REFERENCES

- A. Association Publications:
 - 1. Federal Emergency Management Agency (FEMA) / Vibration Isolation and Seismic Control Manufacturers Association (VISCMA) / American Society of Civil Engineers (ASCE):
 - a. FEMA 412, 'Installing Seismic Restraints For Mechanical Equipment' (December 2002).
 - 2. Vibration Isolation and Seismic Control Manufacturers Association (VISCMA):
 - a. VISCMA 101-15, 'Seismic Restraint Specification Guidelines for Mechanical, Electrical, and Plumbing Systems'.
 - b. VISCMA 102-12, 'Vibration Isolation Specification Guidelines for Mechanical, Electrical, and Plumbing Systems'.
- B. Definitions:
 - 1. 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.
 - 2. Vibration Isolation: Vibration reduction in which an isolation system is placed between the source of unwanted vibration and an item which needs to be shielded from the vibration.
- C. Reference Standards:
 - 1. American National Standards Institute (ANSI) / American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE):
 - a. ANSI/ASHRAE 15-2016 and 34-2016, 'Safety Standard and Designation and Classification of Refrigerants'.
 - 2. American National Standards Institute / American Welding Society:
 - a. ANSI/AWS A5.8M/A5.8-2011, 'Specification for Filler Metals for Brazing and Braze Welding'.
 - 3. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE):
 - a. 2011 ASHRAE Handbook - HVAC Applications.
 - 1) Chapter 48, 'Noise and Vibration Control'.
 - 4. ASTM International:
 - a. ASTM A36/A36M-14, 'Standard Specification for Carbon Structural Steel'.
 - b. ASTM B280-18, 'Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service'.
 - 5. 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).
 - 6. Underwriters Laboratories:
 - a. UL 2182, 'Refrigerants' (April 2006).

1.3 SUBMITTALS

- A. Action Submittals:
 - 1. Shop Drawings: Show each individual equipment and piping support.
- B. Informational Submittals:
 - 1. Qualification Statements: Technician certificate for use of HFC and HCFC refrigerants.
 - 2. Test Reports: Submit to Architect within seven days of testing.

1.4 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Refrigerants:
 - a. Underwriters Laboratories:
 - 1) Comply with requirements of UL 2182.
- B. Qualifications. Section 01 4301 applies, but is not limited to the following:
 - 1. Installer: Refrigerant piping shall be installed by refrigeration contractor licensed by State and by technicians certified in use of HFC and HCFC refrigerants.

PART 2 - PRODUCTS

2.1 COMPONENTS

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Airtec, Fall River, MA, www.noventcaps.com.
 - b. Cooper Industries, Houston, TX www.cooperindustries.com.
 - c. Cush-A-Clamp by ZSI Manufacturing, Canton, MI www.cushaclamp.com.
 - d. Elkhart Products Corp, Elkhart, IN www.elkhartproducts.com.
 - e. Emerson Climate Technologies, St Louis, MO www.emersonflowcontrols.com.
 - f. Handy & Harman Products Division, Fairfield, CT www.handy-1.com.
 - g. Harris Products Group, Cincinnati, OH www.harrisproductsgroup.com.
 - h. Henry Valve Co, Melrose Park, IL www.henrytech.com.
 - i. Hilti Inc, Tulsa, OK www.hilti.com.
 - j. Hydra-Zorb Co, Auburn Hills, MI www.hydra-zorb.com.
 - k. JB Industries, Aurora, IL www.jbind.com.
 - l. Mueller Steam Specialty, St Pauls, NC www.muellersteam.com.
 - m. Nibco Inc, Elkhart, IN www.nibco.com.
 - n. Parker Corp, Cleveland, OH www.parker.com.
 - o. Sporlan Valve Co, Washington, MO www.sporlan.com. (also ZoomLock)
 - p. Sherwood Valves, Washington, PA www.sherwoodvalve.com.
 - q. Thomas & Betts, Memphis, TN www.superstrut.com.
 - r. Unistrut, Div of Atkore International, Inc., Harvey, IL www.unistrut.com.
- B. Materials:
 - 1. Refrigerant Piping:
 - a. Meet requirements of ASTM B280, hard drawn straight lengths. Soft copper tubing not permitted.
 - b. Do not use pre-charged refrigerant lines.
 - 2. Refrigerant Fittings:
 - a. Wrought copper with long radius elbows.
 - b. Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories:
 - 1) Mueller Streamline.
 - 2) Nibco Inc.
 - 3) Elkhart.

- 4) Sporlan - ZoomLock [Flame-Free Refrigerant Fittings]
3. Suction Line Traps:
 - a. Manufactured standard one-piece traps.
 - b. Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories:
 - 1) Mueller Streamline.
 - 2) Nibco Inc.
 - 3) Elkhart.
 - 4) Sporlan - ZoomLock [Flame-Free Refrigerant Fittings]
4. Tee Access:
 - a. Brass:
 - 1) Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories:
 - a) JB Industries: Part #A3 Series with Factory Cap and Valve Core.
5. Connection Material:
 - a. Sporlan - ZoomLock Flame-Free Refrigerant Fittings with factory approved tools.
 - b. Brazing Rods in accordance with ANSI/AWS A5.8M/A5.8:
 - 1) Copper to Copper Connections:
 - a) Classification BCuP-4 Copper Phosphorus (6 percent silver).
 - b) Classification BCuP-5 Copper Phosphorus (15 percent silver).
 - 2) Copper to Brass or Copper to Steel Connections: Classification BAg-5 Silver (45 percent silver).
 - 3) Do not use rods containing Cadmium.
 - c. Flux:
 - 1) Type Two Acceptable Products:
 - a) Stay-Silv White Brazing Flux by Harris Products Group.
 - b) High quality silver solder flux by Handy & Harmon.
 - c) Equal as approved by Architect before use. See Section 01 6200.
6. Valves:
 - a. Manual Refrigerant Shut-Off Valves:
 - 1) Ball valves designed for refrigeration service and full line size.
 - 2) Valve shall have cap seals.
 - 3) Valves with hand wheels are not acceptable.
 - 4) Provide service valve on each liquid and suction line at compressor.
 - 5) If service valves come as integral part of condensing unit, additional service valves shall not be required.
 - 6) Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories:
 - a) Henry.
 - b) Mueller.
 - c) Sherwood.
 - d) Virginia.
7. Filter-Drier:
 - a. On lines smaller than 3/4 inch outside diameter, filter-drier shall be sealed type with brazed end connections.
 - b. Size shall be full line size.
 - c. Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories:
 - 1) Emerson Climate Technologies.
 - 2) Mueller.
 - 3) Parker.
 - 4) Sporlan.
 - 5) Virginia.
8. Sight Glass:
 - a. Combination moisture and liquid indicator with protection cap.
 - b. Sight glass shall be full line size.
 - c. Sight glass connections and sight glass body shall be solid copper or brass, no copper-coated steel sight glasses allowed.
 - d. Category Four Approved Product. See Section 01 6200 for definitions of Categories:
 - 1) HMI by Emerson Climate Technologies.
9. Liquid Line Solenoid Valve:
 - a. As recommended by equipment manufacturer for long line applications.

10. Refrigerant Piping Supports:
 - a. Base, Angles, And Uprights: Steel meeting requirements of ASTM A36.
 - b. Securing Channels:
 - 1) At Free-Standing Pipe Support:
 - a) Class One Quality Standard: P-1000 channels by Unistrut.
 - b) Acceptable Manufacturers: Hilti, Thomas & Betts.
 - c) Equal as approved by Architect before installation. See Section 01 6200.
 - 2) At Wall Support:
 - a) Class One Quality Standard: P-3300 channels by Unistrut.
 - b) Acceptable Manufacturers: Hilti, Thomas & Betts.
 - c) Equal as approved by Architect before installation. See Section 01 6200.
 - 3) At Suspended Support:
 - a) Class One Quality Standard: P-1001 channels by Unistrut.
 - b) Acceptable Manufacturers: Hilti, Thomas & Betts.
 - c) Equal as approved by Architect before installation. See Section 01 6200.
 - 4) Angle Fittings:
 - a) Class One Quality Standard: P-2626 90 degree angle by Unistrut.
 - b) Acceptable Manufacturers: Hilti, Thomas & Betts.
 - c) Equal as approved by Architect before installation. See Section 01 6200.
 - c. Pipe Clamps:
 - 1) Type Two Acceptable Manufacturers:
 - a) Hydra-Zorb.
 - b) ZSI Cush-A-Clamp.
 - c) Hilti Cush-A-Clamp.
 - d) Equal as approved by Architect before installation. See Section 01 6200.
 - d. Protective Cover: 18 ga steel, hot-dipped galvanized.
11. Locking Refrigerant Cap:
 - a. Provide and install on charging valves:
 - 1) Class One Quality Standard: 'No Vent' locking refrigerant cap.
 - 2) Acceptable Manufacturers: Airtec.
 - 3) Equal as approved by Architect before installation. See Section 01 6200.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Refrigerant Lines:
 1. Install as high in upper mechanical areas as possible. Do not install underground or in tunnels.
 2. Slope suction lines down toward compressor one inch/10 feet. Locate traps at vertical rises against flow in suction lines.
 3. Comply with condensing unit manufacturer's installation instructions.
- B. Connections:
 1. Refrigeration system connections shall be copper-to-copper, copper-to-brass, or copper-to-steel type properly cleaned and brazed with specified rods. Use flux only where necessary. No soft solder (tin, lead, antimony) connections will be allowed in system.
 2. Braze manual refrigerant shut-off valve, sight glass, and flexible connections.
 3. Circulate dry nitrogen through tubes being brazed to eliminate formation of copper oxide during brazing operation.
- C. Specialties:
 1. Install valves and specialties in accessible locations. Install refrigeration distributors and suction outlet at same end of coil.
 2. Install thermostatic bulb as close to cooling coil as possible. Do not install on vertical lines.
 3. Install equalizing line in straight section of suction line, downstream of and reasonably close to thermostatic bulb. Do not install on vertical lines.
 4. Provide liquid line solenoid valve when required for long line applications.

- D. Refrigerant Supports:
 - 1. Support Spacing:
 - a. Piping 1-1/4 inch And Larger: 8 feet on center maximum.
 - b. Piping 1-1/8 inch And Smaller: 6 feet on center maximum.
 - c. Support each elbow.
 - 2. Isolate pipe from supports and clamps with Hydrozorb or Cush-A-Clamp systems.
 - 3. Run protective cover continuous from condensing units to risers or penetrations at building wall. Support entire cover utilizing exterior supports as detailed.
 - 4. Provide opening through exterior cover with removable plug or cover to observe site glass.

3.2 FIELD QUALITY CONTROL

- A. Field Tests:
 - 1. Make evacuation and leak tests after completing refrigeration piping systems. Positive pressure test will not suffice for procedure outlined below. Submit test reports.
 - a. Draw vacuum on each entire system with two stage vacuum pump. Draw vacuum to 300 microns using micron vacuum gauge capable of reading from atmosphere to 10 microns. Do not use cooling compressor to evacuate system nor operate it while system is under high vacuum.
 - b. Break vacuum with nitrogen and re-establish vacuum test. Vacuum shall hold for 30 minutes at 300 microns without vacuum pump running.
 - c. Conduct tests at 70 deg F ambient temperature minimum.
 - d. Do not run systems until above tests have been made and systems started up as specified. Inform Owner's Representative of status of systems at time of final inspection and schedule start-up and testing if prevented by outdoor conditions before this time.
 - e. After testing, fully charge system with refrigerant and conduct test with Halide Leak Detector.
 - f. Recover all refrigerant in accordance with applicable codes. Do not allow any refrigerant to escape to atmosphere.
- B. Non-Conforming Work:
 - 1. If it is observed that refrigerant lines are being or have been brazed without proper circulation of nitrogen through lines, all refrigerant lines installed up to that point in time shall be removed and replaced at no additional cost to Owner.

END OF SECTION

SECTION 23 2600**CONDENSATE DRAIN PIPING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Related Requirements:
 - 1. Section 23 0501: 'Common HVAC Requirements'.

1.2 REFERENCES

- A. Reference Standards:
 - 1. ASTM International:
 - a. ASTM B88-09, 'Standard Specification for Seamless Copper Water Tube'.
 - b. ASTM D1785 - 06 'Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.'

PART 2 - PRODUCTS**2.1 SYSTEMS**

- A. Materials:
 - 1. Condensate Drains:
 - a. 3 inch 75 mm deep seal, vented water trap adjacent to cooling coil connection.
 - b. Schedule 40 PVC for condensate drains from furnace combustion chambers and furnace cooling coils.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Condensate Drains:
 - 1. Support piping and protect from damage.
 - 2. Do not combine PVC condensate drain piping from furnace combustion chamber with copper condensate drain piping from cooling coil.

END OF SECTION

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).

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.

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. Where hangers are secured to forms before concrete slabs are poured, cut off flush all nails, strap ends, and other projections after forms are removed.
5. 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

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).
 - 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. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Duct Butter or ButterTak by Cain Manufacturing Co Inc, Pelham, AL www.cainmfg.com.
 - 2) DP 1010 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.

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. Properly flash where ducts protrude above roof.
- F. 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.

END OF SECTION

SECTION 23 3300**AIR DUCT ACCESSORIES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install duct accessories in specified ductwork as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 23 0933: 'Electric And Electronic Control System For HVAC' for temperature control damper actuators and actuator linkages.
 - 2. Section 23 3001: 'Common Duct Requirements'.

1.2 REFERENCES

- A. Reference Standards:
 - 1. ASTM International:
 - a. ASTM A653/A653M-15, 'Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process'.
 - b. ASTM C1071-12, '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. McGill AirSeal, Columbus, OH www.mcgillairseal.com.
- kk. United Enertech Corp, Chattanooga, TN www.unitedenertech.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 thick, 1-1/2 lb density fiberglass conforming to requirements of ASTM C1071. Liner will not support microbial growth when tested in accordance with ASTM C1338.
- 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 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) Category Four Approved Water-Based Products. See Section 01 6200 for definitions of Categories:
 - 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) Category Four Approved Solvent-Based (non-flammable) Products. See Section 01 6200 for definitions of Categories:
 - 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) Category Four Approved Solvent-Based (flammable) Products. See Section 01 6200 for definitions of Categories:
 - 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) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 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.
 - c. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 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 minimum.
 - 2) Fire and smoke damper access doors shall have minimum clear opening of 12 inches square or larger as shown on Drawings.
 - b. Rectangular Ducts:
 - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 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.
 - c. Round Ducts:
 - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) Ductmate: 'Sandwich' Access Door.
 - b) Elgen: Sandwich Access Door.
 - c) Kees: ADL-R.
 - d) Nailor: 0890.
 - e) Pottorff: RAD.
 - f) Ruskin: ADR.
 - g) Ward: DSA.
- 4. Dampers And Damper Accessories:
 - a. Locking Quadrant Damper Regulators:
 - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 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) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 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 galvanized steel, single blade and opposed blade type with 3/8 inch axles and end bearings. Blade width 8 inches maximum. Blades shall have 1/8 inch 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) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (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 galvanized steel, single blade with 3/8 inch axles and end bearings.
 - b) For use in outside air ducts.
 - c) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (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. Motorized Outside Air Dampers:
 - 1) General:
 - a) Low leakage type. AMCA certified.
 - b) Make provision for damper actuators and actuator linkages to be mounted external of air flow.
 - 2) Rectangular Ducts:
 - a) Damper Blades:
 - (1) Steel or aluminum airfoil type with mechanically locked blade seals, 8 inch blade width maximum measured perpendicular to axis of damper.
 - (2) Jamb seals shall be flexible metal compression type.
 - (3) Opposed or single blade type.
 - b) Category Four Approved Products. See Section 01 6200 for definitions of Categories:

- (1) Air Balance: AC 526.
 - (2) American Warming: AC526.
 - (3) Arrow: AFD-20.
 - (4) C & S: AC50.
 - (5) Cesco: AGO3.
 - (6) Nailor: 2020.
 - (7) Pottorff: CD-52.
 - (8) Ruskin: CD-60.
 - (9) Tamco: Series 1000.
 - (10) United Enertech: CD-150 or CD-160.
 - 3) Round Ducts:
 - a) Damper Blades:
 - (1) Steel with mechanically locked blade seals.
 - (2) Blade seals shall be neoprene or polyethylene.
 - (3) Single blade type.
 - b) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (1) Air Balance: AC 25.
 - (2) American Warming: VC25.
 - (3) Arrow: Type 70 or 75.
 - (4) C & S: AC25R.
 - (5) Cesco: AGG.
 - (6) Nailor: 1090.
 - (7) Pottorff: CD-25R.
 - (8) Ruskin: CD25.
 - (9) Tamco: Square-to-Round Series 1000.
 - (10) United Enertech: RI.
 - e. 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 mesh.
 - 3) Frame shall be galvanized steel or extruded aluminum alloy.
 - 4) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) Air-Rite: Model BDD-3.
 - b) American Warming: BD-15.
 - c) C & S: BD31.
 - 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 wide vane rail. Junior vane rail not acceptable.
- 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 long mechanical fasteners 12 inches 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. Mixed air.
 - d. Transfer air.
 - e. Elbows, fittings, and diffuser drops greater than 12 inches in length.
 - 2. Do not install acoustic lining in round ducts.
- B. Flexible Connections: Install flexible inlet and outlet duct connections to each fan coil unit.
- C. Access Doors In Ducts:
 - 1. Install between manual and motorized outside air damper at each system. Locate doors within 6 inches of installed dampers.
 - 2. Install within 6 inches of fire dampers and in Mechanical Room if possible. Install on side of duct that allows easiest access to damper.
- D. Dampers And Damper Accessories:
 - 1. Install concealed ceiling damper regulators.
 - a. Paint cover plates to match ceiling tile.
 - b. Do not install damper regulators for dampers located directly above removable ceilings or in Mechanical Rooms.
 - 2. Provide each take-off with an adjustable volume damper to balance that branch.
 - a. Anchor dampers securely to duct.
 - b. Install dampers in main ducts within insulation.
 - c. Dampers in branch ducts shall fit against sheet metal walls, bottom and top of duct, and be securely fastened. Cut duct liner to allow damper to fit against sheet metal.
 - d. Where concealed ceiling damper regulators are installed, provide cover plate.
 - 3. Install motorized dampers.

END OF SECTION

SECTION 23 3316**FIRE AND SMOKE DAMPERS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install fire and smoke dampers described in Contract Documents.
- B. Related Requirements:
 - 1. Section 15 3001: 'Common Duct Requirements'.

1.2 REFERENCES

- A. Reference Standards:
 - 1. Underwriters Laboratories (UL):
 - a. UL 555: 'Fire Dampers'.
 - b. UL 555C, 'Ceiling Dampers'
 - c. UL 555S, 'Smoke Dampers'

1.3 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Dampers shall conform to NFPA and SMACNA requirements and bear UL label.
 - 2. Dampers shall be approved by fire authorities having jurisdiction where so required.
 - 3. Combination fire / smoke dampers shall conform to UL 555 Fire Damper Test Standard and to UL 555S Leakage Rated Damper Test Standard.

PART 2 - PRODUCTS**2.1 ASSEMBLIES**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Air Balance Inc, Holland, OH www.airbalance.com.
 - b. Cesco Products, Florence, KY www.cescoproducts.com.
 - c. Greenheck Corp, Schofield, WI www.greenheck.com or Greenheck Corp/ E H Price Ltd, Winnipeg, MB (204) 669-4220.
 - d. Honeywell Inc, Minneapolis, MN www.honeywell.com.
 - e. Nailor Industries, Houston, TX www.nailor.com.
 - f. Pottorff, Fort Worth, TN www.pottorff-hvac.com.
 - g. Prefco Products Inc, Buckingham, PA www.prefco-hvac.com.
 - h. Ruskin Manufacturing, Kansas City, MO www.ruskin.com.
 - i. Safe-Air / Dowco, Cicero, IL www.safeair-dowco.com.
 - j. United Enertech Corp, Chattanooga, TN www.unitedenertech.com.
- B. Manufactured Units:
 - 1. Fire Dampers:
 - 2. Corridor Combination Fire / Smoke Dampers (Type 5):

- a. One hour rated and Class II **250 deg F (121 deg C)** leakage rated minimum for protection of tunnel type corridor ceilings with horizontal walls.
 - b. Power-open, fail-close non-stall type motorized damper operating at 115 V and drawing 0.2 AMP maximum.
 - c. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Air Balance: Model FS2C.
 - 2) CESCO: Model TG2C.
 - 3) Greenheck: Model CFSD212.
 - 4) Nailor: Model 1271C-1.
 - 5) Pottorff: FSD-172.
 - 6) Prefco: 5050TC.
 - 7) Ruskin: Model FSD36C.
 - 8) United Enertech: F/S-3V-CR-II.
- C. Fabrication:
- 1. General:
 - a. 16 ga frames.
 - b. Integral sleeves, except for Type 2 Fire Dampers.
 - 2. Type 3, 4, And 5 Dampers:
 - a. Seals:
 - 1) Blade seals shall be mechanically locked into blade edge. Clip-on and adhesive type seals are not acceptable.
 - 2) Jamb seals shall be flexible metal compression type.
 - b. Blades:
 - 1) Type 3: **16 ga (1.59 mm)** minimum steel.
 - 2) Type 4 And 5: **22 ga (0.79 mm)** minimum steel.
- D. Operation Sequences:
- 1. Types 4 And 5: Dampers shall close on signal from smoke detectors, on power failure, or when temperatures at damper exceed **165 deg F (74 deg C)**.

2.2 ACCESSORIES

- A. Damper Actuators:
- 1. For Type 3, 4, and 5 dampers.
 - 2. Category Four Approved Product. See Section 01 6200 for definitions of Categories:
 - a. Honeywell: ML 4115.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Placement:
- 1. Corridor Combination Fire / Smoke Dampers (Type 5): Install in ducts where ducts penetrate fire-rated corridor ceilings.

END OF SECTION

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.

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 roof cap for flat roof installation.
 - 7. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a. Acme: VQ.
 - b. Broan: LoSone.
 - c. Carnes: VCD.
 - d. Cook: Gemini.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Anchor fan units securely to structure.

END OF SECTION

SECTION 23 3713**DIFFUSERS, REGISTERS, AND GRILLES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install diffusers, registers, and grilles connected to ductwork as described in Contract Documents.
- B. Related 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. Krueger Air System Components, Richardson, TX www.krueger-hvac.com.
 - 3. Metal*Aire by Metal Industries Inc, Clearwater, FL www.metalaire.com.
 - 4. Nailor Industries Inc, Houston, TX or Weston, ON www.nailor.com.
 - 5. Price Industries Inc, Suwanee, GA www.price-hvac.com or E H Price Ltd, Winnipeg, MB (204) 669-4220.
 - 6. Titus, Richardson, TX www.titus-hvac.com.
 - 7. Tuttle & Bailey, Richardson, TX www.tuttleandbailey.com.

2.2 MANUFACTURED UNITS

- A. Ceiling Diffusers:
 - 1. Finish: Off-white baked enamel.
 - 2. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a. Carnes: SKSA.
 - b. Krueger: SH.
 - c. Metal*Aire: 5500S.
 - d. Nailor: 6500B.
 - e. Price: SMD-6.
 - f. Titus: TDC-6.
 - g. Tuttle & Bailey: M.
- B. Ceiling Return And Transfer Grilles:
 - 1. Finish: Off-white baked enamel.
 - 2. 1/2 inch (12.7 mm) spacing.
 - 3. See Contract Documents for location of filter grilles.
 - 4. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a. Carnes: RSLA.

- b. Krueger: S85H.
 - c. Metal*Aire: SRH.
 - d. Nailor: 6155H.
 - e. Price: 535.
 - f. Titus: 355RL or 355 RS.
 - g. Tuttle & Bailey: T75D.
- C. Side Wall Supply Grilles And Registers:
 - 1. Finish: Off-white baked enamel.
 - 2. Removable core.
 - 3. Double deflection.
 - 4. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a. Krueger: 5815.
 - b. Metal*Aire: 42C.
 - c. Nailor: 51RCD.
 - d. Price: RCG-DVS.
 - e. Titus: 1707.
 - f. Tuttle & Bailey: AVF.
- D. Low Sidewall Return Grilles:
 - 1. Finish: Off-white baked enamel.
 - 2. 38 or 45 degree deflection.
 - 3. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a. Carnes: RSHA.
 - b. Krueger: S480H.
 - c. Metal*Aire: HD-RH.
 - d. Nailor: 6145H-HD.
 - e. Price: 91.
 - f. Titus: 33RL or 33RS.
 - g. Tuttle & Bailey: T115D.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Anchor securely into openings. Secure frames to ductwork by using four sheet metal screws, one per side.

3.2 ADJUSTING

- A. Set sidewall supply register blades at 15 degrees upward deflection.

END OF SECTION

SECTION 23 3714**LOUVERS AND VENTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install louvers connected to ductwork as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 23 3001: 'General Duct Requirements'.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Manufacturer Contact List:
 - 1. Airolite Co, Marietta, OH www.airolite.com.
 - 2. Air-Rite Manufacturing, Bountiful, UT www.air-ritemfg.com.
 - 3. American Warming & Ventilating, Holland, OH www.awv.com.
 - 4. Arrow United Industries, Wyalusing, PA www.arrowunited.com.
 - 5. Carnes Co, Verona, WI www.carnes.com or Energy Technology Products LTD, Edmonton, AB (780) 468-1110.
 - 6. Industrial Louvers Inc, Delano, MN www.industriallouvers.com or DKG Construction, LTD., Waterdown, ON 289-895-9729.
 - 7. Pottorff, Fort Worth, TX www.pottorff.com.
 - 8. Ruskin Manufacturing, Kansas City, MO www.ruskin.com.
 - 9. United Enertech Corporation, Chattanooga, TN www.unitedenertech.com.
 - 10. Vent Products Co Inc, Chicago, IL www.ventprod.com.
 - 11. SF435 by Western Ventilation Products Ltd, Calgary, AB www.westvent.com.
 - 12. Wonder Metals Corp, Redding, CA www.wondermetals.com.

2.2 MANUFACTURED UNITS

- A. Louvers:
 - 1. General:
 - a. Extruded aluminum, with blades welded or screwed into frames.
 - b. Frames shall have mitered corners.
 - c. Louvers shall be recessed, flanged, stationary, or removable as noted on Contract Documents.
 - d. Finish:
 - 1) Polyvinylidene Fluoride (PVF₂) Resin-base finish (Kynar 500 or Hylar 5000) containing 70 percent minimum PVF₂ in resin portion of formula. Thermo-cured two coat system consisting of corrosion inhibiting epoxy primer and top coat factory applied over properly pre-treated metal.
 - 2) Color as selected by Architect from Manufacturer's standard colors.
- 2. Louvers Connected To Ductwork:
 - a. 1/2 inch (13 mm) mesh 16 ga (1.59 mm) aluminum bird screen.
 - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) K638 by Airolite.
 - 2) LE-1 by Air-Rite Manufacturing.
 - 3) LE48 by American Warming & Ventilating.

- 4) EA-405 by Arrow United Industries.
- 5) FKDA by Carnes.
- 6) 455-XP by Industrial Louvers.
- 7) EFK-445 by Pottorff.
- 8) ELF81S30 by Ruskin.
- 9) EL-4 by United Enertech.
- 10) 2740-31 by Vent Products.
- 11) EX by Wonder Metals.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Anchor securely into openings.
- B. Where louvers touch masonry or dissimilar metals, protect with heavy coat of asphaltum paint.

END OF SECTION

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. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 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.

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'.

1.2 REFERENCES

- A. Reference Standard:
 - 1. American National Standards Institute (ANSI) / American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE):
 - a. ANSI/ASHRAE 52.2-2017, 'Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size'.

PART 2 - PRODUCTS**2.1 MANUFACTURED UNITS**

- A. Furnace Filters: One inch thick throw-away type as recommended by Furnace Manufacturer.

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

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. Section 07 6310: 'Steep Slope Roof Flashing: Asphalt Tile' for pipe flashing used on steep slope asphalt tile roofs only.
 - 2. Sections Under 09 9000 Heading: Painting.
 - 3. Section 23 0501: 'Common HVAC Requirements'.
 - 4. Section 23 5417: 'Gas-Fired Furnaces'.

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.armacell.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. 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. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Tubolit by Armaflex.
 - 2) ImcoLock or Therma-Cel by Nomaco K-Flex.
 - 4. Insulation Joint Sealer:

- a. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) 520 by Armaflex.
 - 2) R-320 by Nomaco K-Flex.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation For Condensing Furnaces:
 - 1. Run individual vent and individual combustion intake piping from each furnace to concentric roof termination kit provided by Furnace Manufacturer. Slope lines downward toward furnace.
 - 2. Slope combustion chamber drain downward to funnel drain. Anchor to wall with wall clamps, allowing free movement through clamp for expansion.
 - 3. Use concentric roof termination kit provided by Furnace Manufacturer. Install vent and combustion air intake piping at clearance and distances required by Furnace Manufacturer.
 - 4. Attach factory-supplied neoprene coupling to combustion-air inlet connection and secure with clamp.
 - 5. Ensure that factory-supplied perforated metal disc is installed in flexible coupling, unless its removal is required.
- 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

SECTION 23 5417**GAS-FIRED FURNACES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install horizontal/vertical gas-fired condensing furnaces as described in Contract Documents.
- B. Related Sections:
 - 1. Section 23 0501: 'Common HVAC Requirements'.
 - 2. Section 23 1123: 'Facility Natural Gas Piping'.
 - 3. Section 23 2300: 'Refrigerant Piping'.
 - 4. Section 23 4100: 'Air Filters'.
 - 5. Section 23 5135: 'Air Piping'.
 - 6. Section 23 6214: 'Compressor Units: Air Conditioning (5 Ton or less)' for DX Cooling.

1.2 SUBMITTALS

- A. Informational Submittals:
 - 1. Manufacturer Reports: Equipment check-out sheets.
- B. Special Procedure Submittals:
 - 1. Installer must register with Manufacturer before submitting Manufacturer Warranty:
 - a. Installer to contact Owner's Representative (FM Group or Project Manager) for following MANDATORY information to be given to Manufacturer before Manufacturer will issue Manufacturer's 'Special LDS Warranty' included with Closing Submittal:
 - 1) This must be given to Manufacturer:
 - a) Name of Owner (name of FM Group) _____
 - b) Mailing Address (FM office address) _____
 - c) Building Property ID (unique 7 digit identifier) _____
 - d) Project site address: _____
 - e) Model Number of each Unit _____
 - f) Serial Number of each Unit _____
 - g) Date of Installation / Startup _____
- 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.
 - b. Record Documentation:
 - 1) Manufacturers Documentation:
 - a) Equipment checkout sheet: Complete and sign all items for each unit.

1.3 WARRANTY

- A. Manufacturer's Warranty:
 - 1. Provide Manufacturer's 'Special LDS Warranty' for the following:
 - a. Provide fifteen (15) year minimum limited warranty of heat exchanger.
 - b. Provide five (5) year limited warranty on parts.

PART 2 - PRODUCTS**2.1 ASSEMBLIES****A. Manufacturers:****1. Manufacturer Contact List:****a. Carrier Corporation:**

- 1) Carrier National: Bradley Brunner (270) 282-1241 Bradley.M.Brunner@Carrier.com.
- 2) Carrier Utah: Bret Adams ([Contractors Heating/Cooling Supply](mailto:bret.adams@mc.supply)) (801) 224-1020 ext. 2527 bret.adams@mc.supply

b. Lennox Industries:

- 1) For pricing and information contact: Lennox Mountain Commercial @ 1-800-972-3283.
- 2) Lennox National Contact: Jeff Barrett (801) 556-6114 jeff.barrett@lennoxind.com

c. York (US Air Conditioning Distributors):

- 1) Nick Filimoehala (801) 463-5323 n.filimoehala@us-ac.com.

B. Design Criteria:

1. Rated at 92 percent minimum AFUE (Annual Fuel Utilization Efficiency) calculated in accordance with DOE test procedures.

C. Manufactured Units:**1. Furnaces:**

- a. Factory assembled units certified by AGA complete with blower section, furnace section, steel casing, piped, and wired.
- b. Blower section shall consist of cabinet, blower, and motor.
 - 1) Cabinet shall be of 22 ga (0.8 mm) minimum cold rolled steel and have finish coat of baked-on enamel.
 - 2) Blower shall be Class 1, full DIDW, statically and dynamically balanced.
- c. Automatic controls shall consist of:
 - 1) Manual gas shut-off valve.
 - 2) Operating automatic gas valve.
 - 3) Solid-state type fan and thermal limit controls.
 - 4) 24-volt transformer.
 - 5) Hot surface ignition system.
- d. Blower shall be driven by multi-speed direct driven motor.
- e. Furnace section shall be enclosed in 22 ga (0.8 mm) minimum enameled steel casing lined with foil covered insulation.
- f. Heat Exchanger: Aluminized steel.
- g. Gas Burners: Aluminized steel.
- h. PVC intake of outside air and PVC combustion product exhaust, with sealed combustion, direct vent system.
- i. Concentric roof termination kit for roof mounting.
- j. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Standard Furnaces with ECM motor:
 - a) Carrier: 59SC6A.
 - b) Lennox: ML196E
 - c) York: TM9E

2. Cooling Coil:

- a. Cooling coil shall consist of heavy gauge steel cabinet with baked-on enamel finish to match furnace:
 - 1) Coil shall have aluminum fins bonded to seamless copper or aluminum tubing.
 - 2) Coil shall be ARI rated. Provide drain pans with connections at one end.
 - 3) Use thermal expansion valve.
- b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Horizontal:
 - a) Carrier: CVAMA.
 - b) Lennox: CK40HT.
 - c) York: CM.
 - 2) Vertical:

- a) Carrier: CVAMA.
- b) Lennox: CK40CT.
- c) York: CF.

2.2 ACCESSORIES

- A. Filter Frame:
 - 1. Build filter frame external to furnace as detailed on Contract Drawings.
- B. Vibration Isolators:
 - 1. Horizontal Installation:
 - a. Neoprene hanger type with load of 75 lbs (34 kg) maximum.
 - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) RH by Kinetics Noise Control, Dublin, OH www.kineticsnoise.com.
 - 2) Mason Industries, Hauppauge, NY www.mason-ind.com.
 - 3) RH by Vibration Mounting & Controls, Bloomington, NJ www.vmc-kdc.com.
 - 2. Vertical Installation: 4 inches (100 mm) square by 1/2 inch (13 mm) thick minimum neoprene type vibration isolation pads.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Vibration Isolators:
 - 1. Install vibration isolator on each hanger rod supporting horizontal furnace and under each corner of vertical furnace.

3.2 FIELD QUALITY CONTROL

- A. Manufacturer Services:
 - 1. Furnace installer shall:
 - a. Verify proper gas orifice size.
 - b. Clock gas meter for rated input.
 - c. Verify and set gas pressure at furnace.
 - d. Check and measure temperature rise.
 - e. Check safety controls for proper operation.
 - f. Check combustion vent sizes and combustion air sizes.
 - 2. In addition, furnace installer shall start up, check out, and adjust furnaces using equipment check-out sheet provided by Manufacturer. Complete and sign all items on sheet.

END OF SECTION

SECTION 23 6214**COMPRESSOR UNITS: Air Conditioning (5 Ton or less)****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install compressor units as described in contract documents.
- B. Related Sections:
 - 1. Section 23 0501: 'Common HVAC Requirements'.
 - 2. Section 23 2300: 'Refrigerant Piping'.
 - 3. Section 23 5417: 'Gas-Fired Furnaces'.

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. Compressor 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.
 - 3. Condenser: Device used to condense refrigerant in a cooling system.
 - 4. Condenser Coils: In a compressor unit, the coil dissipates heat from the refrigerant, changing the refrigerant from vapor to liquid.
 - 5. 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.
 - 6. 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. Since 2006, the minimum SEER required by the Department of Energy is 13.00 and 15.00+ SEER is considered high efficiency.
 - 7. Split System: Combination of an outdoor unit (air conditioner or heat pump) with an indoor unit (furnace or air handler). Split systems must be matched for optimum efficiency.
- B. Reference Standards:
 - 1. American National Standards Institute / Air-Conditioning, Heating, and Refrigeration Institute:
 - a. ANSI/AHRI Standard 210/240-2017, 'Performance Rating of Unitary Air-Conditioning & Air-Source Heat Pump Equipment' (formerly ARI Standard 210/240).
 - 2. American National Standards Institute / American Society of Heating, Refrigerating and Air-Conditioning Engineers:
 - a. ANSI/ASHRAE 15-2016 and 34-2016, 'Safety Standard and Designation and Classification of Refrigerants'.

1.3 SUBMITTALS

- A. Informational Submittals:
 - 1. Tests and Evaluation Reports:
 - a. Manufacturer Reports: Equipment check-out sheets.
- B. Special Procedure Submittals:
 - 1. Installer must register with Manufacturer before submitting Manufacturer Warranty:

- a. Installer to contact Owner's Representative (FM Group or Project Manager) for following MANDATORY information to be given to Manufacturer before Manufacturer will issue Manufacturer's 'Special LDS Warranty' included with Closing Submittal:
 - 1) This must be given to Manufacturer:
 - a) Name of Owner (name of FM Group) _____
 - b) Mailing Address (FM office address) _____
 - c) Building Property ID (unique 7 digit identifier) _____
 - d) Project site address: _____
 - e) Model Number of each Unit _____
 - f) Serial Number of each Unit _____
 - g) Date of Installation / Startup _____
 2. Qualification Statements:
 - a. Technician certificate for use in HFC and HCFC refrigerants.
- C. Closeout Submittals:
 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Warranty Documentation:
 - 1) Final, executed copy of Manufacturer's 'Special LDS Warranty' including required Owner / Manufacturer mandatory information.
 - b. Record Documentation:
 - 1) Manufacturers Documentation:
 - a) Equipment checkout sheet: Complete and sign all items for each unit.

1.4 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 1. Each unit shall be UL / ULC or ETL labeled.
 2. Comply with ANSI/AHRI Standard 210/240.
 3. Refrigeration compressor, coils, and specialties shall be designed to operate with CFC-free refrigerants.
- B. Qualifications. Section 01 4301 applies, but is not limited to the following:
 1. Installer: Refrigerant piping shall be installed by refrigeration contractor licensed by State and by technicians certified in use of HFC and HCFC refrigerants.

1.5 WARRANTY

- A. Manufacturer's Warranty:
 1. Provide Manufacturer's Special LDS Warranty for the following:
 - a. Provide ten (10) year limited warranty on compressor and five (5) year limited warranty on parts from date of 'start-up'.
 - b. Record 'start-up' date on warranty certificate for each unit.

PART 2 - PRODUCTS

2.1 ASSEMBLIES

- A. Manufacturers:
 1. Manufacturer Contact List:
 - a. Carrier Corporation:
 - 1) Carrier National: Rob Lambert; (317) 739-9379. robert.lambert@carrier.com.
 - 2) Carrier Utah: Bret Adams (Contractors HVAC Supply); (801) 224-1020 ext. 2527; bret.adams@chcsut.com.
 - b. Lennox Industries:
 - 1) For pricing and information call Lennox National Account at (800) 367-6285.

- 2) Lennox National Contact: Jeff Barrett (801) 556-6114 jeff.barrett@lennoxind.com.
- c. York (US Air Conditioning Distributors):
 - 1) Nick Filimoehala (801) 463-5323 n.filimoehala@us-ac.com.
- B. Performance:
 - 1. Capacities: SEER rating as defined by AHRI shall be 15.0 or greater.
- C. Manufactured Units:
 - 1. Compressor Units (5 Tons or Less):
 - a. General:
 - 1) Units shall be operable down to 0 deg F (minus 18 deg C) outdoor temperature.
 - 2) Use R-454b refrigerant.
 - 3) Only one liquid line, one suction line, and one power connection shall be made to each compressor. Provide charging valves.
 - b. Condenser Coils:
 - 1) Aluminum plate fins mechanically bonded to seamless copper tubes or 'Spine Fin' trade mark system which has aluminum fins epoxy bonded to aluminum tubes or micro-channel.
 - 2) Provide stamped louver coil guard for unit.
 - c. Fans:
 - 1) Direct driven propeller type.
 - 2) Fan motor shall be single or two speed, thermostatically controlled, permanently lubricated, and designed with permanent protection.
 - 3) Motors shall be resiliently mounted.
 - 4) Each fan shall have a safety guard.
 - d. Compressor:
 - 1) Each condenser unit shall have only one compressor.
 - 2) Design with following features:
 - a) Externally mounted brass service valves with charging connections.
 - b) Crankcase heater.
 - c) Resilient rubber mounts.
 - d) Compressor motor-overload protection.
 - e) Single speed.
 - e. Controls:
 - 1) Factory wired and located in separate enclosure.
 - 2) Following three paragraphs may not be factory installed and will therefore have to be field installed.
 - 3) Safety devices:
 - a) High and low pressure cutout.
 - b) Condenser fan motor-overload devices.
 - 4) Anti-cycle timers to prevent units from starting up again for five minutes after any power interruption.
 - 5) Head pressure type low ambient kit.
 - f. Casing:
 - 1) Fully weatherproof for outdoor installation. Finish shall be weather resistant.
 - g. Openings shall be provided for power and refrigerant connections.
 - h. Panels shall be removable for servicing.
 - i. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) North Region:
 - a) Carrier: 26SCA5.
 - b) Lennox: ML14KC1.
 - c) York: YC3.

2.2 ACCESSORIES

- A. Vibration Isolators:
 - 1. 4 inches (100 mm) square by 3/4 inch (19 mm) thick minimum neoprene type vibration isolation pads anchored solidly to concrete slab.

PART 3 - EXECUTION**3.1 INSTALLATION****A. General:**

1. Set compressor units level on concrete slab on vibration isolation pads located at each corner of unit. This does not apply to compressor units that have composite non-metal bottom.
2. Do not use capillary tube and piston type refrigerant metering devices.

3.2 FIELD QUALITY CONTROL**A. Manufacturer Services:**

1. Compressor units shall be started up, checked out, and adjusted by compressor unit Installer.
2. Use equipment checkout sheet provided by Manufacturer:
 - a. Complete and sign all items on sheet.

END OF SECTION

DIVISION 26: ELECTRICAL

26 0500 COMMON WORK RESULTS FOR ELECTRICAL

- 26 0501 COMMON ELECTRICAL REQUIREMENTS
- 26 0519 LINE-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
- 26 0523 CONTROL-VOLTAGE ELECTRICAL CABLES
- 26 0526 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
- 26 0533 RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS SCHEDULE
- 26 0613 ELECTRICAL EQUIPMENT MOUNTING HEIGHT SCHEDULE

26 2000 LOW-VOLTAGE ELECTRICAL TRANSMISSION

- 26 2417 CIRCUIT-BREAKER PANELBOARDS
- 26 2726 WIRING DEVICES
- 26 2816 ENCLOSED SWITCHES AND CIRCUIT BREAKERS

26 5000 LIGHTING

- 26 5100 INTERIOR LIGHTING
- 26 5121 INTERIOR LIGHTING: LED DIMMING DRIVERS
- 26 5200 EMERGENCY LIGHTING

END OF TABLE OF CONTENTS

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.
- B. Products Furnished But Not Installed Under This Section:
 - 1. Anchor bolts and templates for exterior lighting equipment bases.
- C. Related Requirements:
 - 1. Section 01 3200: 'Construction Process Documentation' for scheduling of equipment and materials removed by Owner.
 - 2. Section 02 4119: 'Selective Structure Demolition' for salvage of existing electrical items to be reused or recycled.
 - 3. Section 31 2316: 'Excavation' for criteria for performance of excavating.
 - 4. 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 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate with Owner for equipment and materials to be removed by Owner.
- B. Sequencing:
 - 1. Include detailed sequence of individual electrical demolition operations on Construction Schedule specified in Section 01 3200.

1.4 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.
 - b. Furnish such information for following equipment:
 - 1) Section 26 2417: 'Circuit-Breaker Panelboards'.

- 2) Section 26 2726: 'Wiring Devices'.
 - 3) Section 26 2816: 'Enclosed Switches And Circuit Breakers'.
 - 4) Section 26 5100: 'Interior Lighting Fixtures'.
 - 5) Section 26 5200: 'Emergency Lighting' for battery units.
- c. Do not purchase equipment before approval of product data.
- 2. Shop Drawings:
 - a. Submit on following equipment:
 - 1) 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.

1.5 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:
 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.
- B. Evaluation And Assessment:
 1. All relocations, reconnections, and removals are not necessarily indicated on Drawings. Include such work without additional cost to Owner.

3.3 PREPARATION

- A. Disconnect equipment that is to be removed or relocated. Carefully remove, disassemble, or dismantle as required, and store in approved location on site, existing items to be reused in completed work.
- B. Where affected by demolition or new construction, relocate, extend, or repair raceways, conductors, outlets, and apparatus to allow continued use of electrical system. Use methods and materials as specified for new construction.
- C. Perform drilling, cutting, block-offs, and demolition work required for removal of necessary portions of electrical system. Do not cut joists, beams, girders, trusses, or columns without prior written permission from Architect.
- D. Remove concealed wiring abandoned due to demolition or new construction. Remove circuits, conduits, and conductors that are not to be re-used back to next active fixture, device, or junction box.
- E. Patch, repair, and finish surfaces affected by electrical demolition work, unless work is specifically specified to be performed under other Sections of the specifications.

3.4 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.

3.5 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.

3.6 CLEANING

- A. Remove obsolete raceways, conductors, apparatus, and lighting fixtures promptly from site and dispose of legally.

3.7 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 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.
- 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 or not concealed.
 - f. Not over suspended ceilings.
 - g. As restricted by NFPA 70 Article 334.
- C. 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.
- D. Terminal blocks for tapping conductors:
 1. Terminals shall be suitable for use with 75 deg F (24 deg C) copper conductors.
 2. Acceptable Products:
 - a. 16323 by Cooper Bussmann, Ellisville, MO www.bussmann.com
 - b. LBA363106 by Square D Co, Palatine, IL www.us.squared.com.
 - c. Equal as approved by Architect before bidding. See Section 01 6200.

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.
 - 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

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. 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 unless otherwise indicated in 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 26 0501: 'Common Electrical Requirements'.

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 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.
 - 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. 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.

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. Conduits and other conductor enclosures.
 - 2. Neutral or identified conductor of interior wiring system.
 - 3. Lighting panelboards.
 - 4. Non-current-carrying metal parts of fixed equipment such as motors, starter and controller cabinets, instrument cases, and lighting fixtures.
- C. 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.
- D. Provide grounding bushings on all feeder conduit entrances into panelboards and equipment enclosures.
- E. Bond conduit grounding bushings to enclosures with minimum #10 AWG conductor.
- F. 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.
- G. Run separate insulated grounding cable from each equipment cabinet to electrical panel. Do not use intermediate connections or splices. Affix directly to cabinet.

- H. On motors, connect ground conductors to conduit with approved grounding bushing and to metal frame with bolted solderless lug.

END OF SECTION

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. Section 23 0933: 'Electric and Electronic Control System for HVAC' for concealed raceway and extensions for temperature control system.
 - 2. Section 26 0501: 'Common Electrical Requirements' for general electrical requirements'.
 - 3. Section 26 0503: 'Electrical Utility Services' for electrical primary underground service requirements.
 - 4. Section 27 1501: 'Communications Horizontal Cabling' for raceway for telephone and data systems.
 - 5. Section 27 4117: 'Video Systems' for system wiring.
 - 6. Section 27 5117: 'Audio Systems' for sound system wiring.
 - 7. Section 28 3101: 'Fire Detection And Alarm System' for clarification of raceway and conduit requirements for detection and alarm system.

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.
 - 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.

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: Sealite 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. Seal Devices: OZ Type WSK.**4. 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.

5. 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.
6. 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 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.
 - 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. Install insulated bushings on each end of raceway **1-1/4 inches (32 mm)** in diameter and larger, and on all raceways where cables emerge. Install expansion fittings where raceways cross building expansion joints.
 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:
 - 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

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. 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).
 3. Communications
 - a. TV Distribution System Components: As indicated on Drawings.
 - b. Computer and TV: 18 inches (450 mm).
 - c. Telephone / Data Terminal Boards: 72 inches (1 800 mm) to top.
 - d. Telephones (wall type): 60 inches (1 500 mm).
 - e. Telephones (desk type): 18 inches (450 mm).
 - f. Telephone / Data (desk type): 18 inches (450 mm).
 - g. Data (desk type): 18 inches (450 mm).

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'.

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. General Electric Industrial Systems, Charlotte, NC www.geindustrial.com.
- B. Performance:
 - 1. Capacities:
 - a. Lighting And Appliance Panelboards:
 - 1) Minimum integrated equipment short circuit rating of 22,000 amperes for 120 / 208 Volts.
 - b. Load Centers:
 - 1) 125 Amp main lugs, 120 / 208 Volt, three-phase.
 - 2) Minimum integrated equipment short circuit rating of 22,000 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. 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 AL or AQ by General Electric.
- 7. 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 PowerMark Plus by General Electric.
- 8. 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 and load centers 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 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. Rectangular Face Designer Style:****a. Category Four Approved Products. See Section 01 6200 for definitions of Categories:**

- 1) 20 AMP, single pole:
 - a) Cooper: DECB120W.
 - b) Hubbell: HBL2121WA.
 - c) Leviton: 5621-2W.
 - d) Pass & Seymour: 2621-W.
- 2) Two Pole:
 - a) Cooper: DECB220W.
 - b) Hubbell: HBL2122WA.
 - c) Leviton: 5622-2W.
 - d) Pass & Seymour: 2622-W.
- 3) Three Way:
 - a) Cooper: DECB320W.
 - b) Hubbell: HBL2123WA.
 - c) Leviton: 5623-2W.
 - d) Pass & Seymour: 2623-W.
- 4) Four Way:
 - a) Cooper: DECB420W.
 - b) Hubbell: HBL2124WA.
 - c) Leviton: 5624-2W.
 - d) Pass & Seymour: 2624-W.

b. Font:

- 1) 0-4 Hour, no hold position.
- 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) Intermatic: FDHW.
 - b) Tork: A504HW.

C. Receptacles:**1. Standard Style:**

- a. 15 AMP, specification grade, back and side wired, self grounding, tamper resistant.
- b. Verified by UL to meet Fed Spec WC-596F.
- c. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Cooper: TR5262.
 - 2) Hubbell: BR20.
 - 3) Leviton: TBR20.
 - 4) Pass & Seymour: TR20.

2. 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.

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.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install devices flush with walls, straight, and solid to box.

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.
- 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

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. Novitas Inc, Peachtree City, GA www.novitas.com.
 - f. Osram Sylvania, Danvers, MA www.sylvania.com or Osram Sylvania Ltd, Mississauga, ON (905) 673-6171.
 - g. Philips Lighting Co, Somerset, NJ www.lighting.philips.com/nam or Philips Lighting Canada, Scarborough, ON (416) 292-3000.
 - h. Universal Lighting Technologies, Nashville, TN www.universalballast.com.
 - i. Venture Lighting International, Solon, OH www.venturelighting.com.
 - j. Watt Stopper Inc, Santa Clara, CA www.wattstopper.com.
 - k. 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.
2. Fluorescent Ballasts:
 - a. Energy saving electronic for T8 lamps:
 - 1) Program rapid start type.
 - 2) Parallel circuit type.
 - 3) Minimum power factor of 95 percent.
 - 4) Maximum total harmonic distortion of 10 percent.
 - 5) Operation of lamps in compliance with Lamp Manufacturer's recommendations.
 - 6) Minimum starting temperature 0 deg F (minus 17.8 deg C) for T8 lamps.
 - 7) Class A sound rating.
 - 8) Transient protection in accordance with IEEE / ANSI C62.41.1, Category A.
 - 9) Comply with FCC 47 CFR Part 18.
 - 10) Ballast factor of 0.78.
 - 11) Maximum crest factor of 1.7.
 - 12) Five year full replacement warranty including labor allowance for replacement.
 - 13) Input voltage to match system voltage.
 - 14) Category Four Approved Products and Manufacturers. See Section 01 6200 for definitions of Categories:
 - a) IOP2PSP32LWSC by Advance.
 - b) GE32-MVPS-L by General Electric.
 - c) QHE-UNV-PSX-SC by Osram / Sylvania.
3. Lamps:
 - a. T8 Fluorescent Lamps:
 - 1) Minimum initial output of 3100 Lumens.
 - 2) Rated life of 40,000 hrs at 3 hrs per start for lamps operated on instant start ballasts.
 - 3) Minimum CRI 85.
 - 4) Meet Federal TCLP criteria.
 - 5) Category Four approved Manufacturers. See Section 01 6200 for definitions of Categories:
 - a) General Electric.
 - b) Howard.
 - c) North American Philips.
 - d) Osram / Sylvania.
 - 6) Correlated Color Temperature: 3000k.
 - b. 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.
 - c. 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.
4. Factory Assembly:
5. 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. .
 - 3. 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 fluorescent 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 fluorescent 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 2726: 'Wiring Devices'.
 - 3. 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 ≤ 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) Digital (DALI Low Voltage Controlled) Dimming Drivers.
 - 3) 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, or DALI digital signal calls for light to be extinguished 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) Digital (DALI Low Voltage Controlled) Dimming Drivers:
 - a) Must meet requirements of IEC 62386-101 ED.1.0 B.
 - 3) 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 Fixtures:
 - 1) Battery pack shall 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:

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 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.

END OF SECTION

SECTION 27 1116
COMMUNICATIONS CABINETS, RACKS, FRAMES, AND ENCLOSURES

PART 1 GENERAL**1.01 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 4118: 'Audio Systems'.
- C. Products Installed but Not Furnished Under This Section:
 - 1. Cable Management, Vertical Cable Management, and Horizontal Cable Management.

1.02 REFERENCES

- A. Association Publications:
 - 1. Building Industry Consulting Service International (BISCI):
 - a. Information Technology Systems Installation Methods Manual (ITSIMM) (8th Edition).
 - b. Telecommunications Distribution Methods Manual (TDMM) (14th Edition).
 - 2. Institute of Electrical and Electronics Engineers:
 - a. IEEE 802.3, 'Standard for Ethernet'.
 - b. IEEE 1100-2005, 'Recommended Practice for Powering and Grounding Electric Equipment'.
- B. Reference Standards:
 - 1. National Fire Protection Association:
 - a. NFPA 70, 'National Electrical Code (NEC)' (2020 or most recent edition adopted by AHJ).
 - 2. EIA/TIA 310D - Cabinets, Racks, Panels and Associated Equipment.
 - 3. UL - Underwriters Laboratories:
 - 4. ISO 9001:2000 - Quality Management Systems

1.03 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**2.01 SYSTEMS**

- A. Manufacturers:
 - 1. See ET, TA and TT sheets for specified manufactures, models, and accessories.

PART 3 EXECUTION**3.01 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.

3.02 INSTALLATION

- A. Equipment Cabinet:
 - 1. See Section 27 4118 '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.
 - a. Follow manufactures recommendations.
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. 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. Floor 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 floor 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. Install wall-mounted pivoting equipment racks in accordance with manufacturer's instructions at locations indicated on the Drawings.
 - a. Adjust operating hardware to operate smoothly without binding.
5. Install equipment racks plumb, level, square, and secure.
6. 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.
7. Seismic Bracing:
 - a. Comply with IBC and local seismic requirements for all equipment and conduit pathways.
8. Rack mount screws not used for installing patch panels and other hardware shall be bagged and left with rack upon completion of installation.
9. 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.

3.03 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.
- B. Protect racks from damage during construction
- C. Repair minor damages to finish in accordance with manufacturer's instructions and as approved

END OF SECTION

**SECTION 27 1501
COMMUNICATIONS HORIZONTAL CABLING**

PART 1 GENERAL**1.01 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 4117: 'Video And Satellite Distribution Systems'.
 - 6. Section 27 4118: '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 may include:
 - a. Internet Firewall.
 - b. ISP Modem.
 - c. Network Switch, and SFP modules.
 - 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.

1.02 REFERENCES

- A. Association Publications:
 - 1. Building Industry Consulting Service International (BISCI):
 - a. Information Technology Systems Installation Methods Manual (ITSIMM) (8th Edition).
 - b. Telecommunications Distribution Methods Manual (TDMM) (14th Edition).
 - 2. Institute of Electrical and Electronics Engineers:
 - a. IEEE 802.3, '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. Canadian Standards Association:
 - a. CSA C22.1-18, 'Canadian Electrical Code, part I (21st Edition), safety standard for electrical installations.
3. 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 (Earthling) 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).
4. 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'.

1.03 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.

1.04 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 sample 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 documentation set 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.
 - (b) Sequential number shall identify outlet locations.
 - (c) Numbering, icons, and drawing conventions used shall be consistent throughout all documentation.
 - (d) Provide labeling system information.

1.05 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) (14th 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.

1.06 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

2.01 OWNER-FURNISHED PRODUCTS

- A. Products. See Section 01 6200:
 - 1. Owner Furnished Network Equipment as specified on TT (Technology Telecommunication) and TA (Technology Audiovisual) Drawings as shown in Contract Documents may 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.

2.02 SYSTEMS

- A. Manufacturers:

1. Approved Manufacturers and Products. See Section 01 6200:
 - a. Belden, St. Louis, MO www.belden.com.
 - b. Panduit Corporation, Tinley Park IL www.panduit.com.
 - c. Systimax Solutions, a CommScope Company, Hickory, NC www.systimax.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:

- (b) Eight position modules required in all work areas and shall exceed connector requirements of TIA Category 6 standard.
 - (c) 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.
 - (d) Terminations shall use for TIA-568 wiring scheme.
 - (e) Modules shall terminate 4 pair 23 100-ohm solid unshielded twisted pair cable.
 - (f) Modules shall meet ISO 11801 standard including complying with inter-mateability standard IEC 60603-7 for backward compatibility.
 - (g) Category 6 modules shall have UL and CSA approval.
 - (h) Modules shall have ETL verified Category 6 performance and ISO 11801 Class E performance in both basic and channel links.
 - (i) Modules shall be universal in design, accepting 2, 3, or 4 pair modular plugs without damage to outer jack contacts.
 - (j) Modules shall be able to be re-terminated minimum of 10 times and be available in 11 standard colors for color-coding purposes.
 - (k) Jack shall snap into all outlets and patch panels.
 - (l) 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

3.01 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, video 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.

3.02 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:
 - (b) Fluke Networks DTX-1800 with firmware version 2.04 or later.
 - (c) Test lead to be P/N DTX-PLA001 or PLA002 universal permanent link interface adapter.
 - (d) Agilent Wireshcope Pro N2640A with firmware version 2.1.9 or later.
 - (e) Test lead to be P/N N2644A-101 universal CAT6A link smart probes.
 - (f) Equipment shall be calibrated in accordance with manufacture requirements, TIA standards and warranty requirements.
- 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:
 - (i) Unless Manufacturer specifies more frequent calibration cycle, annual calibration cycle is required on all test equipment used on project.
 - (j) 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

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**SECTION 27 4117
AUDIO SYSTEMS****PART 1 GENERAL****1.01 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. Audiovisual Consultant will perform final inspection, system balance, equalization, and instruct local leaders in operation of system.
- C. Products Installed But Not Furnished Under This Section:
 - 1. Webcast/Streaming Capable Device.

1.02 RELATED REQUIREMENTS

- A. Section 26 0533.13 - Conduit for Electrical Systems
- B. Section 26 0533.16 - Boxes for Electrical Systems.
- C. Section 27 4118 - Video Systems.

1.03 REFERENCE STANDARDS

- A. ANSI/AVIXA 10 - Audiovisual Systems Performance Verification 2013.
- B. ANSI/Infocomm 2M - Standard Guide for Audiovisual Systems Design and Coordination Processes 2010.
- C. ANSI/Infocomm 10 - Audiovisual Systems Performance Verification 2013.
- D. AVIXA RP-C303.01 - Recommended Practices for Security in Networked Audiovisual Systems 2018.
- E. BICSI ITSIMM - Information Technology Systems Installation Methods Manual (ITSIMM), 8th Edition 2022.
- F. BICSI N1 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure, 1st Edition 2019.
- G. BICSI TDMM - Telecommunications Distribution Methods Manual, 14th Edition 2020.
- H. ANSI/AVIXA 4:2 , 'Audiovisual Systems Energy Management'(2012 Edition)..
- I. IEEE 1100 - IEEE Recommended Practice for Powering and Grounding Electronic Equipment 2005.
- J. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- K. NFPA 72 - National Fire Alarm and Signaling Code Most Recent Edition Cited by Referring Code or Reference Standard.
- L. TIA-568-C.2 - Balanced Twisted-Pair Telecommunications Cabling and Components Standards 2009, with Addendum (2016).
- M. TIA-569 - Telecommunications Pathways and Spaces 2019e.
- N. TIA-606 - Administration Standard for Telecommunications Infrastructure 2021d.
- O. TIA-607 - Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises 2019d.

P. TIA-758, 'Customer-Owned Outside Plant Telecommunication Infrastructure Standard' (Revision B, 2012).

Q. UL 486A-486B - Wire Connectors Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate final inspection schedule of both audio and video 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.
3. Deliver metal speaker grilles, which are to be painted to match ceiling, before attachment to speakers and before installation of audio system.

1.05 SUBMITTALS

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

B. 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 technicians(s) with dates of training courses completed.
 - (c) Other items outlined section 1.06 b.

C. Closeout Submittals:

1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Operations and Maintenance Data:
 - 1) Equipment Manufacture'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) DigiDoc – completed and filed out copy of owners latest DigiDoc form printed to PDF format.
 - 2) 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.

1.06 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 4000 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. including at least one (1) project designed by an audio consultant.
 - (c) Firm shall own sufficient hand tools, vehicles, scaffolding, power tools, and so forth to install the system in a timely and proper manner.
 - (d) Firm shall be a factory authorized dealer for the majority of equipment to be furnished, and able to execute manufacturers warranties for installed equipment.
 - (e) Firm must employ personnel which have:
 - (1) At-least 5 years recent experience in sound reinforcement, who will be assigned to the project.
 - (2) Satisfactorily completed formal industry technical training including Syn-Aud-Con: Course 50, AVIXA: CTS-I, or CTS-D, and manufacturers training for equipment installed under this section including Q-sys: Level 1 and 2.
 - (f) Firm Shall be active in industry professional societies such as NSCA, AES, AVIXA, etc.
 - (g) Firm shall own appropriate test equipment for audio and network equipment installed under this section, including but not limited to notebook computer, test and measurement microphone(s), SPL Meter, Level II Cable Certifier, etc.
 - (h) Firm shall be directly responsible for the completion of the work, and shall not sub-contract it to another contractor who would not otherwise meet these qualification requirements.
 - (i) Firm shall have sufficient staff, physical plan, and inventory to provide timely warranty and post-warranty service as required by the specifications.
 - (j) 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
 - d. Same Approved Installer shall furnish and install components of Section 27 1000 - Structured Cabling and 27 4118 - Video Systems.
 - e. Same Approved Installer shall furnish and install components of Section 27 1000 - Structured Cabling.
 - f. Same Approved Installer shall furnish and install components of Section 27 4118 - Video Systems.

1.07 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.

1.08 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. If failure causes Chapel or Cultural Center audio system to be inoperative or unusable for its intended purpose, Installer, when notified of problem before Wednesday, shall repair system so it will be operational and usable by following Sunday. If defective components cannot be repaired in time, furnish and install temporary loaner equipment as required.
 - 4. Honor component warranties for term established by Manufacturer, if greater than one (1) year.

PART 2 PRODUCTS

2.01 OWNER-FURNISHED PRODUCTS

- A. Approved Products. See Section 01 6000:
 - 1. Network Streaming Equipment as specified on contract drawings. Drawings as shown in Contract Documents. including projectors and video monitors.
 - 2. Steaming Equipment, as shown on contract drawings.
 - 3. Coordinate installation of all Owner Furnished Network Streaming Equipment with Div 27 4133 Installer.

2.02 SYSTEM

- A. Shall Consist of components, as specified on Project Drawings. See Section 01 6000.
- 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.
 - e. Seat-to-seat variations in the 4kHz octave band shall not exceed plus or minus 2 dB in the Chapel or Cultural Center.
 - f. Sound masking system:
 - 1) Sound masking system shall provide adequate speech privacy in Corridor when set between 42 dBA and 46 dBA at ear-height under speaker so conversation in Office at slightly raised voice levels cannot be understood in Corridor.
 - 2) Speakers and masking generator, as specified on Technology drawings.
- 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. 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.
 2. Select equipment for normal operation on input power supplied at 105 130 V, 60 Hz.
- E. Operation
 1. Summary: Set up and program the system so room combining, and signal routing is automatically executed based on control commands issued by system switches and partition infra-red sensors.
 2. Program system using owner provided template files. Make modifications to files as indicated on project drawings to provide turn-key system.

PART 3 EXECUTION

3.01 INSTALLERS

- A. Approved Installers. See Section 01 6000:
 1. Qualifications:
 - a. Meet qualification requirements as specified in Quality Assurance in Part 1 of this specification.
 2. Custom Light & Sound: (919) 286-0011.
 3. General Communications: (801) 266-5731.
 4. Marshall Industries: (801) 266-2428.
 5. Poll Sound: (801) 261-2500.
 6. Professional Systems Technology: (801) 649-6696.
 7. IES Systems (Bluffdale) : (800) 792-8835
 8. Alternate Installer(s):
 - a.

3.02 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.
 4. Verify proper functionality for all system components being reused or remaining untouched.

3.03 INSTALLATION

- A. General:
 - 1. Install system in accordance with NFPA 70, NFPA 72, 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 millwork in neat and cosmetically dressed out manner.
 - 2. Install technology equipment and support equipment in podium and other millwork in neat and cosmetically dressed out manner.
 - 3. Saw cuts, holes and recesses into laminates and woodwork shall be straight.
 - 4. 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.
 - 5. Install equipment and panels in technology racks using matching screws, hardware and grommets.
 - 6. 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) Video.
 - (d) Audio cables carrying signals less than -20 dBm.
 - (e) Audio cables carrying signals between -20 dBm and +20 dBm.
 - (f) 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, except video cables which must be cut to electrical length, 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 grommited for clearance of various cable bundles, (i.e., separate audio, video, 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 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. Pulpit:
1. Install pulpit microphone pre-amplifier to be accessible below lectern. Do not alter factory supplied microphone cable and connectors.
 2. Install pulpit microphone so tip of microphone head is 2 inches (50 mm) inside edge of lectern when microphone is tilted down to maximum extent.
- K. Seismic Bracing:
1. Comply with IBC and local seismic requirements for all equipment and conduit pathways.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. 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.
- C. 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) capable of running current DSP configuration software
 - (b) with active commercially available anti-virus software
 - 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) Level II Cable certifier, or cable certifier report.
 - g. Correct minor items so Audiovisual Consultant may certify satisfactory completion during his visit.
- D. Non-Conforming Work:
1. Correct any work found defective or not complying with contract document requirements at no additional cost to the Owner.
 - a. Provide all materials requested by consultant to document rededication of punchlist items not remedied during system commissioning.
- E. 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.

3.05 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.
 3. Disposal of rubbish, debris, and packaging materials in proper manner.

PART 4 MEETINGHOUSE SOUND SYSTEM FUNCTIONALITY

4.01 EACH OF THE SOUND SYSTEM(S) SHOULD FUNCTION AS INDICATED.

4.02 SOUND MASKING SYSTEM

- A. Sound masking speakers located in outside of offices, should be tapped at 1W, and be calibrated to produce X SPL when measured at 5'10" AFF. Masking speakers located in offices, shall be tapped at ½ W. SPL is determined by calibration of public area sound masking speakers.

4.03 CHAPEL SYSTEM

- A. 'CP' shall consist of touch panel installed in Bishop's Pedestal and shall function as follows:
- B. When in the Off state, the touch panel shall contain a single On/Off button. Chapel inputs shall be muted, and power to the amplifier shall be off. Pressing the On/Off Button shall cause the system to turn on.
1. Power to the amplifier shall be engaged. While the amplifier is booting, Touch panel shall display a message indicating the system is powering on, and system chapel outputs shall remain muted.
- C. When the amplifier is fully powered on, Chapel outputs shall be unmuted, and the Touchpanel shall display standard "System On" Page. This page shall consist of:
1. Momentary Pulpit Up and Down Buttons, which shall raise and lower the pulpit respectively when pressed.
 2. Chapel Volume Slider, which shall start at center position, and allow the user to raise or lower the room volume by 5 dB.
 3. Power On/Off Button, which when pressed shall return the system to its original off state.
 4. In systems with video systems, a Program Audio Button, which when pressed shall unmute audio the program audio feed to the room, and add a second slider to the panel for controlling the program audio level.

- a. Pressing the program audio button again, shall mute the program audio, remove the program audio slider from the panel display, and return the program audio slider to its pre-set level.
 - b. Program audio level shall allow adjustment of up to 60dB, and when at its lowest position, shall mute the program output.
- D. Each time the system is turned on, the system will shall:
 - 1. Restore the system to its default settings, and,
 - 2. return chapel volume slider to middle sound level, which corresponds to its default sound level.
 - 3. After the system is fully ready, the touch panel shall display the main operations screen
 - 4. Shall not cause an audible pop to be heard over the sound system
- E. Volume Level Control
- F. Default Configuration
 - 1. The defaults sound level for the system is 4Db below the feedback level.
 - 2. The number of open Mics (NOM) shall be 3.
 - 3. The pulpit, and sacrament microphones shall be set to always open.
 - 4. Auxiliary feeds from both the video system, and the audio system shall not be included in the NOM calculation.

4.04 CULTURAL HALL SYSTEM

- A. The cultural hall system consists of multiple sections. From the available sections, the section closest to the chapel shall be equipped with a 'CC' or main controller, and shall be referred to as the main section. The next largest available section may be equipped with a 'CC2' or secondary controller, and shall be referred to as the secondary. Each section shall be electronically separated, or combined via an Infrared sensor, which shall be mounted such that it reliably detects whether the operable partition doors are open or closed.
- B. The Cultural hall 'CC' device shall consist of a touchpanel installed on the wall and shall function as follows:
 - 1. When Cultural Hall system(CC) is off, and the associated section is separated (separating door(s) are closed) from the chapel, or it is connected to the Chapel (door(s) are open)and the chapel is off, CC shall display the "CC System Off" page.
 - 2. When associated section is connected to chapel (door(s) are open) and Chapel system is on or starting, CC shall display a message indicating "CC is connected to Chapel. To use system turn off chapel system or close one or more doors separating the rooms.
 - 3. The CC System Off pages shall consist of a single "System On" Button. When pressed, the system shall engage power to the amplifier, unmute the cultural hall audio outputs, and display the "CC Auto Mode Page".
 - 4. The CC Auto Mode Page shall consist of a "Power Off" button, and a "CC Manual" Button.
 - a. Pressing the "Power Off" button shall return the CC panel and its associated room to their off states.
 - b. Pressing the "CC Manual" button shall display the CC Manual page.
 - 5. The "CC Manual Mode" page shall consist of the same System On/Off Buttons available on the "Auto Mode" page, and volume sliders for each audio inputs in the associated cultural hall section, or any of its combined sections (door(s) open between then). This excludes the chapel, which inputs are never broken out for individual control. Since the number of available inputs will vary depending on which other sections are combined, the number of sliders will vary. Multiple "CC Manual Mode" pages may be necessary.
 - a. Each slider shall allow for 40dB of gain adjustment, ranging from -30dB to +10dB from teach inputs nominal level. When the slider is set to -30dB, the system shall fully mute the associated input.
 - 6. Pressing the "CC Auto" Button shall return the panel to the "CC Auto Mode" page. return system to Auto mode operation, and reset all manual volume sliders to nominal levels and positions.

7. Pressing "CC Off" Button from this screen shall immediately return associated cultural all sections to their off state, display the "CC System Off" page, and return all manual volume sliders to their nominal volume levels and positions.
- C. When included in a system, CC2 shall function in the same manner as the "CC" control panel.
 1. When cultural hall sections containing CC and CC2 are combined, both panels shall show the same pages, and information at the same time.
 2. When separated (one or more partition doors between them are closed) each panel shall operate independently of the other, enabling only control of the audio inputs and outputs in their respective sections.
- D. If at any time, the chapel system is turned on while connected to the one or more of the cultural hall sections containing a CC or CC2 control. Connected controls shall immediately display the "CC connected to Chapel" page, Mute their inputs, and route chapel audio to any cultural hall sections connected to the chapel.
 1. Any systems which were operation in Manual Mode, shall additionally return sliders to their nominal positions, and levels.
- E. Room Combining
 1. Cultural hall sections and the chapel shall be combinable, by opening the folding partition doors, and triggering the IR sensors. Combinable sections are assigned a priority, when a lower priority section is combined with a higher priority section, controls in the lower priority section shall be disabled, and the sound mix from the higher priority section shall be routed to the lower priority section.

4.05 ASSISTIVE LISTENING SYSTEM (ALS)

- A. The assistive listening system, uses RF frequencies to broadcast an audio feed to compatible receivers. When the chapel sound system is on, the system broadcasts the chapel sound. If the cultural hall system is on, and the chapel is not, the system will broadcast the sound from the cultural hall.

4.06 INDEPENDENT ROOM SYSTEMS

- A. Rooms with independent systems include one or mic or auxiliary input jacks, and a wall controller consisting of an audio switch, and volume control.
 1. Switch shall select which audio signal is heard in the room. Available signals are Local sound, or overflow.

4.07 PERIMETER ROOM SYSTEMS, AND THE PERIMETER FEED

- A. The perimeter room systems shall include a speaker and volume control knob, in each meetinghouse foyer area, serving area, as well as other selected rooms. These systems shall be connected to the perimeter feed.
- B. When active, the perimeter feed shall transmit sound to the connected systems and rooms. Connected systems shall include independent room systems, Assistive Listening Systems, and Foyer systems, the perimeter feed shall default to the chapel sound whenever the chapel system is on. If the cultural hall system is on, when the chapel system is off, the perimeter feed shall transmit the cultural hall system. When both systems are off, the perimeter feed shall transmit no sound signals.

4.08 STREAMING AUDIO

- A. Stake Centers shall be equipped with XLR inputs and outputs for the purpose of allowing users to alter the default webcast audio feed. The AV rack shall include connections for 2 Choir microphones, an Organ Output, a Chapel Mix output, and a Webcast Input. The chapel organ sound shall be routed from the chapel organ to the chapel organ output. The sound heard through the overflow speakers in the chapel shall be routed to the Chapel Mix Output. The Choir Microphone outputs shall be cabled directly to the Choir microphone inputs on the rostrum.
- B. The system shall include a webcast output connected directly from the DSP processor to the Webcast device. By Default, the system shall route the Chapel Mix to webcast device. If signal

is detected on the Webcast In, the system shall automatically route that signal to the webcast device instead of the default chapel mix. Users shall be able to connect a manual mixer to the provided connections on CP1, and automatically route a custom mix to the webcast device.

1. Webcast output (3,5mm plug type connection) shall be set to provide a line level (commercial). adjusted for a typical talker at the pulpit, while chapel slider is in its default position.

END OF SECTION

**SECTION 27 4118
VIDEO SYSTEMS****PART 1 GENERAL****1.01 SUMMARY OF WORK:**

- A. Furnish and install complete and operational video and satellite system (when specified) as described in Contract Documents including:
 - 1. Line amplifiers, video and audio processors, video switchers, cable, connectors and ancillary equipment necessary to successful reception and distribution of video and audio signal from selected reception device (satellite or video stream).
 - 2. Satellite dish, LNB and receiver when specified.
 - 3. Installation and testing of Owner Furnished Network and Streaming Equipment.
- B. Assist Audiovisual Consultant with final inspection of system and provide necessary test equipment. Correct problems found at time of final inspection of system.
- C. Audiovisual Consultant will perform final inspection and instruct local leaders in operation of system.
- D. Products Furnished But Not Installed Under This Section:
 - 1. Steel base pipe for satellite system.
- E. Products Installed But Not Furnished Under This Section:
 - 1. Owner Furnished Network Streaming Equipment as specified on TA and TT (Technology Audiovisual and Technology Telecommunications) Drawings as shown in Contract Documents.

1.02 RELATED REQUIREMENTS

- A. 01 6000 - Product Requirements.
 - 1. Owner will Furnish Network Encoding Streaming Equipment as specified on TA (Technology Audiovisual) Drawings as shown in Contract Documents. Contract Documents establish 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.
- B. 03 1000 - Concrete Forming and Accessories: Installation of concrete base pier for base pipe.
- C. 09 9113 - Exterior Painting: Finish painting of base pipe.
- D. Section 26 0533.13 - Conduit for Electrical Systems.
- E. Section 26 0533.16 - Boxes for Electrical Systems.
- F. 26 0536 - Cable Trays for Electrical Systems.
- G. 27 1000 - Structured Cabling: Communications Cabinet, Racks, Frames, and Enclosures.
- H. Section 27 4117 - Audio Systems.
- I. Instructions to Owner by Audiovisual Consultant.

1.03 REFERENCE STANDARDS

- A. ANSI/Infocomm 2M - Standard Guide for Audiovisual Systems Design and Coordination Processes 2010.
- B. ANSI/Infocomm 3M - Image System Contrast Ratio 2011.
- C. ANSI/Infocomm 4 - Audiovisual Systems Energy Management 2012.
- D. ANSI/Infocomm 10 - Audiovisual Systems Performance Verification 2013.
- E. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless 2022.
- F. AVIXA RP-C303.01 - Recommended Practices for Security in Networked Audiovisual Systems 2018.

- G. BICSI TDMM - Telecommunications Distribution Methods Manual - 14th Edition 2020.
- H. IEEE 1100 - IEEE Recommended Practice for Powering and Grounding Electronic Equipment 2005.
- I. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. NFPA 72 - National Fire Alarm and Signaling Code Most Recent Edition Cited by Referring Code or Reference Standard.
- K. TIA-568-C.2 - Balanced Twisted-Pair Telecommunications Cabling and Components Standards 2009, with Addendum (2016).
- L. TIA-569 - Telecommunications Pathways and Spaces 2019e.
- M. TIA-606 - Administration Standard for Telecommunications Infrastructure 2021d.
- N. TIA-607 - Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises 2019d.
- O. TIA-758, 'Customer-Owned Outside Plant Telecommunication Infrastructure Standard' (Revision B, 2012).

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate with Owner's Representative (Project Manager and/or Facility Manager) well in advance of Substantial Completion for installation of all Owner Furnished Network Streaming Equipment.
- B. Coordinate final inspection schedule of both audio and video systems before Audiovisual Consultant's final inspection.
- C. After completion of video system installation of this section, Installer to perform Field Testing before Audiovisual Consultant Final Inspection of audio system.
- D. Notify Audiovisual Consultant two (2) weeks minimum before Field Inspection specified in Field Quality Control in Part 3 of this specification.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Informational Submittals:
 - 1. Manufacturer Reports: Itemized list of equipment to be supplied.
 - 2. Special Procedure Submittals: Provide itemized list of equipment to be supplied and proposed labeling for system components.
 - 3. Installer Qualifications:
 - a. Provide Qualification documentation as requested by Engineer/Architect including list of Projects requested and list of certified technicians(s) with dates of training courses completed.
- C. Closeout Submittals:
 - 1. Project Record Documents:
 - a. Record actual locations of outlets, devices, and cable routing.
 - b. Equipment manufacturer's manuals and warranty information.
 - 2. Operation Data:
 - a. Instructions for setting and tuning channels.
 - b. System operation and maintenance instructions.
 - c. List of equipment provided, including portable equipment, showing make, model, and serial number.
 - d. Leave clear plastic sheet protector in rear of equipment cabinet with system drawings and documentation.
 - e. Set-up files and settings for video equipment.
 - 3. Warranty Documentation: Final, executed copy of Warranty.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70 and cable television utility company.
- B. 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.
- C. Qualifications:
 - 1. Installer. Requirements of Section 01 4000 applies, but not limited to following:
 - a. Approved Installers:
 - 1) Installers are to furnish and install components of video 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 is proficient with 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 Section 27 4117 - Audio Systems

1.07 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.

1.08 WARRANTY

- A. Provide complete warranty repair or replacement for one (1) year at no cost to Owner, except in case of obvious abuse.
- B. 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.
- C. If failure causes Chapel or Cultural Center audio system to be inoperative or unusable for its intended purpose, Installer, when notified of problem before Wednesday, shall repair system so it will be operational and usable by following Sunday. If defective components cannot be repaired in time, furnish and install temporary loaner equipment as required.
- D. Honor component warranties for term established by Manufacturer, if greater than one (1) year.

PART 2 PRODUCTS**2.01 OWNER-FURNISHED PRODUCTS**

- A. Products. See Section 01 6000:
 - 1. Network Equipment as shown on TT601 (Technology) Drawings.

2. Steaming Equipment, as shown on TA601 and TA602
3. Wall Mounted Televisions, and support brackets
- B. Coordinate installation of all Owner Furnished Network Streaming Equipment including but not limited to:
 1. Installation and configure devices in accordance with Owner requirements.
 2. Mounting and setup of wall-mounted televisions
 3. Proper set-up of Network Streaming Equipment.
 4. Testing of Streaming Equipment, by originating a webcast.

2.02 DESIGN CRITERIA

- A. Video distribution system refers but is not limited to following components:
 1. Line amplifiers, video and audio processors, video switchers, cable, connectors and ancillary equipment necessary for successful reception and distribution of video and audio signal from the selected reception device (satellite or video stream).
 2. Satellite dish, LNB and receiver when satellite system is included.
 3. Owner Furnished streaming and network equipment.
- B. Intent of this specification is that
 1. Audiovisual signals shall be broadcast and available within the originating receiving system will receive broadcasts from network streaming device and/or satellite currently in use by Church and provide video, audio, and video signal distributed properly throughout system.
- C. System shall be fully function and complete video distribution system using equipment and materials of types, sizes, rating, and performances as indicated in Contract Drawings and following requirements:
 1. Equipment and materials shall comply with manufacturers' standard design and construction in accordance with published product data and in compliance with referenced standards.
 2. Equipment and materials are to be integrated with components and connections functions at optimum performance.
 3. Setup shall be optimized for display resolutions matching owner furnished display devices.

PART 3 EXECUTION

3.01 INSTALLERS

- A. Approved Installers - See Section 01 6000:
 1. Meet qualification requirements as specified in Quality Assurance in Part 1 of this specification.
 2. Custom Light & Sound: (919) 286-0011.
 3. General Communications: (801) 266-5731.
 4. Marshall Industries: (801) 266-2428.
 5. Poll Sound: (801) 261-2500.
 6. Professional Systems Technology: (801) 649-6696.
 7. IES Systems (Bluffdale): (800) 792-8835.
- B. Alternate Installer:
 1.

3.02 EXAMINATION

- A. A. Verification Of Conditions:
 1. Verify compliance with following items before beginning work of this Section:
 - a. Assure that antenna clears every obstacle and has clear line-of-sight to United States domestic-arc satellites. If there are obstructions, report to Architect before proceeding.
 - b. No cables spliced.
 - c. Specified cables and equipment cabinets are properly installed.

2. Verify all site conditions are in compliance with requirements for proper installation and function of video system work.
3. Verify proper functionality for all system components being reused or remaining untouched.

3.03 INSTALLATION

- A. Owner Furnished Equipment:
 1. Network Streaming Equipment:
 - a. Install and setup Owner Furnished Network Streaming Equipment.
 2. Extended Display Identification Data (EDID):
 - a. Set all specified EDID capable devices for Owner Furnished Display Device resolutions and sync signals including installation and setup.
- B. General:
 1. Install system in accordance with NFPA 70, NFPA 72, and other applicable codes. Install equipment in accordance with manufacturer's written instructions.
- C. Satellite Dish Antenna:
 1. Supply and install as shown on Contract Drawings in conjunction with Manufacturer's instructions.
 2. Orient to satellite currently used by Church using L-band spectrum analyzer.
 3. Roof Mounted Antenna for low-slope roofs if shown on Construction Drawings:
 - a. Mount Antenna to roof using non-penetrating roof mount, specified on Construct Drawings.
 - b. Place Antenna on top rubber roof pad, 1/8 inch (3 mm) minimum.
 - c. Install additional ballast in uniformly distributed manner, on non-penetrating mount frame. Total weight of mount, antenna and ballast shall weigh between 590 lbs (267.6 kg) and 620 lbs. (281.2 kg).
- D. Equipment Cabinet:
 1. File smooth exposed rough edges after cutting and drilling. Do not allow sharp screws to protrude from cabinet.
 2. Install vent panels at top and bottom of equipment cabinets. In addition, install vent panels above and below satellite receiver and between other components, where possible, for maximum ventilation.
 3. Securely fasten equipment plumb and square in place. Utilize all fastening holes in front of cabinet.
 4. Securely fasten in place equipment that is not rack mounted, including relays and other small components. Do not use sticky-back tape.
 5. Install balancing/isolation transformer when balanced and unbalanced components are connected.
 6. Wire XLR-type connections with pin 2 hot, pin 1 shield.
 7. Connect powered components to 120 VAC outlets on voltage suppressor power bars. Do not connect to outlets on other components.
 8. 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 in cabinet listing name and telephone number of installer. Appropriate warranty instructions may be included.
 9. Comply with IBC and local seismic requirements for all equipment and conduit pathways.
- E. 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 electromagnetic 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, video projector lifts, 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) Video.
 - (d) Audio cables carrying signals less than -20 dBm.
 - (e) Audio cables carrying signals between -20 dBm and +20 dBm.
 - (f) 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, except video cables must be cut to electrical length, 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.
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, AC, 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 grommeted for clearance of various cable bundles, (i.e., separate audio, video, 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 in 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.
- F. 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.
- G. Millwork:

1. Install technology equipment and support equipment in millwork in neat and cosmetically dressed out manner.
 2. Install technology equipment and support equipment in podium, and other millwork in neat and cosmetically dressed out manner.
 3. Saw cuts, holes and recesses into laminates and woodwork shall be straight.
 4. 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.
 5. Verify installation of equipment and panels in technology racks are completed by using matching screws, hardware and grommets.
 6. Verify installation of equipment and panels in technology racks and podiums are completed by using matching screws, hardware and grommets.
- H. 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.
- I. Install in accordance with manufacturer's instructions.

3.04 SYSTEM SETUP

- A. Digital Video System Setup:
1. Pulpit HDMI and VGA Input (DTP T UWP 332D):
 - a. Set Transmitter to Auto Switch between inputs, by shorting Contact Pins 1 and 2 to ground.
- B. Rack Mounted DTP Receiver (DTP HDMI 330 RX):
1. Connect HDMI and Analog audio outputs to respective inputs on DTP switcher.
- C. Video Switcher 'VS' Audio Setup:
1. Inputs:
 - a. Video Input 2 must be set to Analog.
 - b. Video Input 3 must be set to Multi-Ch Auto, system will automatically switch between analog and digital audio inputs when Input 3 is selected.
 - c. Video Input 4 must be set to Multi-Ch Auto, system will automatically switch between analog and digital audio inputs when Input 4 is selected.
 - d. Video Input 5 must be set for LPCM-2Ch Auto.
 - e. Mic/Line Inputs 1 and 2 shall be muted.
 2. Outputs:
 - a. Input 1 and 6 must be set with preset which mutes analog audio outputs to Chapel when either input 1 or 6 is selected.

- b. All other inputs must be set up to unmute analog outputs.
 - c. Input 5 must be configured to pass Left Program on Left Channel, Right Program on Right Channel.
 - d. Variable analog output should be setup to pass 'No Program'.
 - e. Digital Outputs must be setup for 'Stereo Program'.
- D. Video Switcher 'VS' Video Setup:
 - 1. Input Configuration:
 - a. All inputs shall be labeled in software according to inputs connected to them.
 - b. Input 1's selected signal type shall match Camera's Native Signal Output. IF no camera is installed, Signal type shall be set to composite.
 - c. Input 2's signal type shall be set to RGB.
 - d. Aspect Ratio for Inputs 2 and 5 shall be set to follow, all others shall be set to fill.
 - e. All Inputs shall be set to auto image, auto memory, HDCP authorized, and Film Detect.
 - 2. Output Configuration:
 - a. Set output Configuration to auto.
 - b. Set Output Format for Auto for each output group.
 - c. Set Transitions to 'CUT'.
 - 3. General Settings:
 - a. Screen Saver shall be set to Blue with OSD Bug.
 - b. Select display color when sending HDCP content on non-compliant device to Green.
 - c. Set front Panel Lock out to Mode 2, allowing only input selection and volume controls.
 - d. Set HDCP mode to Follow Input.

3.05 FIELD QUALITY CONTROL

- A. Field Tests:
 - 1. Installer Testing:
 - a. Upon completion of installation and before inspection by Audiovisual Consultant, test functions verifying following. Make necessary corrections:
 - 1) System is free from hum, noise, ghosting, loose parts and poor construction or soldering.
 - 2) Video signals shall be clear, sharp, noise-free picture with good chroma and undistorted, noise free audio.
 - 3) Audio to sound system is undistorted and noise free.
 - 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:
 - 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. Provide following test equipment in good working order:
 - 1) Digitally generated video test signal generator:
 - (a) Generator shall provide minimum of but not be limited to industry standard test signals including color bar patterns, grey scale, alternating pixel, cross hatch and H-pattern.
 - (b) Generator shall provide resolutions compatible with all specified video equipment.
 - (c) Generator shall provide resolutions up to 4096 x 2160 at 60 Hz.
 - 2) Digital Volt-Ohmmeter.
 - 3) Necessary chargers, cable, test leads, adapters and other accessories for test equipment.

- d. Ensure Owner Furnished Display Devices such as projectors and video monitors are available and on site at time of inspections.
 - e. Correct minor items so Audiovisual Consultant may certify satisfactory completion without return trip.
- 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.

3.06 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.
 - 3. Disposal of rubbish, debris, and packaging materials in proper manner.

END OF SECTION

SECTION 27 4124 TELEVISION WALL MOUNTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Furnish and install TV wall mount as described in Contract Documents.

1.02 RELATED REQUIREMENTS

- A. Section 01 3000 - Administrative Requirements: Submittal procedures, project meetings, progress schedules and documentation, reports, coordination.
- B. Section 06 1000 - Rough Carpentry for wall blocking and installation of television wall mounts.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Action Submittals:
 - 1. Product Data:
 - a. Provide Manufacturer's written installation instructions.

PART 2 PRODUCTS

2.01 MANUFACTURED UNITS

- A. TV Wall Mounts:
 - 1. Description:
 - a. Large Flat Panel TV Swing Arm Wall Display Mount allowing for perfect display placement and ideal viewing from any angle and remains low-profile in-home position.
 - 2. Design Criteria:
 - a. Adjustable tilt mechanism.
 - b. Mounting system secures flat panel to mount.
 - c. Typical Screen Sizes:
 - 1) Large Classroom: 65 inch to 75 inch.
 - 2) Ecclesiastical Offices 55 inch.
 - d. UL Listed.
 - e. Weight Capacity: 200 lbs (90 kg).
 - 3. General:
 - a. Lateral shift: 9 inch (230 mm).
 - b. Manual Height Adjustment: 1 inch (25 mm).
 - c. Maximum Extension: 37 inch (940 mm) extension.
 - d. Minimum Depth: 3.4 inch (86.4 mm).
 - e. Mounting Pattern Compatibility (Universal Versions): 200 x 200mm - 862 x 517mm.
 - f. Orientation: landscape and portrait.
 - g. Overall Dimensions 22 inches (559 mm) high x 39.5 inches (940 mm) wide x 3.4 inches (86 mm) deep.
 - h. Tilt: +5 deg, -16 deg.
 - 4. Color: Black.
 - 5. Acceptable Products:
 - a. EA762PU Series Large Flat Panel articulating wall mount Peerless AV.
 - b. Equals as approved by Architect before bidding. See Section 01 6200.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions:
 - 1. Verify wall blocking in stud wall is in correct location for mounting TV Wall Mount before beginning installation.

3.02 INSTALLATION

- A. Installing TV Wall Mount to Wall:
1. Follow Manufacturer's written installation instructions for anchoring to wall.
 2. Install Mount so that top of TV is 3 inch (76 mm) minimum from ceiling.
 3. Install at locations shown on Contract Drawings.

END OF SECTION

DIVISION 28: ELECTRONIC SAFETY AND SECURITY

28 3000 ELECTRONIC DETECTION AND ALARM

28 3101 FIRE DETECTION AND ALARM SYSTEM

END OF TABLE OF CONTENTS

SECTION 28 4600
FIRE DETECTION AND ALARM

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Fire alarm system design and installation, including all components, wiring, and conduit.
- B. Transmitters for communication with supervising station.

1.02 RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping: Materials and methods for work to be performed by this installer.
- B. Section 21 1300 - Fire-Suppression Sprinkler Systems: Supervisory, alarm, and actuating devices installed in sprinkler system.
- C. Section 23 3300 - Air Duct Accessories: Smoke dampers monitored and controlled by fire alarm system.
- D. Section 281600 - Intrusion Detection System - Honeywell.

1.03 ICC (IFC) REFERENCE STANDARDS

- A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.
- B. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- C. ICC (IFC) - International Fire Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Corrigendum 2012).
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. NFPA 72 - National Fire Alarm and Signaling Code; Most Recent Edition Cited by Referring Code or Reference Standard.
- G. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL 1480 - Standard for Speakers for Fire Alarm and Signaling Systems, Including Accessories; Current Edition, Including All Revisions.
- I. UL 1971 - Standard for Signaling Devices for the Hearing Impaired; Current Edition, Including All Revisions.
- J. UL 268 - Standard for Smoke Detectors for Fire Alarm Systems; Current Edition, Including All Revisions.
- K. UL 464 - Standard for Audible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories; Current Edition, Including All Revisions.
- L. UL 521 - Standard for Heat Detectors for Fire Protective Signaling Systems; Current Edition, Including All Revisions.
- M. UL 864 - Control Units and Accessories for Fire Alarm Systems; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Evidence of designer qualifications.
- C. Design Documents: Submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, riser diagrams, and description of operation:
 - 1. Copy (if any) of list of data required by authority having jurisdiction.
 - 2. NFPA 72 "Record of Completion", filled out to the extent known at the time.
 - 3. Clear and concise description of operation, with input/output matrix similar to that shown in NFPA 72 Appendix A-7-5-2.2(9), and complete listing of software required.
 - 4. System zone boundaries and interfaces to fire safety systems.

5. Location of all components, circuits, and raceways; mark components with identifiers used in control unit programming.
 6. Circuit layouts; number, size, and type of raceways and conductors; conduit fill calculations; spare capacity calculations; notification appliance circuit voltage drop calculations.
 7. List of all devices on each signaling line circuit, with spare capacity indicated.
 8. Manufacturer's detailed data sheet for each component, including wiring diagrams, installation instructions, and circuit length limitations.
 9. Description of power supplies; if secondary power is by battery include calculations demonstrating adequate battery power.
 10. Certification by either the manufacturer of the control unit or by the manufacturer of each other component that the components are compatible with the control unit.
 11. Certification by the manufacturer of the control unit that the system design complies with Contract Documents.
 12. Certification by Contractor that the system design complies with Contract Documents.
- D. Evidence of installer qualifications.
- E. Inspection and Test Reports:
1. Submit inspection and test plan prior to closeout demonstration.
 2. Submit documentation of satisfactory inspections and tests.
 3. Submit NFPA 72 "Inspection and Test Form," filled out.
- F. Operating and Maintenance Data:
1. Complete set of specified design documents, as approved by authority having jurisdiction.
 2. Additional printed set of project record documents and closeout documents, bound or filed in same manuals.
 3. Contact information for firm that will be providing contract maintenance and trouble call-back service.
 4. List of recommended spare parts, tools, and instruments for testing.
 5. Replacement parts list with current prices, and source of supply.
 6. Detailed troubleshooting guide and large scale input/output matrix.
 7. Preventive maintenance, inspection, and testing schedule complying with NFPA 72; provide printed copy and computer format acceptable to Owner.
 8. Detailed but easy to read explanation of procedures to be taken by non-technical administrative personnel in the event of system trouble, when routine testing is being conducted, for fire drills, and when entering into contracts for remodeling.
- G. Project Record Documents:
1. Complete set of floor plans showing actual installed locations of components, conduit, and zones.
 2. "As installed" wiring and schematic diagrams, with final terminal identifications.
 3. "As programmed" operating sequences, including control events by device, updated input/output chart, and voice messages by event.
- H. Closeout Documents:
1. Certification by manufacturer that the system has been installed in compliance with manufacturer's installation requirements, is complete, and is in satisfactory operating condition.
 2. NFPA 72 "Record of Completion", filled out completely and signed by installer and authorized representative of authority having jurisdiction.

1.05 QUALITY ASSURANCE

- A. Designer Qualifications: NICET Level III or IV (3 or 4) certified fire alarm technician or registered fire protection engineer, employed by fire alarm control panel manufacturer, Contractor, or installer, with experience designing fire alarm systems in the jurisdictional area of the authorities having jurisdiction.
- B. Installer Qualifications: Firm with minimum 3 years documented experience installing fire alarm systems of the specified type and providing contract maintenance service as a regular part of their business.
1. Authorized representative of control unit manufacturer; submit manufacturer's certification that installer is authorized; include name and title of manufacturer's representative making certification.
 2. Installer Personnel: At least 2 years of experience installing fire alarm systems.
 3. Supervisor: NICET level II, III or IV (3 or 4) certified fire alarm technician; furnish name and address.

- C. Instructor Qualifications: Experienced in technical instruction, understanding fire alarm theory, and able to provide the required training; trained by fire alarm control unit manufacturer.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.06 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide control panel manufacturer's warranty that system components other than wire and conduit are free from defects and will remain so for 1 year after date of Substantial Completion.
- C. Provide installer's warranty that the installation is free from defects and will remain so for 1 year after date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Fire Alarm Control Units and Accessories:
 - 1. Simplex 4005 (Existing FACP)
- B. Initiating Devices and Notification Appliances:
 - 1. Same manufacturer as control units.
- C. Substitutions: See Section 01 6000 - Product Requirements.
 - 1. For other acceptable manufacturers of control units specified, submit product data showing equivalent features and compliance with Contract Documents.
 - 2. For substitution of products by manufacturers not listed, submit product data showing features and certification by Contractor that the design will comply with Contract Documents.

2.02 FIRE ALARM SYSTEM

- A. Fire Alarm System: Provide a new automatic fire detection and alarm system:
 - 1. Provide all components necessary, regardless of whether shown in Contract Documents or not.
 - 2. Protected Premises: Entire building shown on drawings.
 - 3. Comply with the following; where requirements conflict, order of precedence of requirements is as listed:
 - a. ADA Standards.
 - b. The requirements of the local authority having jurisdiction.
 - c. Applicable local codes.
 - d. Contract Documents (drawings and specifications).
 - e. IFC
 - f. NFPA 101.
 - g. NFPA 72; where the word "should" is used consider that provision mandatory; where conflicts between requirements require deviation from NFPA 72, identify deviations clearly on design documents.
 - 4. Evacuation Alarm: Single smoke zone; general evacuation of entire premises.
 - 5. Voice Notification: Provide emergency voice/alarm communications with multichannel capability; digital.
 - 6. Program notification zones and voice messages as directed by Owner.
 - 7. Master Control Unit (Panel): New, located at location indicated on the plans..
- B. Supervising Stations and Fire Department Connections:
 - 1. Public Fire Department Notification: By remote supervising station operated by owner.
 - 2. Means of Transmission to Remote Supervising Station: Digital alarm communicator transmitter (DACT), 2 telephone lines.
 - a. Owner provided cellular communicator
- C. Circuits:
 - 1. Initiating Device Circuits (IDC): Class B, Style A.
 - 2. Signaling Line Circuits (SLC) Within Single Building: Class B, Style 0.5.
 - 3. Notification Appliance Circuits (NAC): Class B, Style W.
- D. Spare Capacity:
 - 1. Initiating Device Circuits: Minimum 10 percent spare capacity.
 - 2. Notification Appliance Circuits: Minimum 10 percent spare capacity.

3. Speaker Amplifiers: Minimum 10 percent spare capacity.
 4. Fire Alarm Control Units: Capable of handling all circuits utilized to capacity without requiring additional components other than plug-in control modules.
- E. Power Sources:
1. Primary: Dedicated branch circuits of the facility power distribution system.
 2. Secondary: Storage batteries.
 3. Capacity: Sufficient to operate entire system for period specified by NFPA 72.

2.03 FIRE SAFETY SYSTEMS INTERFACES

- A. Trouble: Provide trouble signals in accordance with NFPA 72 for the following:
1. Primary power failure
 2. Opens or short circuits on indicating circuits.
 3. Disarrangements in system wiring.
 4. Control panel circuit board removal.
 5. Ground faults.
- B. Supervision: Provide supervisory signals in accordance with NFPA 72 for the following:
1. Sprinkler water control valves.
 2. Serving area smoke detector tied to range shunt-trip.
 3. Low temperature switches.
 4. Carbon Monoxide detector
- C. Alarm: Provide alarm initiation in accordance with NFPA 72 for the following:
1. Sprinkler water flow. The following message shall sound on the voice evacuation system: "There has been a report of fire in the building. Please evacuate the building until it has been cleared by emergency responders."
 2. Duct smoke detectors. Turn off
 3. Area smoke detectors. The following message shall sound on the voice evacuation system: "There has been a report of fire in the building. Please evacuate the building until it has been cleared by emergency responders."
 4. Heat detectors. The following message shall sound on the voice evacuation system: "There has been a report of fire in the building. Please evacuate the building until it has been cleared by emergency responders."
 5. Manual stations. The following message shall sound on the voice evacuation system: "There has been a report of fire in the building. Please evacuate the building until it has been cleared by emergency responders."
 6. Serving area heat detector. The following message shall sound on the voice evacuation system: "There has been a report of fire in the building. Please evacuate the building until it has been cleared by emergency responders."
 7. Carbon Monoxide detector. The following message shall sound on the voice evacuation system: "There has been a report of carbon monoxide in the building. Please evacuate the building until it has been cleared by emergency responders."
- D. HVAC:
1. Duct Smoke Detectors: Close dampers indicated; shut down air handlers indicated.
 2. Carbon Monoxide Detectors: Turn off all fuel burning appliances

2.04 COMPONENTS

- A. General:
1. Provide flush mounted units where installed in finish areas; in unfinished areas, surface mounted unit are acceptable.
 2. Provide legible, permanent labels for each control device, using identification used in operation and maintenance data.
- B. Fire Alarm Control Units: Existing Simplex 4005.
- C. Initiating Devices:
1. Carbon monoxide (CO) detection:
 - a. Carbon monoxide detectors shall meet UL 217, UL 2075 and UL 2034.
 - b. Detectors shall be addressable
 - c. Combination heat/CO sensors are acceptable

- d. Combination smoke/CO sensors are acceptable
- e. Provide devices compatible with the control unit.
- f. Device shall be provided with a from C relay.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with applicable codes, NFPA 72, NFPA 70, and Contract Documents.
- B. Install wall-mounted equipment, with tops of cabinets not more than 72 inches (1830 mm) above the finished floor.
- C. Smoke- or Heat-Detector Spacing:
 - 1. Comply with NFPA 72, "Smoke-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for smoke-detector spacing.
 - 2. Smooth ceiling spacing shall not exceed 30 feet (9 m).
 - 3. HVAC: Locate detectors not closer than 3 feet (1 m) from air-supply diffuser or return-air opening.
 - 4. Lighting Fixtures: Locate detectors not closer than 12 inches (300 mm) from any part of a lighting fixture.
- D. Duct Smoke Detectors: Comply with NFPA 72 and IMC. Install sampling tubes so they extend the full width of duct.
- E. Carbon Monoxide Detectors: Install 80" Above finished floor. Ceiling mounted detectors shall be listed for the application. Space devices per NFPA 72 and manufacturer's recommendations.
- F. Audible Alarm-Indicating Devices: Install not less than 6 inches (150 mm) below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille.
- G. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches (150 mm) below the ceiling.
- H. Annunciator: Install with top of panel not more than 72 inches (1830 mm) above the finished floor.
- I. Conceal all wiring, conduit, boxes, and supports where installed in finished areas.
- J. Documentation cabinet:
 - 1. Install at fire alarm panel or another approved location at the protected premises.
 - 2. All record documentation shall be stored in the documentation cabinet.
 - 3. No record documentation shall be stored in the control unit.
 - 4. When not at control unit indicate location of documentation cabinet at the control unit.
 - 5. Emergency communication system and fire alarm system record documentation shall be permitted to be maintained together in the same cabinet.

3.02 INSPECTION AND TESTING FOR COMPLETION

- A. Notify Owner 7 days prior to beginning completion inspections and tests.
- B. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.
- C. Provide the services of the installer's supervisor or person with equivalent qualifications to supervise inspection and testing, correction, and adjustments.
- D. Prepare for testing by ensuring that all work is complete and correct; perform preliminary tests as required.
- E. Provide all tools, software, and supplies required to accomplish inspection and testing.
- F. Perform inspection and testing in accordance with NFPA 72 and requirements of local authorities; document each inspection and test.
- G. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

3.03 FIELD QUALITY CONTROL

- A. Field tests shall be witnessed by authorities having jurisdiction.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

- C. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- D. Tests and Inspections:
 - 1. Visual Inspection: Conduct visual inspection prior to testing.
 - a. Inspection shall be based on completed Record Drawings and system documentation that is required by NFPA 72 in its "Completion Documents, Preparation" Table in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter.
 - 2. System Testing: Comply with "Test Methods" Table in the "Testing" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
 - 3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
 - 4. Test visible appliances for the public operating mode according to manufacturer's written instructions.
 - 5. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
- E. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.
- F. Fire-alarm system will be considered defective if it does not pass tests and inspections.
- G. Prepare test and inspection reports.

3.04 CLOSEOUT

- A. Closeout Demonstration: Demonstrate proper operation of all functions to Owner.
 - 1. Be prepared to conduct any of the required tests.
 - 2. Have at least one copy of operation and maintenance data, preliminary copy of project record drawings, input/output matrix, and operator instruction chart(s) available during demonstration.
 - 3. Have authorized technical representative of control unit manufacturer present during demonstration.
 - 4. Demonstration may be combined with inspection and testing required by authority having jurisdiction; notify authority having jurisdiction in time to schedule demonstration.
 - 5. Repeat demonstration until successful.

END OF SECTION 28 4600

SECTION 31 0501**COMMON EARTHWORK REQUIREMENTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited to:
 - 1. General procedures and requirements for earthwork.
- B. Related Requirements:
 - 1. Section 01 1200: 'Multiple Contract Summary' for multiple contracts.
 - 2. Pre-Installation conferences held jointly with Section 31 0501 as described in Administrative Requirements on Part 1 of this specification section:
 - 3. Section 32 9001: 'Common Planting Requirements':
 - a. Pre-installation conference held jointly with other landscape related sections.

1.2 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. Used to replace soils removed during excavation or to fill in low spot on building site.
 - 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 (aggregate base, asphalt or concrete paving, 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 compacted 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 or topsoil.
 - 11. Topsoil Placement and Grading: Topsoil placement and finish grading work required to prepare site for installation of landscaping.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference:
 - 1. Participate in MANDATORY pre-installation conference for common earthwork sections:
 - a. Schedule conference after completion of site clearing but before beginning grading work.
 - b. Participate in pre-installation conference held jointly with following sections:

- 1) Section 03 3111: 'Cast-In-Place Structural Concrete'.
- 2) Section 31 1100: 'Clearing and Grubbing'.
- 3) Section 31 1123: 'Aggregate Base'.
- 4) Section 31 1413: 'Topsoil Stripping and Stockpiling'.
- 5) Section 31 2213: 'Rough Grading'.
- 6) Section 31 2216: 'Fine Grading'.
- 7) Section 31 2316: 'Excavation'.
- 8) Section 31 2323: 'Fill'.
- 9) Section 32 1216: 'Asphalt Paving'.
- 10) Section 32 3213: 'Cast-In-Place Concrete Retaining Walls'.
- 11) Section 33 3313: 'Sanitary Utility Sewerage'.
- c. In addition to agenda items specified in Section 01 3100, review following:
 - 1) Review Geotechnical Evaluation Report.
 - 2) Review common earthwork schedule.
 - 3) Review protection requirements.
 - 4) Review cleaning requirements.
 - 5) Review safety issues.
 - 6) Review field tests and inspections requirements.
- d. In addition to agenda items specified above, review following. These are items that will occur before pre-installation conference for landscape sections:
 - 1) Review clearing and grubbing requirements.
 - 2) Review topsoil stripping and stockpiling requirements.
 - 3) Review landscape grading requirements.
 - 4) Review landscape finish grade tolerance requirements.
 - 5) Review landscape and plant tolerances.
 - 6) Review surface preparation of landscape and planting areas.
 - 7) Review additional agenda items as specified in related sections listed above.
2. Participate in pre-installation conference for landscape sections as specified in Section 32 9001:
 - a. Schedule pre-installation conference after completion of Fine Grading specified in Section 31 2216, but one (1) week minimum before beginning landscape work and held jointly with following sections:
 - 1) Section 32 8423: 'Underground Sprinklers'.
 - 2) Section 32 9120: 'Topsoil And Placement'.
 - 3) Section 32 9121: 'Topsoil Physical Preparation' (section included based on Topsoil Testing Report).
 - 4) Section 32 9122: 'Topsoil Grading'.
 - 5) Section 32 9300: 'Plants'.
 - b. In addition to agenda items specified in Section 01 3100 and Section 32 9001, review following that these items have been installed correctly:
 - 1) Review topsoil placement requirements.
 - 2) Review topsoil surface preparation requirements.
 - 3) Review topsoil depth requirements.
 - 4) Review landscape finish grade tolerance requirements.
 - 5) Review surface preparation of landscape and planting areas.
- B. Sequencing:
 1. General Earthwork:
 - a. Excavation.
 - b. Rough Grading.
 - c. Fill.
 - d. Fine Grading.
 - e. Aggregate Base or Topsoil Grading.

1.4 QUALITY ASSURANCE

- A. 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.

- a. Owner will employ testing agencies to perform testing and inspection 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'.

PART 2 - PRODUCTS: Not Used

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification Of Conditions:
 1. Forty-eight (48) hours minimum before performing any work on site, contact Blue Stakes of Utah to arrange for utility location services.
 2. Perform minor, investigative excavations to verify location of various existing underground facilities at sufficient locations to assure that no conflict with the proposed work exists and sufficient clearance is available to avoid damage to existing facilities.
 3. Perform investigative excavating ten (10) days minimum in advance of performing any excavation or underground work.
 4. Upon discovery of conflicts or problems with existing facilities, notify Architect by phone or fax within twenty-four (24) hours. Follow telephone or fax notification with letter and diagrams indicating conflict or problem and sufficient measurements and details to evaluate problem.

3.2 PREPARATION

- A. Protection:
 1. Spillage:
 - a. Avoid spillage by covering and securing loads when hauling on or adjacent to public streets or highways.
 - b. Remove spillage and sweep, wash, or otherwise clean project, streets, and highways.
 2. Dust Control:
 - a. Take precautions necessary to prevent dust nuisance, both on-site and adjacent to public and private properties.
 - b. Correct or repair damage caused by dust.
 3. 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.

3.3 REPAIR / RESTORATION

- A. Adjust existing covers, boxes, and vaults to grade.
- B. Replace broken or damaged covers, boxes, and vaults.
- C. Independently confirm size, location, and number of covers, boxes, and vaults that require adjustment.

3.4 FIELD QUALITY CONTROL

- A. Field Tests And Inspections:
 - 1. Civil and structural field tests, laboratory testing, and inspections are provided by Owner's independent Testing Agency as specified in Section 01 4523 'Testing And Inspection Services':
 - a. Quality Control is sole responsibility of Contractor. Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform The Work or Contractor's own Testing and Inspection services.
 - 2. Testing and inspection of earthwork operations is required.
 - 3. Field Tests and Laboratory Tests:
 - a. Owner reserves right to require additional testing to re-affirm suitability of completed work including compacted soils that have been exposed to adverse weather conditions.
 - 4. Field Inspections:
 - a. Notify Architect forty-eight (48) hours before performing excavation or fill work.
 - b. If weather, scheduling, or any other circumstance has interrupted work, notify Architect twenty-four (24) hours minimum before intended resumption of grading or compacting.
- B. 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

SECTION 31 1100**CLEARING AND GRUBBING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Perform clearing and grubbing as necessary to prepare site for rough grading and structure excavation as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 31 0501: Common Earthwork Requirements:
 - a. General procedures and requirements for earthwork.
 - b. Pre-installation conference held jointly with other common earthwork related sections.
 - c. Pre-installation conference held jointly with other landscape related sections.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference:
 - 1. Participate in pre-installation conferences as specified in Section 31 0501.

PART 2 - PRODUCTS: Not Used**PART 3 - EXECUTION****3.1 PERFORMANCE**

- A. Tree And Brush Removal:
 - 1. Cut off trees, shrubs, brush, and vegetative growth **12 inches (300 mm)** maximum above ground.
 - 2. Do not pull up or rip out roots of trees and shrubs that are to remain. If excavation through roots is required, excavate by hand and cut roots with sharp axe. Make clean, smooth, sloping cuts.
 - 3. Cut roots **6 inches (150 mm)** or larger in diameter only with Architect's written permission.
- B. Grubbing:
 - 1. Grub out stumps and roots **12 inches (300 mm)** minimum below original ground surface, except as follows:
 - a. Under buildings, remove roots one inch and larger entirely.
 - b. Entirely remove roots of plants that normally sprout from roots, as identified by Architect.

3.2 CLEANING

- A. Remove from site trees, shrubs, uprooted stumps, vegetative layer, and surface debris and dispose of legally.
- B. Do not bury cuttings, stumps, roots, and other vegetative matter or burnt waste material on site.

END OF SECTION

SECTION 31 1123**AGGREGATE BASE****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install the following as described in Contract Documents:
 - a. Aggregate Base:
 - 1) Interior concrete slabs-on-grade.
 - 2) Miscellaneous exterior concrete (sidewalks, curb, gutter and equipment pads).
 - 3) Asphalt paving.
- B. Related Requirements:
 - 1. Section 01 1200: 'Multiple Contract Summary' for multiple contracts.
 - 2. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
 - 3. Section 03 3111: 'Cast-In-Place Structural Concrete'.
 - 4. Section 31 0501: 'Common Earthwork Requirements':
 - a. General procedures and requirements for earthwork.
 - b. Pre-installation conference held jointly with other common earthwork related sections.
 - 5. Section 31 2213: 'Rough Grading'.
 - 6. Section 31 2216: 'Fine Grading' for subgrade procedures.
 - 7. Section 31 2323: 'Fill' for compaction procedures and tolerances.
 - 8. Section 31 3116: 'Termite Control'.
 - 9. Section 32 1216: 'Asphalt Paving'.
- C. Products Installed But Not Furnished Under This Section:
 - 1. Vapor Retarder:
 - a. Interior slabs on grade:
 - 1) Under-slab vapor retarder and seam tape.
- D. Related Requirements:
 - 1. Section 07 2616: 'Below-Grade Vapor Retarders' for:
 - a. Furnishing of vapor retarder and seam tape.

1.2 REFERENCES

- A. Definitions:
 - 1. Aggregate (Asphalt Paving):
 - a. Aggregate: A hard inert mineral material, such as gravel, crushed rock, slag, or sand.
 - b. Coarse Aggregate: Aggregate retained on No. 8 (2.36 mm) sieve.
 - c. Dense-Graded Aggregate: Aggregate that is graded from maximum size down through filler with object of obtaining an asphalt mix with controlled void content and high stability.
 - d. Fine Aggregate: Aggregate passing No. 8 (2.36 mm) sieve.
 - e. 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.
- B. Reference Standards:
 - 1. ASTM International:
 - a. ASTM C131/C131M-14, 'Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine'.
 - b. ASTM D1556/D1556M-15, 'Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method'.

- c. ASTM D1557-12, 'Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³))'.
- d. ASTM D1883-16, 'Standard Test Method for California Bearing Ratio (CBR) of Laboratory-Compacted Soils'.
- e. ASTM D2167-15, 'Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method'.
- f. ASTM D2419-14, 'Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate'.
- g. ASTM D4318-17, 'Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils'.
- h. ASTM D6938-17, 'Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)'.
- i. ASTM E1643-18a, 'Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs'.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conferences:

- 1. Participate in MANADORY pre-installation conference as specified in Section 31 0501.
- 2. In addition to agenda items specified in Section 01 3100 and Section 31 0501, review following:
 - a. Review requirements and frequency of testing and inspections.
 - b. Review termite control application requirements.
 - c. Review aggregate base installation requirements.
 - d. Review vapor retarder installation requirements.
 - e. Review proposed miscellaneous exterior concrete schedule.
 - f. Review proposed asphalt paving schedule.
 - g. Review Section 01 4523 for Testing and Inspection administrative requirements and responsibilities and Field Quality Control tests and inspections required of this section.
 - 1) Review frequency of testing and inspections.

B. Sequencing:

- 1. Compaction as described in Section 31 2216 'Fine Grading'.
- 2. Termite Control:
 - a. Termite application as described in Section 31 3116 'Termite Control':
 - 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.
- 3. Exterior Footings and Foundations are installed.
- 4. Vapor Retarder below interior concrete slabs on grade:
 - a. Install below-grade vapor retarder on top of aggregate base.
- 5. Aggregate Base:
 - a. Install aggregate base at location shown in Contract Drawings.
- 6. Concrete Slab is installed.

C. Scheduling:

- 1. 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 sub grades and excavations to determine if building pad has been prepared in accordance with geotechnical report prior to placing any aggregate base.
- 2. Miscellaneous exterior concrete:

- a. Notify Testing Agency and Architect twenty-four (24) hours minimum before placing concrete for exterior site work concrete (sidewalks, curbs, gutters, etc.), footings, foundation walls, and building slabs to allow inspection of aggregate base.
3. Asphalt Paving:
 - a. Notify Testing Agency and Architect twenty-four (24) hours minimum before placing aggregate base to allow inspection of aggregate base.

1.4 SUBMITTALS

- A. 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 aggregate base.

1.5 QUALITY ASSURANCE

- A. Testing And Inspection:
 1. Owner will provide Testing and Inspection for aggregate base:
 - a. Owner is responsible for Quality Assurance. Quality assurance performed by Owner will be used to validate Quality Control performed by Contractor.
 - b. 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.
 - 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'.

1.6 DELIVERY, STORAGE, AND HANDLING

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

1.7 FIELD CONDITIONS

- A. Ambient Conditions:
 1. Do not perform work during unfavorable conditions as specified below:
 - a. Aggregate Base:
 - 1) Presence of free surface water.
 - 2) Over-saturated sub base materials.
 - b. Vapor Retarder:
 - 1) Unacceptable conditions for installation include presence of high winds which would tear or damage vapor retarder.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aggregate Base:
 1. Under Interior Slab-On-Grade Concrete (Section 03 3111 'Cast-In-Place Structural Concrete'):
 - a. New Aggregate Base:
 - 1) Gravel: 3/4 inch 18mm minimum to one inch 25 mm maximum well-graded, clean gravel or crushed rock.

- 2) Base type gravel or crushed rock, graded by weight as follows (three-quarter to one-inch clean gap-graded gravel):
 - a) Road Base type gravel or crushed stone (slag not allowed), graded as follows:

(1) Sieve		Percent of Weight Passing
(a) 1 inch	(25.4 mm)	100
(b) 3/4 inch	(19.0 mm)	90 - 80
(c) 1/2 inch	(12.7 mm)	20 - 40
(d) 3/8 inch	(9.5 mm)	5 - 10
(e) No. 4	(4.750 mm)	0 - 12
2. Under Exterior Concrete (Section 03 3111 'Cast-In-Place Structural Concrete') excluding Concrete Paving):
 - a. New Aggregate Base:
 - 1) Road Base to conform to State DOT Specifications.
3. Under Asphalt Paving (Section 32 1216 'Asphalt Paving'):
 - a. New Aggregate Base:
 - 1) Road Base to conform to 1-1/2 inches (38 mm) minus State DOT Specifications and Gradations.
 - 2) Aggregate base shall be non-plastic.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Stockpiles:
 1. Provide area for each stockpile of adequate size, reasonably uniform in cross-section, well drained, and cleared of foreign materials.
 2. Locate piles so that there is no contamination by foreign material and no intermingling of aggregates from adjacent piles. Do not use steel-tracked equipment on stockpiles.
 3. Do not store aggregates from different sources, geological classifications, or of different gradings in stockpiles near each other unless bulkhead is placed between different materials.
 4. Do not use washed aggregates sooner than twenty-four (24) hours after washing or until surplus water has drained out and material has uniform moisture content.
 5. Do not stockpile higher than 15 feet (4.57 m). Cover or otherwise protect stockpiles for use in HMA to prevent buildup of moisture.
- B. Surface Preparation (Miscellaneous Exterior Concrete):
 1. Subgrade:
 - a. Finish grade to grades required by Contract Documents.
 - b. Compact subgrade as specified in Section 31 2323.
- C. Surface Preparation (Asphalt Paving):
 1. Subgrade:
 - a. Finish grade parking surface area to grades required by Contract Documents.
 - b. Aggregate base and paving must be placed before any moisture or seasonal changes occur to subgrade that would cause compaction tests previously performed to be erroneous. Recompact and retest subgrade soils that have been left exposed to weather.
- D. Surface Preparation (Interior Slab-On-Grade Concrete):
 1. 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.
 - 3) Lap joints 6 inches (150 mm) minimum and seal with specified seam tape.
 - 4) Seal vapor retarder around pipes, conduits, and other utility items that penetrate vapor retarder using factory-fabricated boot installed as recommended by Manufacturer.

- 5) Except for punctures required for reinforcing and anchor bolts at top of stem walls, seal tears and punctures.

3.2 INSTALLATION

A. Aggregate Base:

1. General:
 - a. Do not place aggregate base material when subgrade is frozen or unstable.
 - b. Spread aggregate base material with equipment except in limited or restricted areas where use of hand spreading is allowed.
 - c. Spread aggregate base material in manner that does not break down material and eliminates segregation, ruts, and ridges.
 - d. Correct damage to aggregate base caused by construction activities and maintain corrected aggregate base until subsequent course is placed.
 - e. Do not allow traffic on aggregate base.
 - f. Remove all standing storm water.
2. Under interior concrete slab-on-grade aggregate base:
 - a. Place **4 inches (100 mm)** minimum of aggregate base under vapor retarder, level, and compact with vibratory plate compactor.
3. Under miscellaneous exterior concrete aggregate base:
 - a. Except under mow strips, place **4 inches (100 mm)** minimum of aggregate base, level, and compact as specified in Section 31 2323.
4. Asphalt paving aggregate base:
 - a. 8" thick minimum after compaction in accordance with Contract Drawings.
 - b. If roller is smaller than **8 ton (7260 kg)**, lay aggregate base and compact in two courses.
 - c. Compact as specified in Section 31 2323.
 - d. Priming: Prime aggregate base with application of **0.2 to 0.5 gallons (2 to 5 liters)** of asphalt cement primer per square **yard (meter)** if pavement will be laid more than three days after compaction of aggregate base, or if precipitation is anticipated between completion of compaction of aggregate base and laying of asphalt paving.
 - e. Recompact unprimed aggregate base if it receives precipitation before pavement is laid.
 - f. Remove or repair improperly prepared areas as directed by Architect.

B. Tolerances:

1. Asphalt Paving Areas:
 - a. Aggregate base:
 - 1) **0.00 inches (0.00 mm)** high.
 - 2) Measure using string line from curb to curb, gutter, flat drainage structure, or grade break.
 - 3) Finished base course shall be true to line and grade within plus or minus **1/4 inch in 10 feet (6 mm in 3 meters)**.
 - 4) Maximum variation from required grades shall be **1/10 of one foot (28 mm)**.

3.3 FIELD QUALITY CONTROL

A. Field Tests And Inspections:

1. Civil and structural field tests, laboratory testing, and inspections are provided by Owner's independent Testing Agency as specified in Section 01 4523 'Testing And Inspection Services':
 - a. 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.
2. 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. Asphalt 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:
 - 4) 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.

3.4 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.

END OF SECTION

SECTION 31 1413**TOPSOIL STRIPPING AND STOCKPILING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Strip and stockpile acceptable topsoil as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 31 0501: 'Common Earthwork Requirements':
 - a. General procedures and requirements for earthwork.
 - b. Pre-installation conference held jointly with other common earthwork related sections.
 - c. Pre-installation conference held jointly with other landscape related sections.
 - 2. Section 31 1100: 'Clearing and Grubbing'.
 - 3. Section 31 2213: 'Rough Grading'.
 - 4. Section 31 2316: 'Excavation'.
 - 5. Section 32 9001: 'Common Planting Requirements'.
 - 6. Section 32 9120: 'Topsoil And Placement' for topsoil evaluation and placement required for topsoil grading.
 - 7. Section 32 9121: 'Topsoil Physical Preparation' for physical preparation of topsoil (section included based on Topsoil Testing Report).
 - 8. Section 32 9122: 'Topsoil Grading' for preparation of topsoil and addition of amendments prior to landscaping.

1.2 REFERENCES

- A. Definitions:
 - 1. Existing topsoil: Defined as total amount of soil stripped and stored for reuse, less vegetation layer stripped and disposed of as specified in Paragraphs below.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference:
 - 1. Participate in pre-installation conferences as specified in Section 31 0501.

PART 2 - PRODUCTS: Not Used**PART 3 - EXECUTION****3.1 PERFORMANCE**

- A. Strip existing vegetation layer from areas of site to receive buildings, landscaping, and paving and remove from site before stripping topsoil for storage and reuse.
- B. After stripping vegetation layer, strip existing topsoil from areas of site to receive buildings and paving and store on site for later use.
 - 1. Existing topsoil is property of Contractor with restriction that topsoil is to be used first for Project landscape topsoil requirements and second for non-structural fill and backfill.

2. After Project fill, backfill, and landscape topsoil requirements are satisfied, remove excess existing topsoil from site. Do not remove existing topsoil from site without Architect's written approval.
- C. Screen existing topsoil to meet standards established as specified in Section 32 9120 'Topsoil And Placement'.

END OF SECTION

SECTION 31 2213**ROUGH GRADING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Perform rough grading work required to prepare site for construction as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 01 3100: 'Project Management and Coordination' for pre-installation conference.
 - 2. Section 03 3053: Miscellaneous Exterior Cast-In-Place Concrete.
 - 3. 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.
 - 4. Section 31 1123: 'Aggregate Base' for aggregate base requirements.
 - 5. Section 31 1413: 'Topsoil Stripping And Stockpiling' for stripping and storing of existing topsoil.
 - 6. Section 31 2216: 'Fine Grading' for grading of subgrade below aggregate base and topsoil.
 - 7. Section 31 2316: 'Excavation'.
 - 8. Section 31 2323: 'Fill' for compaction procedures and tolerances for base.
 - 9. Section 32 1216: 'Asphalt Paving'.
 - 10. Section 32 9122: 'Topsoil Grading' for preparation of topsoil and addition of amendments prior to landscaping.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference:
 - 1. Participate in MANDATORY pre-installation conference as specified in Section 31 0501:
 - 2. In addition to agenda items specified in Section 01 3100 and Section 31 0501, review following:
 - a. Identify benchmark to be used in establishing grades and review Contract Document requirements for grades, fill materials, and topsoil.
 - b. Examine site to pre-plan procedures for making cuts, placing fills, and other necessary work.

PART 2 - PRODUCTS**2.1 MATERIALS**

- A. Materials used for fill shall be as specified for backfill in Section 31 2323 'Fill'.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Verification Of Conditions:
 - 1. Verify elevations of rough grading are correct before compacted fill, fine grading, aggregate base or landscape grading are placed.

3.2 PREPARATION

- A. Protection Of In-Place Conditions:
 - 1. When existing grade around existing plants to remain is higher than new finish grade, perform regrading by hand.
 - 2. Do not expose or damage shrub or tree roots.
- B. Surface Preparation:
 - 1. Before making cuts, remove topsoil over areas to be cut and filled that were not previously removed by stripping specified in Section 31 1413 'Topsoil Stripping And Stockpiling'. Stockpile this additional topsoil with previously stripped topsoil.

3.3 PERFORMANCE

- A. Subgrade (Natural Soils):
 - 1. Subgrade beneath compacted fill or aggregate base under asphalt or concrete paving shall be constructed smooth and even.
- B. Special Techniques:
 - 1. Compact fills as specified in Section 31 2323 'Fill'.
 - 2. If soft spots, water, or other unusual and unforeseen conditions affecting grading requirements are encountered, stop work and notify Architect.
- C. Tolerances:
 - 1. Maximum variation from required grades shall be 1/10 of one foot (28 mm).

END OF SECTION

SECTION 31 2216**FINE GRADING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Perform fine grading of subgrade work required to prepare site for paving finish grading and for placement of topsoil as described in Contract Documents.
 - 2. Asphalt Paving:
 - a. Prepare natural soil subgrade as described in Section 31 2213 'Rough Grading' or prepare fill subgrade as described in this specification section for asphalt paving.
- B. Related Requirements:
 - 1. Section 01 1200: 'Multiple Contract Summary' for multiple contracts.
 - 2. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
 - 3. 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.
 - 4. Section 31 1123: 'Aggregate Base' for aggregate base requirements.
 - 5. Section 31 1413: 'Topsoil Stripping And Stockpiling' for stripping and storing of existing topsoil.
 - 6. Section 31 2213: 'Rough Grading' for grading and preparation of natural soil subgrades below fill and aggregate base materials.
 - 7. Section 31 2316: 'Excavation'.
 - 8. Section 31 2323: 'Fill' for compaction procedures and tolerances for base.
 - 9. Section 32 1216: 'Asphalt Paving' for finish grading for asphalt paving.
 - 10. Section 32 9001: 'Common Planting Requirements'.
 - a. Pre-installation conference held jointly with other common planting related sections.
 - 11. Section 32 9120: 'Topsoil And Placement' for topsoil evaluation and placement required for topsoil grading.
 - 12. Section 32 9121: 'Topsoil Physical Preparation' for physical preparation of topsoil (section included based on Topsoil Testing Report).
 - 13. Section 32 9122: 'Topsoil Grading' for preparation of topsoil and addition of amendments prior to landscaping.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference:
 - 1. Participate in MANDATORY pre-installation conference as specified in Section 31 0501 and Section 32 9001.
 - 2. In addition to agenda items specified in Section 01 3100 and Section 31 0501, review following:
 - a. Review backfill requirements.
 - b. Review geotechnical report.
 - c. Review Section 01 4523 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. Scheduling:
 - 1. Notify Testing Agency and Architect twenty-four (24) hours minimum before installation of fill / engineered fill to allow inspection.
 - 2. Allow special inspector to review all subgrades and excavations to determine if site has been prepared in accordance with geotechnical report prior to placing any fill, aggregate base or concrete.

3. Allow inspection and testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after inspections and test results for previously compacted work comply with requirements.

1.3 SUBMITTALS

- A. 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 fill / engineered fill.

1.4 QUALITY ASSURANCE

- A. 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 fill / engineering fill:
 - a. Owner will employ testing agencies to perform testing and inspection for fill / engineering fill 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'.

PART 2 - PRODUCTS: Not Used

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protection Of In-Place Conditions: Protect utilities and site elements from damage.
- B. General:
 1. Limit use of heavy equipment to areas no closer than **6 feet (1.80 meter)** from building or other permanent structures.
- C. Surface Preparation:
 1. 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 (38 mm)** 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.
 2. Asphalt 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 2213 (natural soils) and Section 31 2323 (fill).
 - 2) Fine grade parking surface area to grades required by Contract Documents.
 - 3) Subgrade to be constructed smooth and even.

3.2 PERFORMANCE

- A. Interface With Other Work: Do not commence work of this Section until grading tolerances specified in Section 31 2213 are met.
- B. General:
 - 1. Do not expose or damage existing shrub or tree roots.
- C. Tolerances:
 - 1. Site Tolerances:
 - a. Subgrade (material immediately below aggregate base):
 - 1) 0.00 inches (0.00 mm) high.
 - 2) Measure using string line from curb to curb, gutter, flat drainage structure, or grade break.
 - b. Maximum variation from required grades shall be 1/10 of one foot (28 mm).
 - 2. Aggregate Base (Asphalt Paving) Tolerances:
 - a. Aggregate base shall be 8 inches (150 mm) thick minimum after compaction, except where shown thicker on Drawings.
 - b. Measure using string line from curb to curb, gutter, flat drainage structure, or grade break.
 - 3. Slope grade away from building as specified in Section 32 9120.

3.3 FIELD QUALITY CONTROL

- A. Field Tests And Inspections:
 - 1. Civil and structural field tests, laboratory testing, and inspections are provided by Owner's independent Testing Agency as specified in Section 01 4523 'Testing And Inspection Services':
 - a. 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.
 - 2. Site Preparation:
 - a. Prior to placement of fill / engineered fill, inspector shall determine that site has been prepared in accordance with geotechnical report.
 - b. Footing subgrade: At footing subgrades, Certified Inspector is to verify that soils conform to geotechnical report.
 - 3. Fill / Engineered Fill:
 - a. Testing Agency shall provide testing and inspection for fine grading.
 - 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.

END OF SECTION

SECTION 31 2316**EXCAVATION****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Perform Project excavating and trenching as described in Contract Documents, except as specified below.
 - 2. Procedure and quality for excavating and trenching performed on Project under other Sections unless specifically specified otherwise.
- B. Related Requirements:
 - 1. 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.
 - 2. Section 31 1100: Clearing and Grubbing.
 - 3. Section 31 1123: 'Aggregate Base'.
 - 4. Section 31 1413: 'Topsoil Stripping and Stockpiling'.
 - 5. Section 31 2213: 'Rough Grading' for rough grading and preparation of natural soil subgrades below fill and aggregate base materials.
 - 6. Section 31 2216: 'Fine Grading' for grading of subgrade below aggregate base and topsoil.
 - 7. Section 31 2323: 'Fill' for compaction procedures and tolerances for base.
 - 8. 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.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference:
 - 1. Participate in MANDATORY pre-installation conference as specified in Section 31 0501:
 - 2. In addition to agenda items specified in Section 01 3100 and Section 31 0501, review following:
 - a. Review protection of existing utilities requirements.

PART 2 - PRODUCTS: Not Used**PART 3 - EXECUTION****3.1 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.

3.2 PREPARATION

- A. Protection of Existing Utilities:
 - 1. Protect existing utilities identified in Contract Documents during excavation.
 - 2. If existing utility lines not identified in Contract Documents are encountered, contact Architect before proceeding.

3.3 PERFORMANCE

- A. Interface With Other Work:
 - 1. Section 31 2213: 'Rough Grading' for rough grading and preparation of natural soil subgrades below fill and aggregate base materials.
 - 2. Section 31 2216: 'Fine Grading' for grading of subgrade below aggregate base and topsoil.
- B. Excavation:
 - 1. Building Footings And Foundations:
 - a. Bottom of excavations to receive footings shall be undisturbed suitable natural soil or granular structural fill extending to suitable natural soil.
 - b. Excavation Carried Deeper Than Required:
 - 1) Under Footings: Fill with concrete specified for footings.
 - 2) Under Slabs: Use specified compacted backfill material.
 - 2. Pavement And Miscellaneous Cast-In-Place Concrete:
 - a. Excavate as necessary for proper placement and forming of concrete site elements and pavement structure. Remove vegetation and deleterious material and remove from site.
 - b. Backfill over-excavated areas with compacted base material specified in Section 31 1123.
 - c. Remove and replace exposed material that becomes soft or unstable.
 - 3. Utility Trenches:
 - a. 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.
 - b. Excavate to proper alignment, depth, and grade. Excavate to sufficient width to allow adequate space for proper installation and inspection of utility piping.
 - c. If trenches are excavated deeper than required, backfill until trench bottom is proper depth with properly compacted native material.
 - d. Pipe 4 Inches (100 mm) In Diameter Or Larger:
 - 1) Grade bottom of trenches to provide uniform bearing and support for each section of pipe on undisturbed soil at every point along its length.
 - 2) Except where rock is encountered, take care not to excavate below depths indicated.
 - a) Where rock excavations are required, excavate rock with minimum over-depth of 4 inches (100 mm) below required trench depths.
 - b) Backfill over-depths in rock excavation and unauthorized over-depths with loose, granular, moist earth, thoroughly compacted.
 - 3) 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.
 - 4. If unusual excavating conditions are encountered, stop work and notify Architect.

3.4 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.

3.5 CLEANING

- A. Debris and material not necessary for Project are property of Contractor and are to be removed before completion of Project. However, if material necessary for Project is hauled away, replace with specified fill / backfill material.

END OF SECTION

SECTION 31 2323**FILL****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Perform Project backfilling and compacting as described in Contract Documents, except as specified below.
 - 2. Procedure and quality for backfilling and compacting performed on Project under other Sections unless specifically specified otherwise.
- B. Related Requirements:
 - 1. Section 01 1200: 'Multiple Contract Summary' for multiple contracts.
 - 2. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
 - 3. 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.
 - 4. Section 31 1100: 'Clearing and Grubbing'.
 - 5. Section 31 1123: 'Aggregate Base' for aggregate base requirements.
 - 6. Section 31 1413: 'Topsoil Stripping And Stockpiling' for stripping and storing of existing topsoil.
 - 7. Section 31 2213: 'Rough Grading' for grading and preparation of natural soil subgrades below fill and aggregate base materials.
 - 8. Section 31 2216: 'Fine Grading' for grading of subgrade below aggregate base and topsoil.
 - 9. Section 31 2316: 'Excavation'.
 - 10. Section 32 9120: 'Topsoil And Placement' for topsoil evaluation and placement required for topsoil grading.
 - 11. Section 32 9121: 'Topsoil Physical Preparation' for physical preparation of topsoil (section included based on Topsoil Testing Report).
 - 12. Section 32 9122: 'Topsoil Grading' for preparation of topsoil and addition of amendments prior to landscaping.
 - 13. Division 32: Compaction of subgrade under walks and paving.
 - 14. Performance of backfilling and compacting inside and outside of building required for electrical and mechanical work is responsibility of respective Section doing work unless arranged differently by Contractor.

1.2 REFERENCES

- A. Reference Standards:
 - 1. ASTM International (Following are specifically referenced for fill and aggregate base testing):
 - a. ASTM D698-12, 'Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft³ (600 kN-m/m³))'.
 - b. ASTM D1556/D1556M-15, 'Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method'.
 - c. ASTM D1557-12, 'Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³))'.
 - d. ASTM D2167-15, 'Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method'.
 - e. ASTM D2487-17, 'Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System)'.
 - f. ASTM D6938-17a, 'Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)'.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conferences:
 - 1. Participate in MANDATORY pre-installation conference as specified in Section 31 0501.
 - 2. In addition to agenda items specified in Section 01 3100, Section 31 0501, and Section 31 2324 if Flowable Fill is included, review following:
 - a. Review backfill requirements.
 - b. Review Section 01 4523 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. Sequencing:
 - 1. Do not backfill against bituminous dampproofing to exterior of foot foundation walls for twenty-four (24) hours after application of dampproofing.
 - 2. 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. Scheduling:
 - 1. Notify Testing Agency and Architect seventy-two (72) hours minimum before installation of fill / engineered fill to perform proctor and plasticity index tests on proposed fill or subgrade.
 - 2. Notify Testing Agency and Architect twenty-four (24) hours minimum before installation of fill / engineered fill to allow inspection.
 - 3. Allow special inspector to review all subgrades and excavations to determine if site has been prepared in accordance with geotechnical report prior to placing any fill (or concrete).
 - 4. Allow inspection and testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after inspections and test results for previously compacted work comply with requirements.

1.4 SUBMITTALS

- A. 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 fill / engineered fill.

1.5 QUALITY ASSURANCE

- A. 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 fill / engineering fill:
 - a. Owner will employ testing agencies to perform testing and inspection for fill / engineering fill 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'.

1.6 FIELD CONDITIONS

- A. Ambient Conditions:
 - 1. Do not perform work during unfavorable conditions as specified below:
 - a. Aggregate Base:
 - 1) Presence of free surface water.

- 2) Over-saturated sub base materials.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Site Material:
 1. Existing excavated material on site is suitable for use as fill and backfill to meet Project requirements.
- B. Imported Fill / Backfill:
 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.
 - a. Under Building Footprint And Paved Areas: Fill shall comply with soil classification groups GW, GP, GM, SW, SP, or SM. Fill may not contain stones over **6 inches (150 mm)** diameter, ninety-five (95) percent minimum of fill shall be smaller than **1-1/2 inch (38 mm)** in any direction and seventy (70) percent minimum of fill shall be smaller than 3/4 inches.
 - b. Under Landscaped Areas:
 - 1) Fill more than **36 inches (900 mm)** below finish grade shall comply with soil classification groups GW, 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 (38 mm)** in any direction.
 - 2) Fill less than **36 inches (900 mm)** 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 (38 mm)** in any direction and ninety (90) percent minimum of fill shall be smaller than **3/8 inch (4.7 mm)** in any direction.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before placing fill, aggregate base, or finish work, prepare existing subgrade as follows:
 1. Do not place fill or aggregate base over frozen subgrade.
 2. Under Building Slab and Equipment Pad Areas:
 - a. Scarify subgrade **6 inches (150 mm)** deep, moisture condition to uniform moisture content of between optimum and four (4) percent over optimum, and mechanically tamp **6 inches (150 mm)** deep to ninety-five (95) percent minimum of relative compaction.
 3. Under Driveways And Parking Areas:
 - a. Scarify subgrade **6 inches (150 mm)** deep, moisture condition to uniform moisture content between optimum and four (4) percent over optimum, and mechanically tamp to ninety-five (95) percent minimum of relative compaction.
 4. Under Miscellaneous Concrete Site Elements And Outside Face of Foundation Walls
 - a. Scarify subgrade **6 inches (150 mm)** deep, moisture condition to uniform moisture content between optimum and four (4) percent over optimum, and mechanically tamp to ninety-five (95) percent minimum of relative compaction.
 5. Landscape Areas:
 - a. Compact subgrade to eighty-five (85) percent relative compaction.

3.2 PERFORMANCE

- A. Interface With Other Work:
 1. Section 31 2213: 'Rough Grading' for rough grading and preparation of natural soil subgrades below fill and aggregate base materials.

2. Section 31 2216: 'Fine Grading' for grading of subgrade below aggregate base and topsoil.
3. Section 31 2324: 'Flowable Fill' for backfilling of piping systems and other utilities under paving'.

B. Fill / Backfill:

1. General:

- a. Around Buildings And Structures: Slope grade away from building as specified in Section 31 2216. Hand backfill when close to building or where damage to building might result.
- b. Site Utilities:
 - 1) In Landscape Areas: Use backfill consisting of on-site soil.
 - 2) Under Pavement and Concrete Site Elements: Extend backfill to elevation of subgrade.
- c. Do not use puddling or jetting to consolidate fill areas.

2. Compacting:

a. Fill / Backfill And Aggregate Base:

- 1) All fill material shall be well-graded granular material with maximum size less than **3 inch (76 mm)** and with not more than fifteen (15) percent passing No. 200 sieve.
- 2) Under Building Slab and Equipment Pad Areas:
 - a) Place in **8 inch (200 mm)** maximum layers, moisture condition to plus or minus two (2) percent of optimum moisture content, and mechanically tamp to ninety five (95) percent minimum of maximum laboratory density as established by ASTM D1557.
- 3) Under Driveways And Parking Areas:
 - a) Place in **8 inch (200 mm)** maximum layers, dampen but do not soak, and mechanically tamp to ninety five (95) percent minimum of maximum laboratory density as established by ASTM D1557.
- 4) Under Miscellaneous Concrete Site Elements And Outside Face of Foundation Walls:
 - a) Place in **8 inch (200 mm)** maximum layers, dampen but do not soak, and mechanically tamp to ninety five (95) percent minimum of maximum laboratory density as established by ASTM D1557.
- 5) Utility Trenches:
 - a) Site:
 - (1) Place fill in **12 inch (300 mm)** layers and moisture condition to plus or minus two (2) percent of optimum moisture content.
 - (2) Compact fill to ninety-five (95) percent minimum relative compaction to within **12 inches (300 mm)** of finish grade.
 - (3) Compact fill above **12 inches (300 mm)** to eighty-five (85) percent relative compaction.
 - b) Under Slabs:
 - (1) Under Slabs: Place fill in **6 inch (150 mm)** 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 (100 mm)** of finish grade.
 - (2) Final **4 inches (100 mm)** of fill shall be aggregate base as specified in Section 31 1123.
- 6) Fill Slopes: Compact by rolling or using sheepsfoot roller.
- 7) Backfill Under Footings if required by Geotechnical Evaluation Report.
- 8) Landscape Areas:
 - a) Compact fill to eighty-five (85) percent minimum relative compaction.
- 9) Other Backfills: Place other fills in **12 inch (300 mm)** layers and compact to ninety five (95) percent relative compaction.
- 10) Loose material from compacted subgrade surface shall be immediately removed before placing compacted fill or aggregate base course.

3.3 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.

3.4 FIELD QUALITY CONTROL

A. Field Tests and Inspections:

1. Civil and structural field tests, laboratory testing, and inspections are provided by Owner's independent Testing Agency as specified in Section 01 4523 'Testing And Inspection Services':
 - a. 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.
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 report.
 - e. Footing subgrade: At footing subgrades Certified Inspector is to verify that soils conform to geotechnical 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 report. Inspector shall determine that in-place dry density of engineered fill material complies with geotechnical 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. (930 sq. m) or less of paved area but in no case less than three (3) tests.
 - 2) Building Slab Areas: At each compacted fill and backfill layer, at least on test for every 2,500 sq. ft. (232 sq. m) 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 (12 linear m) or less of wall length, but no fewer than two (2) tests.
 - 4) Trench Backfill: At each 12 inch (305 mm) compacted lift for each 100 linear feet (30.5 linear m) 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 lineal feet (12 linear m) or one (1) test for every 5,000 sq. ft. (465 sq. m) or less of pad area but no fewer than three (3) tests.
 - g. Required verification and inspection of soils as referenced in 2015 IBC (or latest approved edition) Table 1704.7 'Required Verification And Inspection Of Soils'. Periodic and continuous inspections include:
 - 1) Verify materials below shallow foundations are adequate to achieve design bearing capacity (periodic).
 - 2) Verify excavations are extended to proper depth and have reached proper material (periodic).
 - 3) Perform classification and testing of compacted fill materials (periodic).
 - 4) Verify use of proper materials, densities and lift thicknesses during placement and compaction of compacted fill (continuous).
 - 5) Prior to placement of compacted fill, observe subgrade and verify that site has been prepared properly (periodic).

3.5 CLEANING

- #### A.
- Debris and material not necessary for Project are property of Contractor and are to be removed before completion of Project. However, if material necessary for Project is hauled away, replace with specified fill / backfill material.

END OF SECTION

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.

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.
 - 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.
 - 6) Do not apply to wasp or hornet nests if they are not attached to structure exterior or inside wall voids.
 - 7) Do no treat within distance of **one foot (300 mm)** out from drip line of edible plants.
 - 8) Do not spray air conditioning units or air intake vents.
 - 9) Doors and windows adjacent to application site must be closed during surface application.
- 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.
 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. One gallon per 10 sq ft (3.5 liters per one sq m) as overall treatment under slab.
- c. 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 0113**ASPHALT PAVING SURFACE TREATMENT: Asphalt Based Penetrating Seal****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and apply asphalt based penetrating seal OVER ENTIRE asphalt paving as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 01 1200: 'Multiple Contract Summary' for multiple contracts.
 - 2. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
 - 3. Section 32 1216: 'Asphalt Paving: Marshall Method'.

1.2 REFERENCES

- A. Association Publications:
 - 1. Asphalt Institute:
 - a. MS-4, '*The Asphalt Handbook*' (Seventh Edition).
 - b. MS-16, '*Asphalt in Pavement Preservation and Maintenance*' (Fourth Edition).
 - 2. Asphalt Emulsion Manufacturers Association:
 - a. MS-19, '*Basic Asphalt Emulsion Manual*' (Fourth Edition).
- B. Definitions:
 - 1. Seal Coat: Thin surface treatment used to improve surface texture and protect asphalt surface. Main types of surface treatments are asphalt based emulsion seals, cape seals, chip seals, fog seals, micro surfacing, penetrating seals, refined coal tar emulsion seals, sand seals, sandwich seals and slurry seals.
- C. Reference Standards:
 - 1. ASTM International:
 - a. ASTM D4552/D4552M-10(2016), 'Standard Practice for Classifying Hot-Mix Recycling Agents'.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conferences:
 - 1. Participate in MANDATORY pre-installation conference as specified in Section 01 3100:
 - 2. Schedule asphalt based penetrating seal pre-installation conference to be held jointly with any other 'Asphalt Surface Treatment' sections involving asphalt maintenance:
 - 3. In addition to agenda items specified in Section 01 3100, review following:
 - a. Review crack repair schedule and verify that other repairs will be completed before application of asphalt based penetrating seal.
 - b. Review asphalt based penetrating seal schedule.
 - c. Review asphalt based penetrating seal mix design.
 - d. Review asphalt based penetrating seal preparation requirements:
 - e. Review safety issues.
- B. Scheduling:

1. Manufacturer Instructions:
 - a. Provide to Owner's Representative at least seven (7) days before asphalt based penetrating seal placement commences, approved Laboratory Report and Manufacturer's Certificate of compliance with these specifications covering specific materials to be used on this project.

1.4 SUBMITTALS

- A. Action Submittals:
 1. Provide Manufacturer's product literature.
- B. Informational Submittals:
 1. Design Submittals:
 - a. Asphalt Based Penetrating Seal:
 - 1) Provide mix design for application rate of asphalt based penetrating seal.
 2. Manufacturer Instructions:
 - a. Asphalt Based Penetrating Seal:
 - 1) Provide Manufacturer's written substrate preparation and sealant application instructions.
 3. Qualification Statement:
 - a. Installer / Supervisor:
 - 1) Provide Qualification documentations if requested by Owner's Representative.
- C. Closeout Submittals:
 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Record Documentation:
 - 1) Manufacturer's documentation:
 - a) Asphalt based penetrating seal product literature.
 - b) Design Data Submittal.

1.5 QUALITY ASSURANCE

- A. Qualifications: Requirements of Section 01 4301 applies but not limited to following:
 1. Installer:
 - a. Minimum five (5) years experience in asphalt surface treatment installations.
 - b. Minimum five (5) years satisfactorily completed projects of comparable quality, similar size, and complexity in past three (3) years before bidding:
 - 1) Project names and addresses.
 - 2) Date of installations.
 2. Supervisor:
 - a. Minimum of five (5) years satisfactorily completed projects of comparable quality, similar size, and complexity in past five (5) years as Supervisor of Applicators:
 - 1) Project names and addresses.
 - 2) Date of installation.
 - 3) Name of Supervisor or Owner.
 3. Upon request, submit documentation.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Storage And Handling Requirements:
 1. Asphalt Based Penetrating Seal:
 - a. Following Manufacturer's recommendations.

1.7 FIELD CONDITIONS

- A. Ambient Conditions:

1. Asphalt Based Penetrating Seal:
 - a. Do not apply asphalt based penetrating seal when ambient temperatures will be less than **55 deg F (13 deg C)** for twenty-four (24) hour period or surface temperature will be less than **60 deg F (16 deg C)** for twenty-four (24) hour period.
 - b. Do not apply asphalt based penetrating seal if subsequent temperatures for forty-eight (48) hours are anticipated to drop below **50 deg F (10 deg C)**.
 - c. Do not apply asphalt based penetrating seal if it will be adversely affected by rain, or wet conditions or when surface contains standing water.

PART 2 - PRODUCTS

2.1 MATERIAL

- A. Asphalt Based Penetrating Seal:
 1. Type One Acceptable Product and Manufacturers:
 - a. APR-100 by Mariani Asphalt (An Associated Asphalt Company), Tampa, FL (813) 623-3941, www.associatedasphalt.com/companies/mariani-asphalt.
 - b. GSB-78 Pavement Sealer and Rejuvenator by Asphalt Systems, Inc., Salt Lake City, UT (801) 972-6433 www.asphaltsystemsinc.com. (Use GSB-88 instead of GSB-78 on pavements less than two (2) years old).
 - c. GSB-88 Pavement Sealer and Rejuvenator by Asphalt Systems, Inc., Salt Lake City, UT (801) 972-6433 www.asphaltsystemsinc.com.
 - d. Quick-Dry Anti-Oxidene Penetrating Asphalt Coating (asphalt, air-blown (CAS# 64742-93-4), equal to /or not less than 50 to 65 percent by weight, white stoddard solvent (CAS# 8052-41-3) 35 to 50 percent by weight. No other unnecessary binders, fillers or additives) by Texas Refinery Corp., Fort Worth, TX (956) 492-6254 www.texasrefinery.com.
 - e. Reclamite Preservative Seal by Tricor Refining LLC, Bakersfield, CA (661) 393-7110 www.reclamite.com.
 - f. RS-90 Cutback Asphalt Seal Coating/Rejuvenator by Denver Industrial Sales & Service Company (DISSCO), Denver, CO (303) 935-2485 www.dissco.net.
 - g. Equal as approved by Owner's Representative before bidding. See Section 01 6200.
 2. Performance Requirement:
 - a. Asphalt Based Penetrating Seal consisting of the following:
 - 1) Asphalt, CAS 8052-42-4 (or CAS 8052-41-3), 50 to 65 percent by weight and naphtha, CAS 8030-30-6, 35 to 50 percent by weight (or CAS 8008-20-9, 40 to 60 percent by weight) or white Stoddard solvent, CAS 64742-93-4, 35 to 50 percent by weight.
 - a) No water is acceptable.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Evaluation And Assessment:
 1. Do not apply sealer on asphalt that has not aged for at least one (1) month minimum.
 2. Do not apply sealer over wet or damp pavement, or when precipitation is imminent.

3.2 PREPARATION

- A. Owner Responsibilities:
 1. Remove Scout Trailer(s) if needed.
- B. Surface Preparation:
 1. General:
 - a. Do not allow irrigation watering for at least twenty-four (24) hours prior to application.

- b. Do not apply to new asphalt pavements (less than one (1) month) in that softening may occur.
- c. New asphalt and patched areas should be allowed to cure for at least thirty (30) days at **60 deg F (16 deg C)** temperature prior to application to eliminate any concentration of oils on pavement surface. Longer cure times of up to sixty (60) days may be required. New asphalt must not exhibit ribboning, crawling nor show oil rings when clean water is poured onto surface.
 - 1) To determine if surface oils have dissipated, pour one (1) or two (2) gallons of clean water over pavement surface:
 - a) If water sheets out, uniformly wetting surface and no oil rings appear, surface is ready to be sealed.
 - b) If water balls up and/or shows signs of oil rings, additional curing time is required prior to sealing.
- 2. Paint Stripes:
 - a. During Evaluation and Assessment, verify if acrylic, thermoplastic or paint stripes must be removed in preparation for asphalt based penetrating seal application.
- 3. Grease or Oil Patches:
 - a. Remove grease or oil patches, and spillage of any material that has adhered to pavement. Do not place seal over unsound oil spots softened by fuel or oil.
 - b. Clean oil spots and treat with oil spot primer.
 - c. Seal areas damaged by oil or grease with an oil spot primer compatible with seal being used in accordance with Manufacturer's recommendations.
- 4. Cleaning:
 - a. Remove all debris, dirt, dust, leaves, loose material, moisture, mud spots, sand, silt spots, vegetation (including moss), water and other objectionable and foreign material from existing surface prior to placing seal. In areas where moss is prevalent, apply herbicide.
 - b. Power brooms, power blowers, air compressors, vacuum sweepers, rotary brooms, water flushing equipment, and blowers, or by another approved method.
- 5. Cracks:
 - a. Repair cracks if required per Section 32 0117.01 'Asphalt Paving Crack Seal' or Section 32 0117.02 'Asphalt Paving Crack Fill' prior to placing asphalt based penetrating seal. Cracks that contain weed and other live vegetation matter must be treated with Pre-Emergent Herbicide prior to crack repair.

3.3 APPLICATION

- A. Asphalt Based Penetrating Seal:
 - 1. Applied after Asphalt Paving is installed as specified in Section 1216: 'Asphalt Paving' as follows:
 - a. Mandatory Asphalt Paving Surface Treatment (Asphalt Based Penetrating Seal) to be applied no sooner than thirty (30) days or no later than eighteen (18) months of placing Asphalt Paving to be included with this project.
 - 2. Surface preparation:
 - a. Do not apply asphalt based penetrating sealer until completion of surface preparation items.
 - 3. Follow Manufacturer's recommendations for application of sealer.
 - 4. Apply sealer without thinning from container using squeegee, brush, or sprayer at rate of **1-1/2 gallons (5.6 liters) per 100 square feet (9.3 square meters)** minimum and **2 gallons (7.6 liters) per 100 square feet (9.3 square meters)** maximum, depending on absorbency of pavement.
- B. Paint Stripes:
 - 1. If paint stripes were removed in preparation for penetration seal, include following:
 - a. Apply paint stripes after asphalt based penetrating seal has been applied and cured.

3.4 CLEANING

- A. General:
 - 1. Upon completion of asphalt based penetrating seal operations, clean up and remove debris.

3.5 PROTECTION

- A. Do not allow traffic on paving until asphalt based penetrating seal is thoroughly cured:
 - 1. Warm weather condition is approximately twenty-four (24) hours.
- B. Do not allow irrigation watering for at least twenty-four (24) hours after application.

END OF SECTION

SECTION 32 1216**ASPHALT PAVING: Marshall Method****PART 1 - GENERAL****1.1 SUMMARY****A. Includes But Not Limited To:**

1. Furnish and install asphalt paving in driveways and parking areas as described in Contract Documents including the following, but not limited to:

- a. Asphalt Mix Design Criteria Summary:

- | | |
|--------------------------------------|---|
| 1) Asphalt Binder: | PG 58-28 (or Binder locally used by DOT) |
| 2) Maximum Size Aggregate: | 1/2 inch (12.5 mm) |
| 3) Marshall Blow Count: | 50 |
| 4) Stability: | 1200 pounds (545 kg) minimum |
| 5) Flow: | 8 minimum, 16 maximum |
| 6) Antistrip Agent: | If required by supplier's mix design (use 1 percent or greater lime slurry when required) |
| 7) Asphalt Reinforcement Fibers: | Specified in Section 32 1217 as Alternate 'A'. |
| 8) Reclaimed Asphalt Pavement (RAP): | Allowed up to 25 percent. Asphalt binder shall be one grade softer when more than 15 percent RAP is used. |
| 9) ROSP: | Not allowed. |
| 10) Mineral Filler: | Not allowed |
| 11) Warm Mix Additive: | If required by supplier's mix design. |
| 12) Recycle Agent: | If required by supplier's mix design. |

- b. Design Air Voids:

- 1) Three and one-half percent (3.5 percent).

- c. Tack Coat: Application of asphaltic material to existing asphalt concrete or Portland concrete surfaces before asphalt concrete pavement.

- d. Blotter materials and procedures for absorbing excess asphalt as required.

B. Related Requirements:

1. Section 01 1200: 'Multiple Contract Summary' for multiple contracts.
2. Section 01 3100: 'Project Management and Coordination' for pre-installation conference.
3. Section 01 4301: 'Quality Assurance - Qualifications' establishes minimum qualification levels required.
4. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
5. Section 01 7800: 'Closeout Submittals'.
6. 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.
7. Section 31 1123: 'Aggregate Base' for compaction of aggregate base.
8. Section 31 2213: 'Rough Grading' for rough grading and preparation of natural soil subgrades below fill and aggregate base materials.
9. Section 31 2216: 'Fine Grading' for grading of subgrade below aggregate base and topsoil.
10. Section 31 2323: 'Fill' for compaction procedures and tolerances for base.
11. Section 32 0113.01: 'Asphalt Paving Surface Treatment: Penetrating Seal'.

1.2 REFERENCES**A. Association Publications:**

1. Asphalt Institute, 2696 Research Park Dr., Lexington, KY www.asphaltinstitute.org:
 - a. MS-2, 'Mix Design Methods' (7th Edition 2015).

B. Definitions:

1. Aggregate: Hard inert mineral material, such as gravel, crushed rock, slag, or sand.
 - a. Coarse Aggregate: Aggregate retained on or above No. 8 (2.36 mm) sieve.
 - b. Coarse-Graded Aggregate: Aggregate having predominance of coarse sizes.
 - c. Dense-Graded Aggregate: Aggregate that is graded from maximum size down through filler with object of obtaining an asphalt mix with controlled void content and high stability.
 - d. Fine Aggregate: Aggregate passing No. 8 (2.36 mm) sieve.
 - e. Fine-Graded Aggregate: Aggregate having predominance of fine sizes.
 - f. Mineral Filler: Fine mineral product at least 70 percent of which passes a No. 200 (75µm) sieve.
2. Air Voids: Total volume of small air pockets between coated aggregate particles in asphalt cement concrete (ACC); expressed as percentage of bulk volume of compacted paving mixture.
3. Anti-Stripping Agent: Chemicals added to bitumen to improve the adhesion of the bitumen to hydrophilic aggregates
4. Asphalt Binder: Asphalt cement or modified asphalt cement that binds aggregate particles into dense mass.
 - a. Asphalt Cement used in paving applications that has been classified according to the Standard Specification for Performance Graded Asphalt Binder, AASHTO Designation MP 320. It can be either unmodified or modified Asphalt Cement, as long as it complies with specifications.
5. Asphalt-Aggregate Designator: Alpha-numeric code that indicates nominal maximum size of aggregate, and type and grade of asphalt in aggregate-asphalt mix.
 - a. Example: "12.5 PG70-28" means aggregate asphalt mix shall be composed of aggregate gradation with 12.5 mm (1/2 inch) nominal maximum size and performance grade asphalt binder designed to perform between temperatures of 70 deg C and -28 deg C (158 deg F and -18.4 deg F).
6. Equivalent Single Axle Load (ESAL): Effect on pavement performance of any combination of axle loads of varying magnitude equated to number of 18,000-lb. (80-kN) single-axle loads that are required to produce an equivalent effect.
7. Performance Graded Asphalt Binder (PGAB): Asphalt binder designed to produce HMA that meets certain performance standards. Designations for performance-graded asphalt binders are prefixed with PG. Each grade designation also includes two sets of numbers that denote temperature range. This is a range of climate temperatures to which road may be exposed and still be expected to give superior performance. PG numbers do not indicate viscosity as in conventional liquid asphalt designations.
8. Pre-emergent Herbicide: Chemical that is applied before weeds emerge. It acts by killing weed seedlings and/or establishing layer of chemical on or near soil surface that is toxic to germinating seeds and young seedlings.
9. 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.
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.
11. Tack Coat: Very light application of liquid asphalt, or asphalt emulsion diluted with water.

C. Reference Standards:

1. American Association of State and Highway Transportation Officials:
 - a. AASHTO T 304-17: 'Standard Method of Test for Uncompacted Void Content of Fine Aggregate'.
 - b. AASHTO T 322-07(2016), 'Standard Method of Test for Determining the Creep Compliance and Strength of Hot-Mix Asphalt (HMA) Using the Indirect Tensile Test Device.
2. ASTM International:
 - a. ASTM C29/C29M-17a, 'Standard Test Method for Bulk Density ("Unit Weight") and Voids in Aggregate'.
 - b. ASTM C88-18, 'Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate'.
 - c. ASTM C131/C131M-14, 'Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine'.

- d. ASTM C142/C142M-17, 'Standard Test Method for Clay Lumps and Friable Particles in Aggregates'.
- e. ASTM D242/D242M-18, 'Standard Specification for Mineral Filler For Bituminous Paving Mixtures'.
- f. ASTM D977-17, 'Standard Specification for Emulsified Asphalt'.
- g. ASTM D979/D979M-15, 'Practice for Sampling Bituminous Paving Mixtures'.
- h. ASTM D2041/D2041M-11, 'Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures'.
- i. ASTM D2172/D2172M-17, 'Standard Test Methods for Quantitative Extraction of Bitumen From Bituminous Paving Mixtures'.
- j. ASTM D2256/ D2256M-10(2015), 'Standard Test Method for Tensile Properties of Yarns by the Single-Strand Method'.
- k. ASTM D2397/D2397M-17, 'Standard Specification for Cationic-Emulsified Asphalt'.
- l. ASTM D2419-14, 'Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate'.
- m. ASTM D2726/D2726M-17, 'Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures'.
- n. ASTM D2950/D2950M-14, 'Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods'.
- o. ASTM D3203/D3203M-17, 'Standard Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures'.
- p. ASTM D3549/D3549M-18, 'Standard Test Method for Thickness or Height of Compacted Bituminous Paving Mixture Specimens'.
- q. ASTM D3665-12(2017), 'Standard Practice for Random Sampling of Construction Materials'.
- r. ASTM D4318-17, 'Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils'.
- s. ASTM D4552/D4552M-10(2016), 'Standard Practice for Classifying Hot-Mix Recycling Agents'.
- t. ASTM D4791-10, 'Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate'...
- u. ASTM D5444-15, 'Standard Method for Mechanical Size Analysis of Extracted Aggregate'.
- v. ASTM D5821-13(2017), 'Standard Test Method for Determining the Percentage of Fractured Particles in Coarse Aggregate'.
- w. ASTM D6307-19, 'Standard Test Method for Asphalt Content of Hot-Mix Asphalt by Ignition Method'.
- x. ASTM D6931-17, 'Standard Test Method for Indirect Tensile (IDT) Strength of Bituminous Mixtures'.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conferences:
 - 1. Participate in MANDATORY pre-installation conference as specified in Section 31 0501 'Common Earthwork Requirements'.
 - 2. In addition to agenda items specified in Section 01 3100 'Project Management and Coordination' and Section 31 0501 'Common Earthwork Requirements', review following:
 - a. Review surveying and staking of parking areas and installation of sleeves.
 - b. Review proposed aggregate base schedule.
 - c. Review rough grading elevations before fine grading operations.
 - d. Review fine grading elevations of subgrade fine grading operations before placing aggregate base and paving.
 - e. Review proposed asphalt paving schedule.
 - f. Review asphalt paving mix design.
 - g. Review pre-emergent herbicide protection of adjoining property and planting area on site requirements, schedule and application requirements.
 - h. Review schedule of mandatory asphalt paving surface treatment to be applied after placement of asphalt paving.
 - i. Review schedule of paint stripes to be applied after asphalt paving surface treatment.
 - j. Review safety issues.

- k. Review Section 01 4523 'Testing and Inspecting Services' for administrative requirements and responsibilities and Field Quality Control tests and inspections required of this section.
 - 1) Review requirements and frequency of testing and inspections.
 - 2) Review Contractor Testing Agency Qualifications.
- B. Scheduling: Notify Testing Agency and Architect twenty-four (24) hours minimum before placing asphalt paving.

1.4 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Pre-Emergent Herbicide:
 - 1) Manufacturer's published product data on pre-emergent herbicide.
- B. Informational Submittals:
 - 1. Certificates:
 - a. Require mix plant to furnish delivery/load tickets for each batch of asphalt. Keep delivery tickets at job-site for use of Owner's Representative. Tickets shall show following:
 - 1) Name of mix plant.
 - 2) Date.
 - 3) Name of contractor.
 - 4) Name and location of Project.
 - 5) Serial number of ticket.
 - 6) Asphalt mix type.
 - 7) Time loaded.
 - 8) Identity of truck.
 - b. Installer to provide Manufacturer's Certificate of Compliance stating material authenticity and properties for review and acceptance by Architect before product use.
 - 2. Design Data:
 - a. Hot Mix Asphalt:
 - 1) Design Criteria:
 - a) Develop mix design according to current Asphalt Institute MS-2, '*Mix Design Methods*' for Marshall Method.
 - b) Submittal format:
 - (1) Design mix submittal shall follow format as indicated in current Asphalt Institute MS-2, '*Mix Design Methods*'.
 - 2) Mix design of asphalt paving must meet Design Criteria minimum requirements and show conformance to the following:
 - a) Location and name of hot mix asphalt concrete production facility.
 - b) Date of mix design. If older than two (2) years, recertify mix design.
 - c) Asphalt mix type.
 - d) Mix design method used.
 - e) Mix density.
 - f) Design air voids (three and one half (3.5) percent).
 - g) Asphalt content in percent.
 - h) Performance grade of asphalt binder.
 - i) Nominal maximum size of aggregate.
 - j) Aggregate source and gradation.
 - k) Mix properties and design parameters.
 - l) Temperature of mix at plant and in the field for optimum field compaction.
 - m) Amount of recycled asphalt pavement (RAP).
 - n) Mineral fillers, antistripping, and recycle agent percentages.
 - o) Identify if warm mix technologies will be used and how much warm mix additive will be used.
 - 3) Within thirty (30) days prior to asphalt construction, submit actual design mix to Architect, Civil Engineering Consultant of Record and Independent Testing Laboratory for review and approval.
 - 3. Test And Evaluation Reports:

- a. Hot Mix Asphalt:
 - 1) Contractor's Testing Agency copies of Field Test results to show compliance with all contract requirements and quality control for quality of asphalt mixture and asphalt installation.
 - 2) Owner's Testing Agency copies of Field Tests and Inspections used to validate or determine discrepancies with testing by Contractor.
- 4. Manufacturer Instructions:
 - a. Pre-Emergent Herbicide:
 - 1) Application instructions for pre-emergent herbicide.
- 5. Qualification Statement:
 - a. Installer:
 - 1) Provide Qualification documentation if requested by Owner's Representative.
- C. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800 'Closeout Submittals':
 - a. Record Documentation:
 - 1) Manufacturer's documentation:
 - a) Pre-emergent herbicide documentation.
 - b) Asphalt paving design.
 - c) Test reports.
 - d) Certificates from mix plant of delivery/load tickets.
 - e) Manufacturer's Certificate of Compliance.
 - 2) Testing and Inspection Reports:
 - a) Testing Agency Testing and Inspecting Reports of asphalt paving.

1.5 QUALITY ASSURANCE

- A. Qualifications. Requirements of Section 01 4301 'Quality Assurance - Qualifications' applies but not limited to following:
 - 1. Asphalt Paving:
 - a. Foreman of asphalt paving crew has completed at least three (3) projects of similar size and nature.
 - b. Upon request, submit documentation.
 - 2. Pre-emergent herbicide:
 - a. Applicator:
 - 1) Pre-emergent herbicide shall be applied by applicator certified by State in which Project is located as an applicator of agricultural chemicals.
- B. 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 asphalt paving:
 - a. Owner will employ testing agencies to perform testing and inspection for asphalt 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'.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
 - 1. Asphalt Material:
 - a. Each shipment must:
 - 1) Be uniform in appearance and consistency.
 - 2) Show no foaming when heated to specified loading temperature.

- b. Do not supply shipments contaminated with other asphalt types or grades than those specified:
 - 1) Do not use petroleum distillate as a release agent.
 - 2. Pre-emergent herbicide:
 - a. Materials shall be delivered in original, unopened packages with labels intact.
- B. Storage And Handling Requirements:
 - 1. Pre-emergent herbicide:
 - a. Do not freeze. Store in at temperatures above **41 deg F (5 deg C)**.
 - b. Follow Manufacturer's storage and handling requirements.

1.7 FIELD CONDITIONS

- A. Ambient Conditions:
 - 1. Pre-emergent herbicide:
 - a. Follow printed Manufacturers instruction for environmental hazards:
 - b. Follow printed Manufacturers instruction ambient conditions for application of product.
 - 2. Tack Coat:
 - a. Apply only when air and roadbed temperatures in shade are greater than **40 deg F (4.4 deg C)**. Temperature restrictions may be waived only upon written authorization from Architect or Civil Engineer.
 - b. Do not apply to wet surfaces.
 - c. Do not apply when weather conditions prevent tack coat from adhering properly.
 - 3. Asphalt paving:
 - a. Do not perform work during following conditions:
 - 1) Ambient temperature is below **45 deg F (7.2 deg C)** or will fall below **45 deg F (7.2 deg C)** during placement.
 - 2) Temperature of aggregate base below **50 deg F (10 deg C)**.
 - 3) Cold Weather Asphalt Paving Plan: If asphalt pavement is placed outside of these temperature limits or those identified in MINIMUM Temperature Degrees, a plan is required which includes:
 - a) Haul times.
 - b) Placement details.
 - c) Compaction aids used in production.
 - d) Owner does not assume responsibility for asphalt when placed outside temperature limits.
 - 4) Presence of free surface water or weather is unsuitable.
 - 5) Over-saturated aggregate base and subgrade materials.
 - 6) Wind or ground cools mix material before compaction.

PART 2 - PRODUCTS

2.1 DESIGN CRITERIA:

- A. General:
 - 1. Follow current Asphalt Institute MS-2 'Asphalt Mix Design Methods' for Marshall Method.
- B. Asphalt Mix:
 - 1. Asphalt Binder:
 - a. Performance Graded Asphalt Binder:
 - 1) Use performance graded asphalt binder identified under Asphalt Mix Design Criteria.
 - 2. Aggregates:
 - a. Use clean, hard, durable, angular, sound, consisting of crushed stone, crushed gravel, slag, sand, or combination.
 - b.
 - c. Provide aggregate material properties to meet **Table 1 – AGGREGATE PHYSICAL PROPERTIES** requirements:

Table 1 –AGGREGATE PHYSICAL PROPERTIES					
Property		ASTM	ESAL	Min	Max
Coarse Aggregate (does not pass No. 4 sieve)					
Angularity (fractured faces), percent	D5821	less than 0.3	55	--	
		0.3 to 3.0	75	--	
		greater than 3.0	85/80	--	
Wear (hardness or toughness), percent	C131/C131M	less than 0.3	--	40	
		0.3 to 3.0	--	35	
		greater than 3.0	--	35	
Flats or elongates (3:1 length to width), percent, maximum		D4791	--	--	20
Fine Aggregate (passing No. 4 sieve)					
Angularity (uncompacted void content), percent (AASHTO T304)	--	less than 0.3	--	--	
		0.3 to 3.0	40	--	
		greater than 3.0	45	--	
Sand equivalent, percent	D2419	less than 0.3	40	--	
		0.3 to 3.0	40	--	
		greater than 3.0	45	--	
Friable particles, percent		C142/C142M	--	--	2
Plastic limit, maximum	Liquid limit	D4318	--	--	25
	Plastic limit	D4318	--	--	6
Notes: 1. ESAL in millions. 2. Angularity by weight retained above 9 mm sieve, with at least one fractured face. 85/80 denotes 85 per- cent coarse aggregate has one fractured face and 80 percent has two or more fractured faces. 3. Wear of aggregate retained above 2.36 mm sieve unless specific aggregates have higher values are known to be satisfactory. 4. Flats or elongates retained above 4.75 mm sieve. 5. Friable particles passing No. 4.75 mm sieve. 6. Plasticity, passing No. 4.75 sieve. Aggregate is no-plastic even when filler material is added to aggre- gate.					
Blended Physical Properties					
Dry-rodded unit weight, lb/ft ³ , minimum		C29/C29M	-	75	--
Weight loss (soundness), percent, maximum		C88		--	16
Clay content or cleanliness (sand equivalent), percent	D2419	less than 0.3	45	--	
		more than 0.3	60	--	
Notes: 1. Weight loss using sodium sulfate. 2. Sand equivalent value is after going through dryer or before drum mixer. The sand equivalent require- ment is waived for RAP aggregate but applies to remainder of aggregate blend. 3. Friable particles of clay lumps, shale, wood, mica, and coal passing 4.75 sieve.					

2.2 MATERIAL

- A. Aggregate Base: Conform to applicable requirements as specified in Section 31 1123: 'Aggregate Base'.
- B. Asphalt Paving Surface Treatment:

1. Include mandatory Asphalt Paving Surface Treatment to be applied no sooner than thirty (30) days or no later than eighteen (18) months of placing Asphalt Paving to be included with this project:
 - a. Asphalt Based Penetrating Seal as specified in Section 32 0113.01 'Asphalt Paving Surface Treatment: Asphalt Based Penetrating Seal'.
- C. Pre-Emergent Herbicide:
 1. Design Criteria:
 - a. Selective type pre-emergence control chemical containing twenty-five (25 percent) Prometon minimum for control of annual grasses and broadleaf weeds.
 - b. Non-oil based sterilant.
 - c. Labeled for under-pavement use.
 2. Type Two Acceptable Products:
 - a. Pramitol 25E Herbicide by WinField United, St Paul MN www.winfieldunited.com.
 - 1) Apply at a rate of 10 gal (37.85 liter) per 1 acre (0.4046863 hectare) conforming to application rates indicated on product label.
 - b. Equal as approved by Architect before installation. See Section 01 6200.
- D. Recycled Asphalt Pavement, RAP. Aggregate Restrictions include:
 1. Allowed up to 25 percent. Asphalt binder shall be one grade softer when more than 15 percent RAP is used.
- E. Tack Coat:
 1. Emulsified asphalt meeting requirements of ASTM D977, Grade SS-1H, CQS-1H, or ASTM D2397/D2397M, Grade CSS-1H.

PART 3 - EXECUTION

3.1 PREPARATION

- A. General:
 1. Aggregate base and paving must be placed before any moisture or seasonal changes occur to subgrade that would cause compaction tests previously performed to be erroneous. Re-compact and retest subgrade soils that have been left exposed to weather.
- B. Protection Of In-Place Conditions:
 1. Pre-emergent herbicide:
 - a. Take necessary precautions to protect adjoining property and areas designated for planting on building site.
 - b. Do not contaminate any body of water by direct application, cleaning of equipment or disposal of wastes.
 2. Asphalt Paving:
 - a. Protect all structures, including curb, gutter, sidewalks, guard rails and guide posts.
 - b. Protect neighborhood, storm drains and down-stream fish habitat.
- C. 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'.
 - b. Application shall be no more than one (1) day before installation of granular road base.
 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 'Aggregate Base'.
 - c. Tolerances:
 - 1) Elevation of aggregate base shall be 0.00 inches (0.00 mm) high and no more than 1/2 inch (12.7 mm) low.

- 2) Measure using string line from curb to curb, gutter, flat drainage structure, or grade break.
4. Tack coat:
 - a. Clean surface of all materials such as mud, dirt, leaves, etc. that prevent tack from bonding to existing surfaces.
 - 1) If flushed, allow surface to dry.
5. Asphalt paving:
 - a. Area shall be clean and tack coat applied before placing of asphalt paving.
 - 1) Remove all moisture, dirt, sand, leaves, and other objectionable material from prepared surface before placing asphalt.
 - 2) Locate, reference, and protect all utility covers, monuments, curb, and gutter and other components affected by asphalt paving operations.
 - 3) Allow sufficient cure time for tack coat before placing asphalt.

3.2 APPLICATION

- 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. Pre-Emergent Herbicide:
 1. Asphalt paving areas:
 - a. Follow Manufacturer's printed application requirements:
 - b. Apply to prepared subgrade dispersed in liquid. Concentrate shall be such that Manufacturer's full recommended amount of chemical will be applied to every 1000 sq ft (93 sq m) and liquid will penetrate minimum of 2 inches (50 mm).
 - c. Application shall be no more than one (1) day before installation of aggregate base.
- C. Tack Coat:
 1. General:
 - a. Tack coat vertical surfaces or existing asphalt cement concrete or portland cement concrete that will be in contact with asphalt paving.
 - b. Use tack coat diluted to a 2:1 (concentrate water) ratio.
 - c. Use pressure distributor to apply in uniform, continuous spread.
 - d. Cover all tacked surface areas with surfacing materials same day of application.
 2. Application rate. Typically as follows:
 - a. Emulsions, 0.08 to 0.15 gallons per sq yd (0.303 to 0.679 L per sq m) of diluted material:
 - 1) Apply sufficient to achieve ninety five (95) percent or better coverage of existing surfaces.
 - 2) Above application rates may vary according to field conditions. Obtain approval from Civil Engineer for quantities, rate of application, temperatures, and areas to be treated before any application.
- D. Asphalt Paving:
 1. General:
 - a. Paving adjacent to cast-in-place concrete site elements shall be between 1/4 inch (6 mm) higher than concrete.
 - b. Surface texture of hand worked areas shall match texture of machine-laid areas.
 - c. Surface shall be uniform with no 'birdbaths'. Leave finished surfaces clean and smooth. Variations from specified grades shall not exceed 1/2 inch (12.7 mm).
 - d. Cross Slope: 1/4 inch (6 mm) in 10 feet (3.0 m) perpendicular to centerline except at cross section grade breaks.
 - e. Grade: 1/8 inch (3 mm) in 10 feet (3.0 m) parallel to centerline.
 - f. Do not place on frozen aggregate base or during adverse climatic conditions such as precipitation or when roadway surface is icy or wet.
 - g. Uniformly mix materials so aggregate is thoroughly coated with asphalt.

- h. Place at temperatures established by the mix design with self-propelled laydown machine.
- i. Use **Table 2 – MINIMUM TEMPERATURE, DEGREES** as guide:

Table 2 – MINIMUM TEMPERATURE, DEGREES							
Ambient Air Temperature Deg F.	Ambient Air Temperature Deg C.	Compacted Paving Mat Thickness					
		3/4" (19 mm)	1" (25 mm)	1 1/2" (38 mm)	2" (50 mm)	3" (75 mm)	4" + (100 mm) +
45 – 50	7 – 10	---	---	---	---	280	265
50 – 59	10 – 15	---	---	---	280	270	255
60 – 69	16 – 20	---	---	285	275	265	250
70 – 79	21 – 29	285	285	280	270	265	250
80 - 89	27 - 31	280	275	270	265	260	250
90+	32+	275	270	265	260	250	250

- j. Longitudinal bituminous joints shall be vertical and properly tack coated if cold. Transverse joints shall always be tack coated.
- 2. Compaction:
 - a. Compact asphalt paving to ninety-six (96) percent minimum of Marshall value. Determine percent compaction by ASTM D2950/D2950M.
 - 1) Alternate density and compaction:
 - a) Compact asphalt paving to ninety-four (94) percent of Maximum Theoretical Specific Gravity minimum plus three (3) percent and minus two (2) percent. Determine percent compaction by D2041/D2041M.
 - b. Roll with powered equipment capable of obtaining specified density while providing required smoothness.
 - c. Begin breakdown rolling immediately after asphalt is placed when asphalt temperature is at maximum:
 - d. Complete handwork compaction concurrently with breakdown rolling.
 - e. Execute compaction so visibility of joints is minimized:
 - f. Complete finish rolling to improve asphalt surface as soon as possible after intermediate rolling and while asphalt paving is still warm.
 - g. Do not use vibration for finish rolling.
- 3. Lift Thickness:
 - a. Preferred Method:
 - 1) For pavements **3-1/2 inch (89 mm)** or thinner apply asphalt paving in single lift.
- E. Asphalt Paving Surface Treatments:
 - 1. Apply mandatory Asphalt Paving Surface Treatment no sooner than thirty (30) days or no later than eighteen (18) months of placing Asphalt Paving to be included with this project. Do not apply prior to asphalt curing (refer to 'Asphalt, Concrete and Pervious Concrete Maintenance Guidelines'):
 - a. Asphalt Based Penetrating Seal as specified in Section 32 0113.01 'Asphalt Paving Surface Treatment: Asphalt Based Penetrating Seal'.
- F. Paint Stripes:
 - 1. Apply paint stripes after asphalt paving surface treatment has been applied to asphalt paving.

3.3 FIELD QUALITY CONTROL

- A. Field Tests And Inspections:
 - 1. Civil and structural field tests, laboratory testing, and inspections are provided by Owner's independent Testing Agency as specified in Section 01 4523 'Testing And Inspection Services':
 - a. 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 will be responsibility of Contractor to be performed by an independent entity.
 - 2) Contractor bears full responsible for compliance with all contract requirements and quality control on project and will be responsible for quality of asphalt mixture and asphalt installation.
- B. Field Tests (Provided by Contractor):
1. General:
 - a. Contractor bears full responsibility for compliance with all contract requirements and quality control on project and will be responsible for quality of asphalt mixture and asphalt installation.
 - b. Testing and Inspection Reports to be distributed as specified in Section 01 4523 'Testing And Inspection Services'.
 2. Compaction Tests:
 - a. Contractor to provide compaction tests of asphalt being placed to establish rolling patterns and installation procedures.
 - b. Compaction tests by Contractor are independent of compaction tests being provided by Owner. See Section 01 4523 'Testing And Inspection Services'.
 - c. Compact asphalt paving to ninety-six (96) percent minimum of Marshall value. Determine percent compaction by ASTM D2041/D2041M:
 - 1) Alternate density and compaction:
 - a) Compacted to ninety-four (94) percent of Theoretical Maximum Specific Gravity (Rice) minimum plus three (3) percent and minus two (2) percent. Determine percent compaction by ASTM D2950/D2950M.
 3. Thickness Tests:
 - a. Determine thickness of paving being placed, no less than one (1) test per 10,000 sq. ft. (930 sq. m) of paving or portion thereof, three (3) tests minimum.
- C. Field Tests And Inspections (Provided by Owner):
1. General:
 - a. Compaction tests provided by Owner will be used to validate or determine discrepancies with testing by Contractor.
 - b. Civil engineer applies pay factor for Gradation/Asphalt Content, In-Place Density. Civil engineer computes pay factor for each lot.
 - c. Opening paved surface to traffic does not constitute acceptance.
 - d. Unless required by the Owner's Representative, Testing Agency is to base compaction testing on the Contractor's submitted mix design for theoretical maximum specific gravity (Rice) or Marshall specific gravity (Bulk) values.
 - e. Asphalt-aggregate mix sampling as per ASTM D979/D979M.
 - 1) Test for:
 - a) Air voids as per ASTM D3203/D3203M.
 - b) Asphalt binder content as per ASTM D6307.
 - c) Aggregate gradation as per ASTM D5444.
 - f. Lot size: 10,000 sq. ft. (930 sq. m) or part thereof.
 - g. Sub lot size: 5,000 sq. ft. (465 sq. m) or part thereof.
 2. At Site Testing and Inspection:
 - a. Asphalt Paving:
 - 1) Testing Agency shall provide full time nuclear density testing and inspection for asphalt paving during asphalt paving operations (nuclear density testing is informational testing only and does not constitute acceptance by Owner).
 - 2) Inspection to include:
 - a) Aggregate coating.
 - b) Compaction control and effort required.
 - c) Suitability of spreading and asphalt paving equipment.
 - d) Temperature of mix as delivered and placed.
 - (1) Reject mixes exceeding 325 deg F (163 deg C) in transport vehicle as required in Non-Conforming Work below.
 - (2) Dispose of cold mix in paver hopper as thin spread underlay.
 - 3) Field Tests:

- a) When tested with **10 foot (3 meter)** straight edge, surface of completed work shall not contain irregularities in excess of **1/4 inch (6 mm)**.
 - b) Determine percent compaction per ASTM D2950/D2950M unless other nondestructive nonnuclear methods such as sonar are used.
 - c) Provide written nuclear density testing, or other nondestructive nonnuclear methods such as sonar, of asphalt paving at minimum rate of one (1) per **2,500 sq. ft. (232 sq. m)**. Select test locations by ASTM D3665 and sample per ASTM D979/D979M before compaction. Minimum of three (3) tests required.
 - d) Compact asphalt paving to ninety-six (96) percent minimum of Marshall/Bulk value. Determine percent compaction by ASTM D2950/D2950M:
 - (1) Alternate density and compaction:
 - (a) Compact asphalt paving to ninety-four (94) percent of Theoretical Maximum Specific Gravity (Rice) plus three (3) percent or minus two (2) percent. Determine percent compaction by ASTM D2041/D2041M.
 - e) Maximum average total air voids in completed hot mix asphalt shall be eight (8) percent but more than three (3) percent as determined by ASTM D2041/D2041M.
 - f) Determine thickness of paving being placed, no less than one (1) test per **10,000 sq. ft. (930 sq. m)** of paving or portion thereof, three (3) tests minimum.
3. At Laboratory Testing:
- a. General:
 - 1) Provide at least one (1) laboratory test series for every **10,000 sq. ft. (930 sq. m)** or part thereof (minimum of one (1) test):
 - a) Test reports will show compliance with Contract Documents regarding type of aggregate base, depth of aggregate base, depth and density of asphalt paving, asphalt content, aggregate gradation, flow and stability, bulk specific gravity and maximum specific gravity.
 - b) Reports will also give test procedures used by testing laboratory.
 - b. Compaction and Final Density:
 - 1) Pavement thickness and final density to be determined by results of coring. Provide one (1) core per **10,000 sq. ft. (930 sq. m)** or part thereof. Minimum of three (3) tests required:
 - a) Based upon core samples, compaction is acceptable if test deviations are within pay factor 1.00 limits.
 - b) At Project Manager's discretion, after consulting with design team, a Lot with a sub-lot test deviation greater than Reject may stay in place at fifty (50) percent cost.
 - c) Select test locations by ASTM D3665 and sample per ASTM D979/D979M after compaction.
 - c. Compaction Pay Factor:
 - 1) Based upon core samples, compaction is acceptable if test deviations are within pay factor 1.00 limits.
 - 2) At Project Manager's discretion, after consulting with design team, a Lot with a sub-lot test deviation greater than Reject may stay in place at fifty (50) percent cost.
 - 3) Average Density, in percent as per **Table 3 – COMPACTION PAY FACTORS**:

Table 3 – MINIMUM TEMPERATURE, DEGREES (96 percent of laboratory required – Marshall Method ASTM D2726/D2726M)	
Actual Density percent As Compared Marshall/Bulk Density	Pay Factor Applied to Bid Asphalt Qualities
96.0	100.0
95.9	99.7
95.8	99.3
95.7	98.9
95.6	98.4
95.5	97.8
95.4	97.1
95.3	96.4

95.2	95.8
95.1	94.6
95.0	93.4
94.9	92.2
94.8	90.7
94.7	89.1
94.6	87.8
94.5	85.1
94.4	82.6
94.3	79.5
94.2	75.5
94.1	69.7
94.0	60.0
Under 94.0	REJECT

- d. Average Density determined by alternate method as shown in following **Table 4 – COMPACTION PAY FACTORS**:

Table 4 – COMPACTION PAY FACTORS (94 percent of theoretical maximum specific gravity – Superpave (Rice) (ASTM D2041/D2041M plus three (3) or minus two (2) percent)		
Pay Factor	Density, in Percent	
	Average	Lowest Test
0.70	More than 96	---
1.00	92 to 96	89 or Greater
0.90	92 to 96	Less than 89
Reject	Less than 92	---
Notes: 1. At Contractor's discretion and expense, do Hamburg wheel track test (AASHTO T 304) on 3 additional random core samples from non-complying sub-lot of 5,000 sq. ft. (465 sq. m) . Sub-lot will be accepted if average rut depth is less than 10 mm at 20,000 passes.		

- e. Pavement Thickness:
- 1) Pavement thickness and final density to be determined by results of coring. Provide one (1) core per **10,000 sq. ft. (930 sq. m) or part thereof**. Minimum of three (3) tests required if under **30,000 sq. ft. (2 787 sq. m)**.
 - a) Acceptance will be based on the average of all thickness tests.
 - b) At Project Manager's discretion, after consulting with design team, payment may be made for areas deficient in thickness by more than **0.75 inches (19.05 mm)** at fifty (50) percent. If not, remove and replace at no additional cost to the Owner in following **Table 5 – THICKNESS PAY FACTORS**:

Table 5 – THICKNESS PAY FACTORS	
Pay Factors	Thickness Deficiency, in Inches (ASTM D3549/D3549M)
1.00	0.00 to 0.25
0.90	0.26 to 0.50
0.70	0.51 to 0.75
Reject	0.76 to 1.00

- f. Air Voids:
 - 1) Basis of evaluation is laboratory compacted samples (not field compacted samples).
 - 2) Air voids will be mix design target plus or minus one (1) percent.
 - 3) If test results are not within this Section's limits, options include correction of production procedures or alternate mix design acceptable to Civil Engineer.
- D. Non-Conforming Work: Non-conforming work as covered in the General Conditions applies, but is not limited to the following:
 - 1. Asphalt Paving:
 - a. Deficient asphalt paving thickness:
 - 1) Place additional material over deficient areas. Do not skin patch. Mill for inlay if necessary. Correct deficient asphalt paving thickness at no additional cost to the Owner.
 - b. Rejection and Removal of Asphalt Paving:
 - 1) Remove asphalt paving found defective after installation and install acceptable product at no additional cost to the Owner.
 - c. Removal of Asphalt Paving:
 - 1) Remove spatter, over-coat, or mar at no additional cost to the Owner.
 - 2) Remove asphalt from borrow pits or gutters at no additional cost to the Owner.
 - d. Repair of Asphalt Paving:
 - 1) Repair or replace defective joints, seams, edges at no additional cost to the Owner.

3.4 PROTECTION

- A. Tack Coat:
 - 1. Protect all surfaces exposed to public view from being spattered or marred. Remove any spattering, over-coating, or marring at no additional cost to Owner.
 - 2. Traffic:
 - a. Do not permit traffic to travel over tacked surface until tack coat has cured and dried.
- B. Asphalt Paving:
 - 1. Protect hot mixed asphalt (HMA) pavement from traffic until mixture has cooled enough not to become marked.

3.5 CLEANING

- A. Waste Management:
 - 1. Pre-emergent herbicide:
 - a. Follow Manufacturer's recommendations for disposal of product at approved waste disposal facility.
 - 1) Do not reuse empty containers.

END OF SECTION

SECTION 32 1723**PAVEMENT MARKINGS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish acrylic paint and apply pavement and curb markings as described in Contract Documents including:

1.2 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. U.S. Department of Transportation Federal Highway Administration:
 - a. FHWA MUTCD-10, 'Manual on Uniform Traffic Control Devices'.

1.3 SUBMITTALS

- A. Action Submittal:
 - 1. Product Data:
 - 1) 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.

1.4 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.

1.5 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.
 2. Protect stored material from freezing at temperatures above 35 deg F (2 deg C) or above 115 deg F (46.1 deg C).
 3. Do not invert or roll containers.

1.6 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 (10 deg C) and rising.
 - c. Temperature shall not drop below 50 deg F (10 deg C) 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 (0 deg C) within twenty-four (24) hour period following application.

PART 2 - PRODUCTS

2.1 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.
 - 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:
 - (1) Color Match (all colors except white and yellow).
 - (2) Daylight directional reflectance.
 - (3) Yellow color match.
 - f) Condition in container.
 - g) Dry-through (early washout) for Type II only.
 - h) Flexibility.
 - i) Freeze/thaw stability.
 - j) Heat-shear stability.
 - k) Scrub resistance.
 - l) Skinning.
 - m) Titanium dioxide content.
 - n) 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) Traffic Paint will be furnished in white and any Federal Standard 595 color in accordance to FED-STD-595C:
 - a) Yellow: 33538.
 - b) Blue: 35180.
 - c) Red: 31136.
 - b. White (Yellow may be used at Owner Representative's discretion):
 - 1) Lane lines, edge lines, transverse lines, arrows, words, symbol markings, speed bump markings, parking space markings.
 - c. Yellow:
 - 1) Cross-hatching in medians, cross hatching in safety zones separating opposing traffic flows, crosswalk stripes, safety markings, centerlines, edge lines along left edge of one-way roadway or one-way ramp.
 - d. Blue And White:
 - 1) In parking spaces specifically designated as reserved for disabled.
 - e. Red:
 - 1) Fire lanes, no parking zones, special raised pavement markers that are placed to be visible to "wrong-way" drivers.
- 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

3.1 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.

3.2 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 (6 mm)** variance on straight segments.
 - b. Plus or minus **1/2 inch (13 mm)** variance on curved alignments.
- C. Coverage:
 - 1. Paint stripes added to new asphalt and concrete surfaces:
 - a. Apply single coat.
 - 2. Paint stripes applied to existing asphalt and concrete surfaces:
 - a. Apply single coat to existing asphalt parking lots which are being re-striped and where no surface treatments are being applied to asphalt.
 - b. Apply single coat to existing concrete parking lots which are being re-striped.
 - c. Apply single coat to existing concrete curbs.
 - 3. Paint stripes applied to new asphalt paving surface treatment over existing asphalt paving.
 - a. Except for slurry seal:
 - 1) Apply single coat after seal coat has completely dried.
 - b. Slurry seal coat:
 - 1) Apply first coat after seal coat has completely dried.
 - 2) Apply second coat after first coat has thoroughly dried and then wait thirty (30) to forty-five (45) days and after ravel sweeping to apply second coat.
 - 4. 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.

3.3 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.

3.4 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

SECTION 32 8423 UNDERGROUND SPRINKLERS

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 31 2316 - Excavation and Trenching: Excavating for irrigation piping.
- C. Section 31 2323 - Fill and Aggregate Base: Backfilling for irrigation piping.
- D. Section 32 9001: 'Common Planting Requirements' for pre-installation conference held jointly with other common planting related sections.
- E. Section 32 9120: 'Topsoil And Placement' for topsoil evaluation and placement required for topsoil grading.
- F. Section 32 9122: 'Topsoil Grading' for preparation of topsoil and addition of amendments prior to landscaping.
- G. Section 32 9300: 'Plants'.
- H. 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.
- 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. Pre-installation 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 Landscape 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:
 - 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 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.
 - 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. System 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.
- D. 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.
- 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.

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. HydroRain, North Salt Lake, UT www.hydorain.com.
- f. King Innovation, St Charles, MO www.kinginovation.com.
- g. IPS Corporation, Compton, CA www.ipscorp.com.
- h. Leemco, Colton, CA www.leemco.com.
- i. Mueller Company, Atlanta, GA www.muellercompany.com.
- j. Netafim, Inc. www.netafimusa.com.
- k. Nibco Inc, Elkhart, IN www.nibco.com.
- l. Paige Electric, Union, NJ www.paigewire.com.
- m. Rain Bird Sprinkler Manufacturing Corp, Glendora, CA www.rainbird.com.
- n. T. Christy Enterprises, Inc. (Christy's), Anaheim, CA www.tchristy.com.
- o. VAF Filtration Systems, Arvada, CO www.vafusa.com.
- p. Weathermatic Irrigation Products, Garland, TX www.weathermatic.com.
- q. 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.
- d. Sleeves:
 - 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. Rotary Stream Heads in Lawn and Shrub Areas:
 - 1) Rain Bird: 1806-P45 with R-VAN nozzles. SAM optional.
 - d. Rotor Pop-ups:
 - 1) Rain Bird: 5000 plus PRS with MPR nozzle series, 6504 Series, 8005 Series.
8. Sprinkler Risers:
 - a. Spray Heads (Pre-Manufactured Swing Assemblies):
 - 1) Hunter: SJ-512 (12 inch (305 mm) x 1/2 inch (12.7 mm)) thread) or SJ-7512 (12 inch (305 mm) x 3/4 inch (19 mm) x 1/2 inch (12.7 mm)) thread).
 - 2) Rain Bird model SA125050.
 - 3) Hydorain: Blu-lock model BLJ-050-MC-1.
 - b. 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.
9. Control wiring
 - a. Traditional Control Wiring:
 - 1) Wiring
 - (a) 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.
 - (b) Aside from connectivity to automatic control valves, this material will be used to connect to master valve portion of hydrometer.
 - b. Waterproof Wire Connectors:
 - 1) Control wire connections shall consist of properly-sized wire nut inserted in waterproof grease cap:
 - (a) DBY or DBR by 3M.
 - (b) 'One Step' 20111SP by King Innovation.
 - (c) DB 57905, 57505 by Orbit.
10. Valves:
 - a. Manual Drain Valves:
 - 1) Brass ball valve with 'T' handle.
 - (a) Mueller Company: MH20283NF FIP Curb Stop, 3/4 inch (19 mm).

- b. Automatic Control Valves:
 - 1) Rain Bird: DVF Series, PGA series, PEB series, PESB series. Provide with PRS-Dial pressure regulator if required.
- c. Isolation Valves:
 - 1) PVC ball valves, size to match pipe size (use in warm climates- eco-regions 8.2, 10.2, 11.0, 12.0, 13.0, 14.0, 15.0).
 - (a) Nibco: 4660-T.
 - 2) 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).
 - (a) Nibco: T-113 .
- d. Pressure Reducing Valve:
 - 1) Culinary Water:
 - (a) Make and model shown on Contract Drawings or as required by local codes.
 - 2) Secondary Water:
 - (a) Netafim: quick acting pressure relief valve.
- e. Quick Coupling Valves and Keys:
 - 1) Rain Bird: 44LRC with SH-O swivel.
- 11. Valve Accessories:
 - a. Valve manifolds:
 - 1) Action Machining: 1800 Series, Models 18001, 18001-1-5, and 18001-2.0, 1, 1-1/2, and 2 inch (25, 38, and 50 mm) sizes.
 - 2) Hydro-Rain: HRM Series.
 - b. Valve Boxes And Extensions:
 - 1) Lid Colors:
 - (a) Green: Lawn areas (potable and secondary water).
 - (b) Tan: Bare soil and rock areas (potable and secondary water).
 - (c) Purple: Reclaimed water.
 - 2) Carson:
 - (a) 12 Inch (300 mm) Model 1324-12.
 - (b) 12 Inch (300 mm) Model 1419-12.
 - (c) 10 Inch (255 mm) Model 0910.
 - c. Valve ID tags:
 - 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) GPH Standard yellow ID Tag with alpha-numeric labeling matching zone.
 - d. Valve Box Supports:
 - 1) Standard size fired clay paving bricks without holes.
 - 2) Standard size 6 inch x 8 inch x 16 inch (150 mm x 200 mm x 400 mm) CMU Block.
- 12. Drip System:
 - a. Drip Valve Assembly (Coordinate zone size with hydrometer limits):
 - 1) Rain Bird:
 - (a) 0.3 to 20 GPM: XCZ-100-PRB COM. Select screen size.
 - (b) 0.3 to 20 GPM: XCZ-100-PRBR. Select screen size and provide with line-size matching ball valve.
 - (c) 15 to 62 GPM: XCZ-150-LCS. Provide with line-size matching ball valve in separate round valve box.
 - (d) 15 to 62 GPM: XCZ-150-LCDR. Reclaimed water kit. Provide with line-size matching ball valve in separate round valve box.
 - b. Distribution Tubing (from lateral lines to emitter):
 - 1) Rain Bird: SPX swing pipe with barbed fittings.
 - c. Drip Emitters:

- 1) Rain Bird: XBT Series and PCT Series (2, 5, 7, 10 gph emitters).
- d. Indicator Emitter:
 - 1) Tree drip indicator:
 - (a) Rain Bird: XBCVPC, DBC-025 diffuser cap, TS-025 stake, and XQ 1/4 inch (6.4 mm) tubing.
- e. Distribution Tubing (from lateral lines to in-line emitter tubing).
 - 1) Flexible polyethylene pipe.
- f. In-Line Emitter Tubing:
 - 1) Netafim: Techline CV tubing, flush valves, and fittings.
- g. Valve Boxes and Extensions:
 - 1) Lid Colors:
 - (a) Green: Lawn areas (potable and secondary water).
 - (b) Tan: Bare soil and rock areas (potable and secondary water).
 - 2) Carson:
 - (a) 12 Inch (300 mm) Model 1324-12.
 - (b) 12 Inch (300 mm) Model 1220-12.
 - (c) 12 Inch (300 mm) Model 1419-12.
 - (d) 10 Inch (255 mm) Model 0910.
- h. Valve ID Tags:
 - 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) GPH Standard yellow ID Tag with alpha-numeric labeling matching zone.
- i. Valve Box Supports:
 - 1) Standard size fired clay paving bricks without holes.
 - 2) Standard size 6 inch x 8 inch x 16 inch (150 mm x 200 mm x 400 mm) CMU Block.
- 13. Solvent Cement:
 - a. Solvent Cement: ASTM D2564 for PVC pipe and fittings.
 - b. Primer:
 - 1) Low VOC emissions and compliant with LEED.
 - 2) Product: Weld-On P-70 primer by IPS.
 - c. PVC Solvent Cement:
 - 1) Heavy bodied, medium setting, high strength:
 - (a) Low VOC emissions and compliant with LEED.
 - (b) Product: Weld-On 711 Low VOC PVC Cement by IPS.
 - 2) Flexible, medium bodied, fast setting, high strength (flexible pipe only):
 - (a) Low VOC emissions and compliant with LEED.
 - (b) Product: Weld-On 795 Low VOC Flex PVC Cement by IPS.
- 14. Other Components:
 - a. Weed Barrier:
 - 1) DeWitt 4.1 oz (116 g) 20 year woven polypropylene weed barrier
 - 2) Hanes Pro-Platinum 4.1 oz (116 g) 20 year woven polypropylene weed barrier.
 - b. Recommended by Manufacturer and subject to Architect's review and approval before installation.
 - c. Provide components necessary to complete system and make operational.
- 15. Substitutions: See Section 01 6000 - Product Requirements.
 - a. Equals as approved by Landscape Architect prior to bid.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify location of existing utilities.
- B. Verify that required utilities are available, in proper location, and ready for use.

- C. Verify pressure.

3.02 PREPARATION

- A. Protection:
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. Do not cut existing tree roots measuring over 2 inches (50 mm) in diameter in order to install irrigation lines.
- B. Surface Preparation:
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. Route piping to avoid plants, ground cover, and structures.
 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. Include changes from Contract Documents on Record Drawings.
- C. Review layout requirements with other affected work.

3.03 TRENCHING

- A. Pulling of pipe is not permitted.
- B. Trench and backfill in accordance with Sections 31 2316 and Section 31 2323.
- C. 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.
- D. Trench to accommodate grade changes.
- E. Maintain trenches free of debris, material, or obstructions that may damage pipe.

3.04 GRADES AND DRAINING

- A. In localities where winter shut-down is required, install piping so system can be completely drained. In addition the system should be able to be blown out with compressed air:
1. Slope pipe to drain at control valve boxes and minimum number of low points. At these locations install:
 - a. 3/4 inch (19 mm) brass ball valve for manual drain. Do not use automatic drain valves.
 - b. Install 2 inch (50 mm) Class 200 PVC pipe over top of drain and cut at finish grade.
 - c. Provide rubber valve cap marker.
 - d. Provide one cu ft (0.03 cu m) pea gravel sump at outlet of each drain.
 2. Slope pipes under parking areas or driveways to drain outside away from them.
 3. Provide and install quick-coupling valve(s) 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.

3.05 INSTALLATION

- A. Install all components per manufacturer's recommendations.
- B. Sleeving
1. Sleeve water lines 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.
 2. Position sleeves with respect to buildings and other obstructions so pipe can be easily removed.
 3. Follow the same directives for wiring in conduits.

C. Installation of Pipe:

1. Install pipe, valves, controls, and outlets in accordance with manufacturer's instructions.
2. Provide for thermal movement of components in system.
3. Connect to utilities.
4. 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.
5. 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.
6. Locate pipe so no sprinkler head will be closer than 12 inches (300 mm) from building foundation.
7. Cut plastic pipe square. Remove burrs at cut ends before installation so unobstructed flow will result.
8. Make solvent weld joints as follows:
 - a. Do not make solvent weld joints if ambient temperature is below 35 deg F (2 deg C).
 - b. Clean mating pipe and fitting with clean, dry cloth and apply one (1) coat of primer to each surface.
 - c. Apply uniform coat of solvent cement to outside of pipe.
 - d. Apply solvent cement to fitting in similar manner.
 - e. Insert pipe completely into fitting.
 - f. Give pipe or fitting quarter turn to insure even distribution of solvent and make sure pipe is inserted to full depth of fitting socket.
 - g. Allow joints to set at least twenty-four (24) hours before applying pressure to PVC pipe.
9. Tape threaded connections with teflon tape.
10. For pipe larger than 3 inches (75 mm), install joint restraints wherever change of direction occurs on PVC main lines.
11. After piping is installed, but before heads and emitters are installed and backfilling commences, open valves and flush system with full head of water.

D. Isolation Valves:

1. Install per plans and details.

E. Automatic Control Valves And Control Valve Wiring:

1. Locate valve boxes within 12 inches (300 mm) to 24 inches (600 mm) of sidewalks and shrub bed edges with tops at detailed grades. Do not install more than one (1) valve in single box.
2. Install equipment for ease of removal.
3. 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.
4. Arrange valve stations to operate in an easy-to-view progressive sequence around building. Tag valves with waterproof labels showing final sequence station assignments.

F. Wiring:

1. Use waterproof wire connectors consisting of properly-sized wire nut and grease cap at splices and locate all splices within valve boxes.
2. Two-Wire Path:
 - a. Wire length from any decoder to the controller shall be no more than 8,500 ft (2 590 m).
 - b. Do not loop wiring.
 - c. Install lightning arrestor(s) as per manufacturer's recommendations.
 - d. Follow all other manufacturer recommendations when installing wire.
3. Traditional Wiring:

- a. 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:
 - b. Use white or gray color for common wire and other colors for all other wire. Each common wire may serve only one (1) controller.
 - c. 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:
 - 1) Run spare wire to each branch of system.
 - 2) Spare wire shall be different color than other wires. Use of green wire is not acceptable.
 - 3) 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'.
- G. Pressure Reducing Valve:
- 1. Install as per details and manufacturer's recommendations.
- H. Sprinkler Heads And Rotor Pop-ups:
- 1. Set sprinkler heads and quick-coupling valves perpendicular to finish grade.
 - 2. Do not install sprinklers using side inlets. Install using base inlets only.
 - 3. 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.
 - 4. 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.
- I. Drip Assembly:
- 1. Install pipe providing for expansion and contraction as recommended by Manufacturer.
 - 2. Cut tubing square and remove burrs at cut ends.
 - 3. 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.
 - 4. Locate drip emitter on uphill side of plant within rootball zone.
 - 5. 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.
 - 6. Locate in-line tubing on top of soil but under weed barrier fabric and bark mulch.
 - 7. Staple in-line tubing to ground at 3 foot (900 mm) maximum intervals and within 12 inches (300 mm) of ends and intersections.
 - 8. Assembly Using Solvent Weld Joints:
 - a. Do not make solvent weld joint if ambient temperature is below 35 deg F (2 deg C).
 - b. Clean mating pipe and fitting with clean, dry cloth.
 - c. Apply uniform coat of PVC solvent cement to outside of pipe and inside socket of fitting.
 - d. Insert pipe completely into fitting.
 - e. Give pipe or fitting quarter turn to insure even distribution of solvent and make sure pipe is inserted to full depth of fitting socket.
 - f. Allow joints to set twenty-four (24) hours minimum before applying pressure to pipe.
 - 9. Assembly Using 'Funny Pipe' Type Joints:
 - a. Connect distribution tubing to lateral line using barbed ell fitting.
 - b. Connect fitting to distribution tubing using straight barbed fitting with 1/2 inch (13 mm) threaded end.

3.06 BACKFILL

- A. Backfill in accordance with Section 31 2323.

- B. Cover both top and sides of pipe with 2 inches (50 mm) of rock-free soil or sand as specified under PART 2 PRODUCTS. Remainder of backfill to meet soil requirements as specified in Sections 32 9120 and 32 9122.
- C. Do not cover pressure main, irrigation pipe, or fittings until Architect has inspected and approved system.

3.07 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Section 01 4000 - Quality Requirements.
 - 1. Source Pressure Test:
 - a. Perform source pressure test at stub-out on main water line provided for irrigation system, or at near-by fire hydrant.
 - b. Notify Architect if pressures over 70 psi (480 kPa) or under 55 psi (379 kPa) are found to determine if some re-design of system is necessary before beginning work on system.
 - 2. System Pressure Test:
 - a. By video or in the presence of Landscape Architect, pressure test main line with all valves installed.
 - b. Test pressure at 100 psi (690 kPa) minimum for two (2) hours minimum.
 - c. Verify there are no leaks.
 - d. Receive Landscape Architect approval to proceed prior to backfilling.
 - e. Following pressure test, create pressure test report.
 - 3. Perform Certified Water Audit if pertinent.
 - 4. Substantial Completion Walkthrough:
 - a. 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.
 - b. 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.
 - 5. Final Acceptance:
 - a. Inspection, no less than thirty (30) days following substantial completion, when all work has been completed, demonstrated, and approved by Landscape Architect.
 - 6. Irrigation Approval
 - a. Landscape Architect will approve irrigation system per Part 1 following reception of completed certified water audit (when audit is required) and when all non-conforming items have been brought into conformance.

3.08 ADJUSTING

- A. Sprinkler Heads:
 - 1. Adjust sprinkler heads to proper grade when turf is sufficiently established to allow walking on it without system harm. Such lowering and raising of sprinkler heads shall be part of contract with no additional cost to Owner.
 - 2. Adjust sprinkler heads for proper distribution and trim so spray does not fall on building.
- B. Watering Time:
 - 1. Adjust watering time of valves to provide proper amounts of water to plants.

3.09 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 long-term maintenance schedule.
 - b. Describe annual and regular filter maintenance.

B. Winter Shut-Down and Spring Start-Up:

1. 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:
 - a. 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:
 - 1) Turn off water source at point of connection.
 - 2) 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.
 - 3) Turn controller off or if available turn to appropriate winterization mode.
 - 4) Open all manual drain valves.
 - 5) 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.
 - 6) Drain and remove pumps for Owner's Representative storage.
 - 7) Drain filters using manufacturer's recommendations.
 - 8) Check sprinkler heads to make sure they are below sidewalk and curb levels and not vulnerable to snowplow damage. Lower heads to proper elevation.
 - b. Spring Start-Up shall include following:
 - 1) Close all manual valves.
 - 2) Clean pump filters and replace if necessary.
 - 3) Remove freeze protection as required.
 - 4) Turn on water source at point of connection.
 - 5) Verify that controller(s) and rain sensor are properly operating. Change battery in controller(s) and sensor(s) as required.
 - 6) Flush entire system. Run each valve for two (2) minutes to check for damage, leaks, and coverage.
 - 7) Repair and adjust system as needed. Fine tune heads for efficient coverage.

END OF SECTION

**SECTION 32 9001
COMMON PLANTING REQUIREMENTS**

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 9219: 'Seeding'.
 - 13. Section 32 9223: 'Sodding'.
 - 14. 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 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 during project construction.
 - 2) During construction, additional site visits may be approved in writing by Architect or Owner for special considerations before commencement.
 - 3) 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.

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: Contractor to have previous L.D.S. Church Meetinghouse experience in the last 5 years.
 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.

PART 2 PRODUCTS – NOT USED

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 Substantial Completion. If maintenance period is interrupted by non-growing season or irrigation winter shut-down, begin maintenance period after start of growing season as agreed with Architect, and continue one (1) continuous month therefrom.
 - 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. 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

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 Landscape 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.

PART 2 PRODUCTS

3.01 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.
 - 2. Project Topsoil Requirements:
 - a. It is anticipated that the following percentages of material will be required to meet Project site topsoil requirements:
 - 1) Imported Topsoil: 100% percent of landscape area:
 - (a) Lawn Areas: 100% percent of imported topsoil.
 - (b) Shrub / Tree Areas: 100% percent of imported topsoil.

PART 3 EXECUTION

4.01 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.

4.02 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.

4.03 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. No topsoil as defined in this Section is required over tree and shrub planting areas or native grass, shrub, or tree areas as long as what is in place is not excessively rocky or otherwise unfavorable to healthy plant growth.
 - 2. 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 subgrade is either wet or frozen enough to cause clodding.
- D. Stockpiled Topsoil:
 - 1. Redistribute tested and approved existing topsoil stored on site as result of work of Section 31 1413 'Topsoil Stripping And Stockpiling'.
 - 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 subgrade is either wet or frozen enough to cause clodding.
- E. In Place Topsoil:
 - 1. At locations where topsoil can remain in place and has been tested and approved, perform the following:
 - a. Remove existing vegetation as required in preparation for new landscaping.
 - b. Remove vegetative layer, roots, organic material, rocks and clods greater than 1-1/2 inch (38 mm) in any dimension, and other objectionable materials.
- 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.

4.04 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**

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.

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.
 - 1) 'Soil Prep' Soil Conditioner from Miller Companies at the following rates:
 - a) 25% 'Soil Prep' per existing topsoil volume mixed thoroughly in backfill of plant pits.
 - b) 2 cubic yards per 1,000 square feet in lawn areas.
 - b. Acceptable Fertilizers And Application Rates:
 - 1) Apply "Gro-Power Plus 5-3-1 w/M" into the backfill of plant pits and mix thoroughly at the following rates:
 - a) 2 cups for all shrubs.
 - b) 1 cup for all perennials and ornamental grasses.
 - 2) Apply NP and Iron Fertilizer at label rate and incorporate well. (Lawn areas)

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. Ground Cover Areas: 2 inches (50 mm) below.
 - b. Seeded Areas: One inch (25 mm) below.
 - c. Sodded Areas: 2 inches (50 mm) below.
 - d. 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 9300
PLANTS****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 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.

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 extend thirty (30) continuous days minimum after Substantial Completion. If a continuous first 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 as agreed on with Architect. Thereafter, continue warranty per the period described herein.
 - b. Warranty shrubs, ground covers, and vines to live and remain in strong, vigorous, and healthy condition for one year from date of Substantial 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 Substantial Completion.
 - d. When trees are completely accepted at end of warranty period, remove staking.

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. 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. As specified on details and Section 32 9122 (Soil Grading and Preparation).
- 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. 32 inch (800 mm) Cinch-Tie tree ties by V.I.T. Products Inc, Escondido, CA www.vitproducts.com.
- E. Pre-Emergent Herbicide:
 - 1. Chipco Dimension Granular by The Andersons Inc, Maumee, IL www.andersonsinc.com.
 - 2. Elanco XL2G granular by Crop Data Management Systems, Marysville, CA www.cdms.net.
 - 3. Ronstar G granular by Bayer Crop Science, Monheim, Germany www.bayercropscience.com.
 - 4. Surflan AS liquid by United Phosphorous Inc, Trenton, NJ www.upi-usa.com.
 - 5. Oryzalin 4 A.S. liquid by FarmSaver, Seattle, WA www.farmsaver.com.
- F. Weed Barrier:
 - 1. DeWitt 4.1 oz 20 year woven polypropylene weed barrier.
- G. Rock Mulch:
 - 1. Tan Rock as specified in drawings.
 - 2. Submit sample for approval.
- H. Substitutions: See Section 01 6000 - Product Requirements.
 - 1. Equals as approved by Landscape Architect prior to bid.

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. 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.
 - b. 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.
 - c. Remove and replace tree plant material if roots are loose, significantly circling, significantly asymmetrical or damaged.
 - d. 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. 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.
- E. Weed Barrier Fabric:
1. After planting and application of herbicide in shrub beds, apply covering of specified weed barrier 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.
- F. Mulching:
1. After application of herbicide, mulch shrub and ground cover planting areas with specified depth of specified rock mulch.
 2. Place mulch to uniform depth and rake to neat finished appearance.

END OF SECTION

SECTION 33 3313**SANITARY UTILITY SEWERAGE****PART 1 - GENERAL****1.1 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 (1.50 meter)** from where it enters building and connecting to serving sewer system.
- B. Related Requirements:
 - 1. Section 22 1313: 'Facility Sanitary Sewers' for sanitary sewage system within building and within **5 feet (1.50 meter)** of building.
 - 2. Section 31 0501: 'Common Earthwork Requirements' for:
 - a. Pre-installation conference held jointly with other common earthwork related sections.
 - 3. Section 31 2316: 'Excavation' for criteria for performance of excavation.
 - 4. Section 31 2323: 'Fill' for criteria for performance of backfill and compaction.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conferences:
 - 1. Participate in pre-installation conference as specified in Section 03 3111.
 - 2. Participate in pre-installation conference as specified in Section 31 0501.

1.3 REFERENCES

- A. Reference Standards:
 - 1. ASTM International:
 - a. ASTM D2235-04(2016), 'Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings'.
 - b. ASTM D2321-18, 'Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications'.
 - c. ASTM D2564-12(2018), 'Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems'.
 - d. ASTM D2661-14, 'Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings'.
 - e. ASTM D2665-14, 'Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings'.
 - f. ASTM D3034-16, 'Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings'.
 - g. ASTM F656-15, 'Standard Specification for Primers for Use in Solvent Cement Joints of Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings'.

1.4 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals
 - 1. Install cleanouts in accordance with local governing authority and State codes.

PART 2 - PRODUCTS

2.1 COMPONENTS

- A. 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.
- B. 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.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification Of Conditions:
 - 1. Before installation, inspect pipe for defects and cracks.
 - 2. Do not use defective, damaged, or unsound pipe.

3.2 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 (300 mm)** minimum below frost line.

3.3 INSTALLATION

- A. General:
 - 1. 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.
 - 2. 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.
 - 3. Trench width at top of pipe:
 - a. Minimum: **18 inches (450 mm)** or diameter of pipe plus **one foot (305 mm)**, whichever is greater.
 - b. Maximum: Outside diameter of pipe plus **two feet (610 mm)**.
- B. Placing And Laying of Underground Pipe:
 - 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 (12 500/D mm per m)** of pipe where D represents nominal diameter of pipe expressed in **inches mm**.
 - 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.
 5. Make joints between cast iron pipe and other types of pipe with standard manufactured cast-iron adapters and fittings.
 6. Valve, plug, or cap, as directed by Architect, where pipe ends are left for future connections.
- C. Thermoplastic 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 (100 to 150 mm)**.
 - 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 back hoe or power equipment to assemble pipe.
 7. Initial backfill shall be **12 inches (305 mm)** above top of pipe with material specified in referenced ASTM standard.
 8. Minimum cover over top of pipe:
 - a. **36 inches (915 mm)** before allowing vehicular traffic over pipe.
 - b. **48 inches (1 200 mm)** before use of compaction equipment other than hand or impact tampers.

3.4 FIELD QUALITY CONTROL

- A. Non-Conforming Work:
1. Failure to install joints properly shall be cause for rejection and replacement of piping system at no additional cost to Owner.

END OF SECTION

SECTION 33 4116**SITE STORM UTILITY DRAINAGE PIPING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Perform excavating and backfilling required for work of this Section.
 - 2. Furnish and install storm drainage system using PVC Polyethylene Pipe and fittings as described in Contract Documents from point of water collection to terminating point.
- B. Related Requirements:
 - 1. Section 31 2316: 'Excavation' for criteria for performance of excavation.
 - 2. Section 31 2323: 'Fill' for criteria for performance of backfill and compaction.

1.2 REFERENCES

- A. Reference Standards:
 - 1. American Association Of State Highway And Transportation Officials:
 - a. AASHTO M 252-18, 'Standard Specification for Corrugated Polyethylene Drainage Pipe'.
 - b. AASHTO M 294-18 'Standard Specification for Corrugated Polyethylene Pipe, 300- to 1500-mm (12- to 60-in.) Diameter'.
 - 2. ASTM International:
 - a. ASTM D2321-18, 'Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications'.
 - b. ASTM D3034-16, 'Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings'.
 - c. ASTM D3212-07(2013), 'Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals'.
 - d. ASTM F794-03(2014), 'Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter'.
 - e. ASTM F1336-15, 'Standard Specification for Poly (Vinyl Chloride) (PVC) Gasketed Sewer Fittings'.
 - 3. International Code Council:
 - a. ICC IPC, '2015 International Plumbing Code'.

PART 2 - PRODUCTS**2.1 SYSTEM**

- A. Materials:
 - 1. Bedding Material: 3/8 inch (9.5 mm) crushed gravel.
 - 2. Catch Basins, Curb Inlets, Etc:
 - a. Concrete:
 - 1) Construct of 5000 psi (34.47 MPa) minimum concrete.
 - 2) 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) Equal as approved by Architect before bidding. See Section 01 6200.

3. PVC Pipe And Fittings:
 - a. Meet requirements of ASTM D3034, SDR 35.
 - b. Fittings: Slip Joint type with elastomeric seals.
4. Fittings: Slip Joint type with elastomeric seals.
5. Corrugated Polyethylene Pipe And Fittings:
 - a. Meet requirements of AASHTO M 252 or AASHTO M 294, Type S.
 - 1) Corrugated, helical or annular, exterior with smooth interior and gasketed connectors.
 - 2) Corrugated, annular, with silt and watertight joints for storm sewers.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Excavate and backfill as specified in Section 31 2316 and Section 31 2323 with following additional requirements:
 1. Runs shall be as close as possible to those shown on Contract Documents.
 2. Excavate to required depth.
 3. Grade to obtain fall required.
 4. Remove debris from trench before laying bedding and pipe.
 5. Do not cut trenches near footings without consulting Architect.
 6. Backfill only after pipe lines have been tested, inspected, and approved by Architect/Engineer.

3.2 INSTALLATION

- A. PVC / Polyethylene Pipe:
 1. Install in accordance with ASTM D2321.
 2. Minimum cover for corrugated polyethylene pipe and fittings shall be 12 inches (300 mm) for H-20 load.
- B. Use jacks to make-up gasketed joints.

3.3 FIELD QUALITY CONTROL

- A. Non-Conforming Work:
 1. Failure to install joints properly shall be cause for rejection and replacement of piping system at no additional cost to Owner.

3.4 CLEANING

- A. Remove excess earth from site or place as directed by Architect.

END OF SECTION