

project manual

THE CHURCH OF
JESUS CHRIST
OF LATTER-DAY SAINTS

Taylorsville 12,25 Taylorsville UT South Stake

4505 South Brians Way, Taylorsville, Utah

Project Number: 5141710-19020101



bradley gygi architect & associates, pllc

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Professional Consultants



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BIDDING REQUIREMENTS

FOR SMALL PROJECTS (U.S.)

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INVITATION TO BID (U.S.)

1. CONTRACTORS INVITED TO BID THE PROJECT:

to be announced

2. PROJECT:

Taylorsville 12,25
Taylorsville UT South Stake
Project Number: 5141710-19020101

3. LOCATION:

4505 South Brians Way
Taylorsville, UT

4. OWNER:

Corporation of the Presiding Bishop of
The Church of Jesus Christ of Latter-day Saints, a Utah corporation sole
c/o
James Dzineku
Meetinghouse Project Management Office
50 E North Temple Street, COB 12
Salt Lake City, UT 84120-0012

5. CONSULTANT:

Bradley Gygi Architect & Associates, PLLC
2150 South 1300 East, Suite 500
Salt Lake City, UT 84106

6. DESCRIPTION OF PROJECT:

- A. Interior remodel of existing restrooms.
- B. Products or systems may be provided under a Value Managed Relationship (VMR) the Owner has negotiated with the supplier. VMR products and systems are indicated as such 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 45 calendar days and will be as noted in the Agreement.

9. BID OPENING: Sealed bids will be received at date, time and place. Bids will be publicly opened at date, time and place.

10. BIDDING DOCUMENTS:

Bidding Documents may be examined at the following plan room locations:

- 1) Dodge Data and Analytics
Office # (859) 885-1091
Fax # (801) 606-7722
email: sherry.roe@construction.com

Steps for downloading from McGraw-Hill Dodge:

Purchasing Individual Reports/Plans/Specs/Addenda from Dodge Data and Analytics

- Access the web-page <http://dodgeprojects.construction.com/>
- Search the Dodge Database by state (required) using the Dodge Report Number or Project Name for a single project report. To see a listing of all of the LDS projects in a particular state, enter the State name from the drop down box and then enter LDS in the second search box. Click Search.
- Select the project from the results list. By clicking on the blue project description, a more descriptive title will help to make sure you are purchasing the correction documents.
- When you find the correct project, select: Get This Report, Get Plans & Specs, or Monthly Access. Add to Cart and Proceed to Checkout or Continue Shopping. After the purchase, select View This Project.

- 2) Mountainlands Area Plan Room
Office (801) 288-1188
Fax (801) 288-1184
Contact: Mike Luke
email: mike@maprutah.com

Hard copy plans are available for viewing at:

- Mountainlands Area Plan Room
583 West 3560 South, Suite 4
Salt Lake City, UT 84115

Plans can also be viewed online with Mountainlands at: www.MAPRonline.com

- Membership is required for online service.

- B. Hard Copy and electronic copy Bidding Documents will be provided to invited Contractors. Hard Copies shall be returned to the Architect complete and in good condition within five days of bid opening.

11. BIDDER'S QUALIFICATIONS: Bidding by the Contractors will be by invitation only.

12. OWNER'S RIGHT TO REJECT BIDS: 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. DOCUMENTS:

- A. Bidding Documents include Bidding Requirements and proposed Contract Documents. Proposed Contract Documents consist of:
 - 1) Agreement Between Owner and Contractor for Small Project (U.S.)
 - 2) Other documents included by reference
 - 3) Addenda.
- B. Bidding Requirements are those documents identified as such in proposed Project Manual.
- C. Addenda are written or graphic documents issued prior to execution of the Contract which modify or interpret the Bidding Documents. They become part of the Contract Documents as noted in the Agreement Between Owner and Contractor for Small Project (U.S.) upon execution of the Agreement by Owner.

2. BIDDER'S REPRESENTATIONS:

- A. By submitting a bid proposal, bidder represents that
 - 1) Bidder has carefully studied and compared 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 contract work, and has correlated its personal observations with requirements of proposed Contract Documents, and
 - 3) Bid is based on materials, equipment, and systems required by Bidding Documents without exception.

3. BIDDING DOCUMENTS:

- A. Copies
 - 1) Owner will provide the Bidding Documents as set forth in the Invitation to Bid.
 - 2) Partial sets of Bidding Documents will not be issued.
- 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) Equal products may be approved upon compliance with Contract Document requirements.
 - 2) Base bid only on materials, equipment, systems, suppliers or performance qualities specified in the Bidding documents.
 - 3) Where a specified product is identified as a "quality standard", products of other manufacturers that meet the performance, properties, and characteristics of the specified "quality standard" may be used without specific approval as a substitute.
- D. Addenda. Addenda will be sent to bidders and to locations where Bidding Documents are on file no later than one week prior to bid opening or by fax no later than 48 hours prior to bid opening.

4. BIDDING PROCEDURES:

- A. Form and Style of Bids

- 1) Use Owner's Bid Form.
 - 2) Bid will be complete and executed by authorized representative of Bidder.
 - 3) Do not delete from or add to the information requested on bid form.
- B. Submission of Bids
- 1) Submit bid in sealed opaque envelope containing only bid form.
 - 2) It is bidder's sole responsibility to see that its bid is received at or before the specified time. Bids received after specified bid opening time may be returned to bidders unopened.
 - 3) No oral, facsimile transmitted, telegraphic, or telephonic bids, modifications, or cancellations will be considered.
- C. 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 by written request or by reclaiming bid envelope.
 - 3) Prior to bid opening, bidder may mark and sign on the sealed envelope that bidder acknowledges any or all Addenda.

5. CONSIDERATION OF BIDS:

- A. Opening Of Bids - See Invitation to Bid.
- B. Acceptance Of Bid
- 1) No bidder will consider itself under contract after opening and reading of bids until Owner accepts Contractor's Bid Proposal by executing same.
 - 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. FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR:

- A. Agreement form will be "Agreement Between Owner and Contractor for Small Project (U.S.)" provided by Owner.

7. MISCELLANEOUS:

- A. Pre-Bid Conference. A pre-bid conference may be held at a time and place to be announced.
- B. Examination Schedule for Existing Building and Site
- 1) Contractor may arrange additional visits by Contractor or subcontractors with FM Manager. Contact information will be provided at the Pre-Bid Conference.

END OF DOCUMENT

INFORMATION AVAILABLE TO BIDDERS (U.S.)

1. GEOTECHNICAL DATA

- A. Geotechnical Report -
 - 1) Not provided for this project.

2. ASBESTOS-CONTAINING MATERIAL (ACM)

- A. The building upon which work is being performed has been examined for asbestos-containing material. Owner will provide a report to the Contractor to maintain on site during construction activities.
- B. Refer to Section 01 3500, Article 1.3 "Environmental Procedures" for requirements to be followed.

END OF DOCUMENT

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BID FORM

FOR GENERAL CONTRACT WORK (U.S.)

PROJECT IDENTIFICATION:

Taylorsville 12,25, Taylorsville UT South Stake, 5141710-19020101

OWNER:

Corporation of the Presiding Bishop of the Church of Jesus Christ of Latter-day Saints, a Utah corporation sole ("Owner")

James Dzineku, Meetinghouse Project Management Office
50 E North Temple Street, COB 12, Salt Lake City, UT 84120-0012

CONSULTANT:

Bradley Gygi Architect & Associates, PLLC
2150 South 1300 East, Suite 500, Salt Lake City, UT 84106

BID

1. In submitting this Bid, Bidder represents that:
 - a. If this Bid is accepted, Bidder will enter into an agreement with Owner to perform and furnish the Work described in the Bidding Documents for the Bid Price and within the Time of Substantial Completion indicated in this Bid and in accordance with the other terms and conditions of the Contract Documents.
 - b. Bidder has carefully examined the Bidding Documents consisting of the Project Manual containing the Bidding Requirements, the Conditions of the Contract, and the Specifications, entitled Taylorsville 12.25, the Drawings entitled Taylorsville 12.25 and dated 10 May 2019 and including sheets numbered A101 through E101, and addenda numbers _____.
 - c. Bidder has examined the site of the work, existing conditions, and all other conditions affecting the work on the above-named Project.
 - d. Bidder has carefully correlated the information known to Bidder and information and observations obtained from visits to the site with the Bidding Documents.
 - e. Bidder is familiar with federal, State, and local laws and regulations applicable to Project.
 - f. Bidder guarantees there will be no revisions or withdrawal of bid amount for forty-five (45) days after the bid opening.
2. Bidder hereby proposes to furnish all materials, labor, equipment, tools, transportations, services, licenses, fees, permits, etc., required by said documents to complete the Work described by the Contract Documents for the lump-sum of: _____ Dollars (\$ _____).
3. Bidder agrees to achieve substantial completion of the Work within the number of days indicated in the Invitation to Bid.

RESPECTFULLY SUBMITTED:

_____	Signature	
_____	Printed name	
_____	Title	
_____	Company name	
_____	Business Address	
_____	City, State, and Zip Code	
_____	Telephone	Fax
_____	Contact Email Address	

Date

License No.

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SMALL PROJECT AGREEMENT BETWEEN OWNER AND CONTRACTOR (U.S.)

Corporation of the Presiding Bishop of The Church of Jesus Christ of Latter-day Saints, a Utah corporation sole, (“Owner”) and _____ (“Contractor”) enter into this *Small Project Agreement Between Owner and Contractor (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 Work.** Contractor will furnish all labor, materials, tools, and equipment necessary to complete the Work in accordance with the Contract Documents. The Work is all labor, materials, tools, equipment, construction, and services required by the Contract Documents (the “Work”).

3. **Contract Documents.** Contract Documents consist of:

- a. This Agreement;
- b. Supplementary Conditions for Small Project Agreement Between Owner and Contractor (U.S.);
- c. The Specifications (Division 01 and Divisions _____);
- d. Drawings entitled and dated _____;
- e. Addendum No. with date(s) _____;
- f. All written Field Changes, written Construction Change Directives and written Change Orders when prepared and signed by Owner and Contractor.

4. **Compensation.** Owner will pay Contractor for performance of Contractor’s obligations under the Contract Documents the sum of _____ Dollars (\$_____) (the “Contract Sum”). This Contract Sum includes all labor, materials, equipment, tools, costs, expenses, work and services of Contractor and its subcontractors necessary to perform the Work in accordance with the terms of this Agreement, including without limitation travel, communications, and copying costs.

5. **Payment.**

- a. If the Contract Sum is over \$100,000 or if otherwise requested by Owner, Contractor will submit to Owner a schedule of values which allocates the Contractor’s Bid Proposal Amount to various portions of the Work. This schedule, when accepted by Owner will be used as a basis for reviewing Contractor’s payment requests.
- b. Not more than once each month, Contractor will submit a payment request to Owner. Owner will pay Contractor for work completed within thirty (30) days after Owner receives:
 - 1) Contractor’s payment request for work to date;
 - 2) a certification by Contractor that Contractor has paid for all labor, materials, and equipment relating to the Work covered by prior payment requests and that Contractor will pay for all labor, materials, and equipment relating to the Work covered by the current payment request; and
 - 3) releases of all mechanics’ liens and claims of subcontractors, laborers, or material suppliers who supplied labor and/or materials for the Work covered by the payment request.
 - 4) updated Construction Schedule.
- c. Owner may modify or reject the payment request if, in Owner’s opinion, the Work for which payment is requested is not acceptable or is less complete than represented on the payment request.
- d. Contractor will timely pay subcontractors their portion of fees and expenses that Owner has paid to Contractor.

6. **Extras and Change Orders.** Owner may order changes in the Work by altering, adding to, or deducting from the Work. In the event of such a change, the Contract Sum and/or the time of completion will be adjusted to reflect the change by means of a written Change Order signed by Contractor and Owner. Contractor will not

commence work on any change until either: (a) Contractor and Owner have executed a Change Order; or (b) Owner has issued a written order for the change acknowledging that there is a dispute regarding the compensation adjustment relating to the change. If Contractor proceeds with a change in the Work without complying with the preceding sentence, Contractor agrees that it will not be entitled to any additional compensation for such change.

7. **Warranty and Correction of Work.** For all Work, services, labor, materials, products, and equipment provided under the Contract Documents, Contractor provides and extends to Owner all statutory, common law, and standard industry warranties as well as those warranties set forth in Owner's Contract Documents. Unless a longer period is specified by Owner's Contract Documents or otherwise, Contractor, at a minimum and in addition to all other warranties, warrants all Work under the Contract Documents for at least one year. Specifically, and without limitation, Contractor will promptly correct at its own expense:
 - a. any portion of the Work which
 - 1) fails to conform to the requirements of the Contract Documents, or
 - 2) is rejected by the Owner as defective or because it is damaged or rendered unsuitable during installation or resulting from failure to exercise proper protection.
 - b. any defects due to faulty materials, equipment, or workmanship which appear within a period of one year from the date of completion of the Work or within such longer period of time as may be prescribed by law or the terms of any applicable special warranty required by the Contract Documents.
8. **Time of Completion.** Contractor will complete the Work and have it ready for Owner's inspection within _____ (_____) calendar days from Notice to Proceed issued by Owner. Time is of the essence. If Contractor is delayed at any time in the progress of the Work by any act or neglect of Owner, or by changes in the Work, or by strikes, lockouts, unusual delay in transportation, unavoidable casualties, or acts of nature beyond Contractor's control, then the time for completion will be extended by the time that completion of the Work is delayed. However, Contractor expressly waives any damages for any such delays.
9. **Owner Provided Items.** Owner may provide furnishings, equipment, and/or other items for the Project. Contractor will install items furnished by Owner and/or receive, store, and protect such items on site until the date Owner accepts the Project.
10. **Product Requirements.** Contractor will provide products that comply with Contract Documents, are undamaged, and, unless otherwise indicated, are new and unused at time of installation. Contractor will provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for complete installation and for intended use and effect.
11. **Permits, Surveys, and Taxes.** Contractor will obtain and pay for all permits and licenses, and also pay any applicable taxes. Contractor will also obtain and pay for any surveys it needs to perform the Work.
12. **Independent Contractor Relationship.** Contractor is not an agent or employee of Owner but is an independent contractor.
13. **Comply with Laws.** Contractor will comply, and ensure that all subcontractors comply, with all applicable laws, ordinances, rules, regulations, covenants, and restrictions.
14. **Indemnity and Hold Harmless.**
 - a. Contractor will indemnify and hold harmless Owner and Owner's representatives, employees, agents, architects, and consultants from and against any and all claims, liens, 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 or failure to perform 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 workers compensation acts, disability benefit acts, or other employee benefit acts.

15. **Work Restrictions.** Contractor will ensure that Contractor, its agents, employees, and subcontractors:

- a. Do not use or consume alcohol or cannabis, or illegally use drugs, on the Project Site or enter on or perform any Work on the Project Site while under their influence.
- b. Do not smoke or vape anything on the Project Site. Do not use tobacco in any form on the Project Site.
- c. Do not perform Work on the Project Site on Sundays except for emergency work.
- d. Refrain from using profanity or being discourteous or uncivil to others on the Project Site or while performing Work under this Agreement.
- e. Do not view or allow pornographic or other indecent materials on the Project Site.
- f. Do not play obnoxious and/or loud music on the Project Site. Do not play any music within existing facilities.
- g. Refrain from wearing immodest, offensive, or obnoxious clothing, while on the Project Site.
- h. Do not bring weapons on the Project Site.

16. **Safety Hazards.** Contractor will ensure that no work or services will be performed that may pose an undue safety hazard to Contractor, Contractor's employees, or any other person.

17. **Contractor's Insurance.** Prior to performing any work, Contractor will obtain and maintain during the term of this Agreement the following insurance:

- a. Workers Compensation Insurance or evidence of exemption.
- b. 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.
- c. 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:
 - 1) Limits of the greater of: Contractor's actual coverage amounts or the following:
 - a) \$2,000,000 General Aggregate;
 - b) \$2,000,000 Products - Comp/Ops Aggregate;
 - c) \$1,000,000 Personal and Advertising Liability;
 - d) \$1,000,000 Each Occurrence; and
 - e) \$50,000 Fire Damage to Rented Premises (Each Occurrence)
 - 2) Endorsements attached to the General Liability policy including the following or their equivalent:
 - a) 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.
 - b) ISO Form CG 20 10 (07/04), Additional Insured – Owners, Lessees, Or Contractors (Form B),

naming Owner and Architect as additional insureds.

d. Automobile Liability Insurance, with:

- 1) Combined Single Limit each accident in the amount of no less than \$500,000; and
- 2) Coverage applying to "Any Auto" or its equivalent.

Contractor will provide evidence of these insurance coverages to Owner by providing an ACORD 25 (2010/05) Form or its equivalent: (1) listing Owner as the Certificate Holder and Additional Insured on the general liability and any excess liability policies, (2) 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 higher), (3) attaching the endorsements set forth above for the Certificate of Liability Insurance, and (4) 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.) Notwithstanding the foregoing, Owner may, in writing and at its sole discretion, modify these insurance requirements.

18. **Resolution of Disputes.** In the event there is any dispute arising under the Contract Documents which cannot be resolved by agreement between the parties, either party may submit the dispute with all documentation upon which it relies to Director of Architecture, Engineering, and Construction, 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. Pending final resolution of a dispute hereunder, Contractor will proceed diligently with the performance of its obligations pursuant to this Agreement.
19. **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 this 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 as well as all warranties relative to Work provided through the date of termination survive a termination hereunder.
20. **Termination by Owner for Cause.** Should Contractor fail to timely provide Owner with the certificates of insurance, 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 this 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, less any offsets. 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 as well as all warranties relative to Work provided through the date of termination survive a termination hereunder.

21. **Termination by Owner for Convenience.** Notwithstanding any other provision contained in the Contract Documents, Owner may, without cause and in its absolute discretion, terminate this 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 Owner and/or its 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 as well as all warranties relative to Work provided through the date of termination survive a termination hereunder.
22. **Enforcement.** In the event either party commences legal action to enforce or rescind any term of this Agreement, the prevailing party will be entitled to recover its attorney fees, costs and legal expenses, 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.
23. **Ownership of Materials, Products, and Intellectual Property Rights.** 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 and its subcontractors for products, services, and Work provided under this Agreement, such products, services, and Work of Contractor and its subcontractors constituting works made for hire. Neither Contractor nor its subcontractors will reuse any portion of such items provided by Owner or work products developed by Contractor or its subcontractors 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. Contractor shall obtain the written agreement of each of its subcontractors to the terms of this section prior to permitting the subcontractor to perform any services contemplated by this Agreement.
24. **Comply with Intellectual Property Rights of Others.** Contractor represents and warrants that no Work or services (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).
25. **Ownership and Use of Renderings and Photographs.** Renderings, photographs, and/or other images of or representing the services, Work, or any improvement on or relative to the Project Site, whether created before, during, or at completion of construction (and whether created by Owner, Contractor, or Contractor's subcontractors), are the property of the Owner. Contractor hereby transfers and assigns to Owner all ownership and intellectual property rights that Contractor and/or its subcontractors may have in and to all such renderings, photographs, and other images. The Owner reserves all rights including copyrights and other intellectual property rights to such renderings, photographs, and other images. No such renderings, photographs, or other images shall be used or distributed without written consent of the Owner.
26. **Public Statements.** Contractor will not make any statements or provide any information to the media about the Project or Work without the prior written consent of Owner. If Contractor receives any requests for information from media, Contractor will refer such requests to Owner.
27. **Confidentiality.** Contractor shall ensure that Contractor and its 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:

- a. The name or address of any affiliate, customer or contractor of Owner or any information concerning the transactions of any such person with Owner;
- b. Any contracts, agreements, business plans, budgets or other financial information, renderings, photographs, and materials provided by Owner, relating to the Work or any improvement on the Project Site to the extent such has not been made available to the public by the Owner;
- c. Any other information that is marked or noted as confidential at the time of its disclosure.

28. **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, or employees shall make any private commercial use of their relationship to Owner or the Project, including, without limitation:

- a. By referring to the Owner or 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 Work or 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 work, 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 Owner or Project.

Notwithstanding the foregoing, Contractor may include a reference to Owner or the Project 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 or the Project is included with at least several other similar references to projects of different owners and is given no more prominence than such other references.

29. **Entire Agreement.** This Agreement contains the entire and integrated agreement between the parties hereto and supersedes all prior negotiations, representations, or agreements, either written or oral, relating to the Project. This Agreement may be amended only by a writing signed by both parties. This Agreement will not be construed to create a contractual relationship of any kind between any persons or entities other than Owner and Contractor.

30. **Assignment.** Contractor will not assign any right or obligation hereunder without the prior written consent of the Owner, which consent may be granted or withheld in Owner's absolute discretion.

31. **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.

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

OWNER:

Corporation of the Presiding Bishop of
The Church of Jesus Christ of Latter-day Saints,
a Utah corporation sole.

CONTRACTOR:

(company)

Signature:

Signature:

Print Name:

Print Name:

Title:

Title:

Address:

Address:

Telephone No:

Telephone No:

Facsimile No:

Facsimile No:

Email:

Email:

Effective Date:

Fed. I.D. or SSN:

License No:

Reviewed By:

Date Signed:

SAMPLE

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SUPPLEMENTARY CONDITIONS

FOR SMALL PROJECT AGREEMENT BETWEEN OWNER AND CONTRACTOR (U.S.)

ITEM 1 - GENERAL

1. Conditions of the Small Project Agreement Between Owner and Contractor (U.S.) apply to each Division of the Specifications.
2. Provisions contained in Division 01 apply to all Divisions of the Specifications.

ITEM 2 - LIQUIDATED DAMAGES PAYABLE TO OWNER

This section may be included as a separate additional paragraph to the Small Project Agreement Between Owner and Contractor (U.S.), at Owner's discretion:

Delay in Completion of the Work. For each day after the expiration of the designated Time of Completion that Contractor has not completed the Work, Contractor will pay Owner the amount of Two Hundred dollars (\$200.00) per day as liquidated damages for Owner's loss of use 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, attorneys' 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.

ITEM 3 - STATE SPECIFIC SUPPLEMENTARY CONDITIONS

UTAH STATE SALES TAX:

Add the following to the Small Project Agreement Between Owner and Contractor (U.S.):

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 Small Project Agreement Between Owner and Contractor (U.S.):

- A. Contractor shall 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 Small Project Agreement Between Owner and Contractor (U.S.):

- A. Within five (5) calendar days of final completion of the Project and in compliance with Section 38-1a-507 Utah Code Annotated, Contractor shall file with the State Construction Registry,

and copy to Owner, a notice of completion which shall 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 STATE PROGRESS PAYMENTS AND FINAL PAYMENT:

Replace paragraph 5 of the Small Project Agreement Between Owner and Contractor (U.S.) with the following:

5. Payment

- a. If the Contractor's Bid Proposal Amount is over \$100,000, Contractor will submit to Owner a schedule of values which allocates the Contractor's Bid Proposal Amount to various portions of the Work. This schedule, when accepted by Owner, will be used as a basis for reviewing Contractor's payment requests.
- b. Progress Payments: Not more than once each month, Contractor will submit a payment request to Owner. Owner will pay Contractor progress payments for work completed within fifteen (15) days after Owner receives:
 1. Contractor's progress payment request for work to date;
 2. A certification by Contractor that Contractor has paid for all labor, materials, and equipment relating to the Work covered by prior payment requests and that Contractor will pay for all labor, materials, and equipment relating to the Work covered by the current payment request; and
 3. Conditional Waiver and Release Upon Progress Payment documents submitted by Contractor (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.
- c. Final Payment: Owner will make full and final payment of the Contract Sum due within thirty (30) days of the completion of all of the following requirements:
 1. Contractor has submitted its final payment request;
 2. Contractor has submitted a certification that Contractor has paid for all labor, materials, and equipment relating to the Work covered by prior payment requests and that Contractor will pay for all labor, materials, and equipment relating to the Work covered by the final payment request; and
 3. Contractor has submitted 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.

Acceptance of final payment by Contractor or any Subcontractor will constitute a waiver of claims by the payee except for those claims previously made to Owner in writing and identified by Contractor in its affidavit as still pending.

If the aggregate of previous payments made by Owner exceeds the amount due Contractor, Contractor will reimburse the difference to Owner.

- d. Owner may modify or reject any payment request if, in Owner's opinion, the Work for which payment is requested is not acceptable or is less complete than represented on the payment request.
- e. 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.

- f. Contractor will maintain a copy of each payment request at the Project site for review by the Subcontractors.
- g. No payment made, either in whole or in part, by Owner will be construed to be an acceptance of defective or improper materials or workmanship.

END OF DOCUMENT

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DIVISION 01**SECTION 01 0000****GENERAL REQUIREMENTS: R&I PROJECT**

- 01 1000 SUMMARY**
- 01 1200 MULTIPLE CONTRACT SUMMARY**
- 01 1400 WORK RESTRICTIONS**
- 01 3000 ADMINISTRATIVE REQUIREMENTS**
- 01 3100 PROJECT MANAGEMENT AND COORDINATION**
- 01 3300 SUBMITTAL PROCEDURES**
- 01 3500 SPECIAL PROCEDURES**
- 01 4000 QUALITY REQUIREMENTS**
- 01 4301 QUALITY ASSURANCE – QUALIFICATIONS**
- 01 4523 TESTING AND INSPECTING SERVICES**
- 01 5000 TEMPORARY FACILITIES AND CONTROLS**
- 01 6100 COMMON PRODUCT REQUIREMENTS**
- 01 6200 PRODUCT OPTIONS**
- 01 6400 OWNER-FURNISHED PRODUCTS**
- 01 6600 DELIVERY, STORAGE, AND HANDLING REQUIREMENTS**
- 01 7000 EXECUTION REQUIREMENTS**
- 01 7400 CLEANING AND WASTE MANAGEMENT**
- 01 7700 CLOSEOUT PROCEDURES**
- 01 7800 CLOSEOUT SUBMITTALS**

SECTION 01 1000 SUMMARY

- A. Work Covered By Contract Documents:
 - 1. Provisions contained in Division 01 apply to all other sections and divisions of Specifications. All instructions contained in Specifications are directed to Contractor. Unless specifically provided otherwise, all obligations set forth in Specifications are obligations of Contractor.
 - 2. Comply with applicable laws and regulations.
- B. Work By Owner:
 - 1. Owner will furnish and install some portions of the Work with its own forces. Complete the Work necessary to accommodate the Work to be performed by Owner before scheduled date for performance of such Work.
 - 2. Owner may provide furnishings and/or equipment for Project. Contractor will receive, store, and protect such items on site until the date Owner accepts Project.

SECTION 01 1200 MULTIPLE CONTRACT SUMMARY

- A. Separate Contracts:
 - 1. Contracts may be issued by Owner for performance of certain construction operations at Project site.
 - 2. 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:

SECTION 01 1400 WORK RESTRICTIONS

- A. Project Conditions:
 - 1. During construction period, Contractor will have use of premises for construction operations. Contractor will ensure that Contractor, its employees, subcontractors, and employees comply with following requirements:
 - a. Confine operations to areas within Contract limits shown on Drawings. Do not disturb portions of site beyond Contract limits.
 - b. Do not allow alcoholic beverages, illegal drugs, or persons under their influence on Project Site.
 - c. Do not allow use of tobacco in any form on Project Site.
 - d. Do not allow pornographic or other indecent materials on site.

- e. Do not allow work on Project Site on Sundays except for emergency work.
 - f. Refrain from using profanity or being discourteous or uncivil to others on Project Site or while performing The Work.
 - g. Wear shirts with sleeves, wear shoes, and refrain from wearing immodest, offensive, or obnoxious clothing, while on Project Site.
 - h. Do not allow playing of obnoxious and loud music on Project Site. Do not allow playing of any music within existing facilities.
 - i. Do not build fires on Project Site.
 - j. Do not allow weapons on Project Site, except those carried by law enforcement officers and/or other uniformed security personnel who have been retained by Owner or Contractor to provide security services.
2. Existing Facilities:
- a. If Owner will occupy existing building, reasonably accommodate use of existing facilities by Owner.

SECTION 01 3000 ADMINISTRATIVE REQUIREMENTS

A. Administrative Requirements:

1. Coordination:
 - a. Coordinate construction activities to ensure efficient and orderly installation of each part of the Work.
 - b. Coordinate construction operations that are dependent upon each other for proper installation, connection, and operation.
 - c. Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

SECTION 01 3100 PROJECT MANAGEMENT AND COORDINATION

A. Multiple Contract Coordination:

1. Contractor shall be responsible for coordination of Temporary Facilities and Controls, Construction Waste Management and Disposal services, and Final Cleaning for entire Project unless directed otherwise by Owner's Representative for those who perform work on Project from Notice to Proceed to date of Substantial Completion.

B. Project Meetings And Conferences:

1. Attend preconstruction conference and organizational meeting scheduled by Architect or Owner Representative 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, equipment deliveries, general inspection of tests, preparation of record documents and O&M manuals, project cleanup, security, shop drawings, samples, use of premises, work restrictions, and working hours.
2. Pre-Installation Conferences.
 - a. Attend pre-installation conferences specified in Contract Document.

SECTION 01 3300 SUBMITTAL PROCEDURES

A. Submittal Procedure:

1. Coordination: Coordination preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently before performance of related construction activities to avoid delay.
2. Process Time: Allow sufficient review time so installation will not be delayed by time required to process submittals.
3. Identification: Place permanent label or title block on each submittal for identification. Include name of entity that prepared each submittal on label or title block.
4. Transmittal: Package each submittal appropriately for transmittal and handling.

General:

- a. Transmit each submittal from Contractor to Architect using transmittal letter. Transmittal letter shall provide sufficient space for Architect review stamp and comments (5" wide x 3" high minimum space).

- b. All submittals shall 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.
- c. Submittals received from sources (both electronic and physical sources) other than Contractor or not marked with Contractor's approval will be returned without action.

Electronic Submittals:

- d. Preferred method of transmittal for most submittals previously in paper format is via email attachment to Architect in .pdf format.
- e. Maintain original size of .pdf files submitted from subcontractors (24"x36" drawings shall remain original size in electronic format, for example).
- f. Electronic submittals shall be submitted as a single file (.pdf) per submittal item / discipline.
- g. Do not submit multiple files, cut sheets, product information, etc.
- h. Contractor shall compile each submittal including transmittal letter as first page of each submittal.
- i. Contractor shall submit each submittal item / discipline in a separate email, not multiple submittals in a single email.
- j. Subject line of submittal email shall include project name and submittal title / category.

Physical Submittals:

- k. Submittals requiring hard copies or including physical product samples shall be delivered or shipped to Architect's office. Deliveries are accommodated from 8:30am to 4:30pm Monday through Friday on regular business days.
- l. Package each submittal appropriately for transmittal and handling. On transmittal, record relevant information and requests for data.

B. Action Submittals:

1. Product Data: Submit product data, as required by individual Sections of Specifications.
2. Shop Drawings: Submit shop drawings for review and designate (stamp) approval of shop drawings.
3. Samples: Samples used for comparison with actual component to be installed. Samples when accepted will be used for quality comparisons throughout course of construction.

C. Informational Submittals:

1. 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.
 - a. Return copies or PDF files marked with action taken and with corrections or modifications required.

D. Closeout Submittals:

1. Submittals that occur during project closeout.

SECTION 01 3500 SPECIAL PROCEDURES

A. Quality Assurance:

1. Hot Work Permit (Available from Owner's Representative):
 - a. Required for doing hot work involving open flames or producing heat or sparks such as:
 - 1) Brazing.
 - 2) Cutting.
 - 3) Grinding.
 - 4) Soldering.
 - 5) Thawing pipe.
 - 6) Torch applied roofing.
 - 7) Welding.

SECTION 01 4000 QUALITY REQUIREMENTS

A. Administrative Requirements:

1. Conflicting Requirements:
 - 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.
2. Minimum Quantity or Quality Levels:

- a. Quantity or quality level shown or specified shall be the minimum provided or performed. Actual installation may comply exactly with minimum quantity or quality specified, or it may exceed minimum within reasonable limits.
 3. Submit to Owner permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, and similar documents, correspondence, and records establishing compliance with standards and regulations bearing upon performance of the Work.
- B. Quality Assurance:
1. 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.
 2. Quality Assurance Services: 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. Owner or Owner's designated representative(s) will perform quality assurance to verify compliance with Contract Documents.
 3. Notify Owner immediately if asbestos-containing materials or other hazardous materials are encountered while performing the Work.
- C. Quality Control:
1. Quality Control Services:
 - a. Quality Control will be sole responsibility of Contractor.
 - 1) 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.
 - a) They do not include inspections, tests or related actions performed by Architect or Owner Representative, governing authorities or independent agencies hired by Owner or Architect.
 - b) Quality assurance performed by Owner will be used to validate Quality Control performed by Contractor.
 - 2) Where services are indicated as Contractor's responsibility, engage qualified Testing Agency to perform these quality control services:
 - a) Contractor will not employ same testing entity engaged by Owner, without Owner's written approval.
- D. Repair And Protection:
1. On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 2. Protect construction exposed by or for Quality Assurance and Quality Control activities.
 3. Repair and protection are Contractor's responsibility, regardless of assignment of responsibility for Quality Assurance and Quality Control Services.

SECTION 01 4301 QUALITY ASSURANCE - QUALIFICATIONS

- A. Qualifications: Qualifications in this Section establish minimum qualification levels required; individual Specification Sections specify additional requirements:
1. Fabricator / Supplier / Installer Qualifications:
 - a. 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:
 - 1) Where heading '*VMR (Value Managed Relationship) Suppliers / Installers*' is used to identify list of specified suppliers or installers, Owner has established relationships that extend beyond requirements of this Project. No other suppliers / installers will be acceptable. Follow specified procedures to preserve relationships between Owner and specified suppliers / installers and advantages that accrue to Owner from those relationships.
 - 2) Where heading '*Acceptable or Approved Suppliers / Installers / Fabricators*' is used to identify list of specified suppliers / installers / fabricators, use only one of listed suppliers / installers / fabricators. No others will be acceptable.
 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 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 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:
 - 1) 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 will be performed by entities who are recognized experts in those operations:
 - 1) Specialists will satisfy qualification requirements indicated and will be engaged for activities indicated.
 - 2) Requirement for special will 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.
 - b. Testing Laboratory:
 - 1) AASHTO Materials Reference Laboratory (AMRL) Accreditation Program.
 - 2) Cement and Concrete Reference Laboratory (CCRL).
 - 3) Nationally Recognized Testing Laboratory (NRTL): Nationally recognized testing laboratory according to 29 CFR 1910.7.
 - 4) 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.

SECTION 01 4523 TESTING AND INSPECTION SERVICES

- A. Submittals:
 1. Certificates: Testing Agency will submit certified written report of each inspection, test, or similar service.
 2. 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 to Owner's Representative and to each of following if involved on project: Architect, Consulting Engineers (Engineer of Record), General Contractor, Authorities Having Jurisdiction (if required).
 3. Testing Agency:
 - a. Qualifications of Testing Agency management, personnel, inspector and technicians designated to project.
 - b. Provide procedures for non-destructive testing, equipment calibration records, personnel training records, welding inspection, bolting inspection, shear connector stud inspection, and seismic connection inspections.
- B. Quality Assurance:
 1. 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.

2. Owner will employ independent Testing Agencies to perform certain specified testing, as Owner deems necessary.
 3. Certification:
 - a. 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.
 - b. 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.
 4. Written Practice for Quality Assurance:
 - a. 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.
 - b. Written practice will describe testing agency procedures for determining acceptability of structure in accordance with applicable codes, standards, and specifications.
 - c. Written practice will describe Testing Agency inspection procedures, including general inspection, material controls, visual welding inspection, and bolting inspection.
- C. Quality Control:
1. Quality Control will be sole responsibility of Contractor. Contractor will be responsible for testing, 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.
 2. Notify results of all Testing and Inspection performed by Contractor's independent Testing Agencies to Architect and/or Owner's Representative within 24 hours of test or inspection having been performed:
 - a. Testing and Inspection Reports will be distributed as follows:
 - 1) 1 copy to Owner's Representative.
 - 2) 1 copy to Architect.
 - 3) 1 copy to Consulting Engineer(s) (Engineer of Record).
 - 4) 1 copy to Authorities Having Jurisdiction (if required).
 3. Contractor's Responsibility:
 - a. Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform the Work in strict accordance with requirements of Contract Documents.
 - b. Tests and inspections that are not explicitly assigned to Owner are responsibility of Contractor.
 - c. 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:
 - 1) 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.
 - 2) Taking adequate quantities of representative samples of materials that require testing or helping Testing Agency in taking samples.
 - 3) Providing facilities for storage and curing of test samples, and delivery of samples to testing laboratories.
 - 4) Providing Testing Agency with preliminary design mix proposed for use for materials mixes that require control by Testing Agency.
 - d. For any requested inspection, Contractor will complete prior inspections to ensure that items are ready for inspection.
 - e. All Work is subject to testing and inspection and verification of correct operation.
 - f. Comply:
 - 1) 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.
 - 2) Comply with Contract Documents in making such repairs.
 - g. Data:
 - 1) Furnish records, drawings, certificates, and similar data as may be required by testing and inspection personnel to assure compliance with Contract Documents.
 - h. Defective Work (Non-Conforming Work): Non-conforming Work as covered in General Conditions applies, but is not limited to following requirements Protection:
 - 1) 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.
 - 2) Where testing personnel take cores or cut-outs to verify compliance, repair prior to acceptance.

- 3) Contractor will be responsible for any and all costs incurred resulting from inspection that was scheduled prematurely or retesting due to failed tests.
 - 4) Remove and replace any Work found defective or not complying with contract document requirements at no additional cost to Owner.
 - 5) 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.
- i. Protection:
 - 1) Protect construction exposed by or for quality assurance and quality control service activities, and protect repaired construction.
 - j. Scheduling: Contractor is responsible for scheduling times for inspections, tests, taking samples, and similar activities:
 - 1) Schedule testing and inspections in advance so as not to delay the Work and to eliminate any need to uncover the Work for testing or inspection.
 - 2) Notify Testing Agency and Architect or Owner as noted in Sections in Division 01 thru Division 50 prior to any time required for such services.
 - 3) Incorporate adequate time for performance of all inspections and correction of noted deficiencies.
 - 4) Schedule sequence of activities to accommodate required services with minimum of delay.
 - 5) Schedule sequence of activities to avoid necessity of removing and replacing construction to accommodate testing and inspections.
 - k. Test and Inspection Log:
 - 1) Provide system of tracking all field reports, describing items noted, and resolution of each item. Prepare record of tests and inspections. Include following requirements:
 - (a) Date test or inspection was conducted.
 - (b) Description of the Work tested or inspected.
 - (c) Date test or inspection results were transmitted to Architect or Owner Representative.
 - (d) Identification of Testing Agency or inspector conducting test or inspection.
 - 2) Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect's or Owner's reference during normal working hours.
- D. Tests And Inspections - General:
1. Testing specifically identified to be conducted by Owner, will be performed by an independent entity and will be arranged and paid for by Owner.
 2. Individual Sections in Division 01 through Division 50 indicate if Owner will provide testing and inspection of the Work of that Section.
 3. Owner may engage additional consultants for testing, air balancing, commissioning, or other special services:
 - a. 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.
 - b. Contractor must cooperate with persons and firms engaged in these activities.
 4. 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 50.
 5. Taking Specimens:
 - a. Only testing laboratory shall secure, handle, transport, or store any samples and specimens for testing.
 6. Scheduling Testing Agency:
 - a. Contractor will coordinate the Work and facilitate timeliness of such testing and inspecting services so as not to delay the Work.
 - b. Contractor will notify Testing Agency and Architect or Owner Representative to schedule tests and / or inspections.
- E. Testing Agency Services And Responsibility:
1. Testing Agency, including independent testing laboratories, will be licensed and authorized to operate in jurisdiction in which Project is located:
 - a. Approved Testing Agency Qualifications: Requirements of Section 01 4301 apply.
 2. Testing and Inspection Services:
 - a. Testing Agency will not release, revoke, alter, or increase Contract Document requirements or approve or accept any portion of the Work.
 - b. Testing Agency will not give direction or instruction to Contractor.

- c. 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.
 - d. Testing Agency will not provide additional testing and inspection services beyond scope of the Work without prior approval of Owner's Representative and/or Architect.
3. Testing Agency Duties:
- a. Independent Testing Agency engaged to perform inspections, sampling, and testing of materials and construction specified in individual specification Sections will cooperate with Architect or Owner Representative and Contractor in performance of its duties and will provide qualified personnel to perform required inspections and tests.
 - b. Testing Agency will test or obtain certificates of tests of materials and methods of construction, as described herein or elsewhere in technical specification.
 - c. Testing Agency will provide management, personnel, equipment, and services necessary to perform testing functions as outlined in this section.
 - d. 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.
 - e. 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.
 - f. 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.
 - g. Welding Procedure Review: Testing Agency will provide review and approval or rejection of all welding procedures to be used and verify compliance with all reference standard requirements.
4. Testing and Inspection Reports:
- a. Conduct and interpret tests and inspections and state in each report whether tested and inspected Work complies with or deviates from requirements.
 - b. Laboratory Reports: Testing Agency will furnish reports of materials and construction as required, including:
 - 1) Description of method of test.
 - 2) Identification of sample and portion of the Work tested:
 - (a) Description of location in the Work of sample.
 - (b) Time and date when sample was obtained.
 - (c) Weather and climatic conditions at time when sample was obtained.
 - 3) Evaluation of results of tests including recommendations for action.
 - c. Inspection Reports:
 - 1) Testing Agency will furnish "Inspection at Site" reports for each site visit documenting activities, observations, and inspections.
 - 2) 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.
 - d. Reporting Testing and Inspection (Conforming Work):
 - 1) Submit testing and inspection reports as required within twenty four (24) hours of test or inspection having been performed.
 - e. Reporting Testing and Inspection Defective Work (Non-Conforming Work):
 - 1) 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:
 - (a) 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).
 - (b) Submit written inspection report and test results as required within twenty four (24) hours of test or inspection having been performed.
 - f. Final Report:
 - 1) Submit final report of tests and inspections at Substantial Completion, which identify unresolved deficiencies.
- F. Architect's Responsibility:
1. Architect Duties:
 - a. Notify Owner's Representative before each test and/or inspection:
- G. Field Quality Control:
1. Field Tests And Inspections:

- a. Field Test and Inspection requirements are described in detail in 'Field Quality Control' in Part 3 Execution' of individual Sections in Division 01 thru Division 49.

SECTION 01 5000 TEMPORARY FACILITIES AND CONTROLS

A. Administrative Requirements:

1. Contractor is responsible for security of materials, tools, and equipment. Do not permit others to use building keys provided by Owner. Safeguard building and contents while the Work is being performed and secure building when the Work is finished for day.
2. 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:
 - a. Avoid use of tools and equipment that produce harmful noise.
 - b. Restrict use of noisemaking tools and equipment to hours that will minimize complaints from persons or firms near site.
 - c. Protect the Work, materials, apparatus, and fixtures from injury due to weather, theft, and vandalism.
3. Existing restroom facilities may be used by Contractor. Clean restrooms and portions of existing building used in accessing restrooms daily. If existing facilities are not usable, provide and maintain temporary sanitary toilet.

B. Temporary Barriers And Enclosures:

1. Protect existing trees and plants. Remove and replace vegetation that dies or is damaged beyond repair due to construction activities.
2. Erect adequate barricades, warning signs, and lights necessary to protect persons from injury or harm.
3. Provide temporary enclosures at exterior building openings for security and protection from weather, theft, and vandalism. Erect and maintain dust-proof partitions and enclosures as required to prevent spread of dust and fumes to occupied portions of building.
4. 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:
 - a. 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.
 - b. 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').
 - c. 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.
 - d. 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.
 - e. 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.

C. Utilities:

1. Electrical Power: Owner will provide electric power for construction activities within limits available at existing facility.
2. Fire Protection: Exercise caution to avoid fire damage: Do not build fires on site.
3. Heating, Cooling, And Ventilation:
 - a. Permanent mechanical system may be operated upon following conditions:
 - 1) Do not interfere with normal set-back temperature patterns except as approved by Project Manager.
 - 2) Do not operate system when the Work causing airborne dust is occurring or when dust caused by such Work is present without first installing temporary filtering system.
4. Lighting: Existing lighting system may be used by Contractor.
5. Water Service: Contractor will use existing water supply for construction purposes to extent of existing facilities.

SECTION 01 6100 COMMON PRODUCT REQUIREMENTS

A. Administrative Requirements:

1. Provide products that comply with Contract Documents, are undamaged, and, unless otherwise indicated, are 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.

SECTION 01 6200 PRODUCT OPTIONS

A. Product selection is governed by Contract Documents and governing regulations, not by previous Project experience. Procedures governing product selection include:

1. Substitutions And Equal Products:
 - a. Generally speaking, substitutions for specified products and systems, as defined in Uniform Commercial Code, are not acceptable. However, equal products may be approved upon compliance with Contract Document requirements.
 - b. Approved Products / Manufacturers / Suppliers / Installers:
 - 1) Category One:
 - (a) Owner has established 'Value Managed Relationships' that extend beyond requirements of this Project. No substitutions or equal products will be allowed on this Project.
 - (b) 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 National Contracts that contain provisions extending beyond requirements of this Project. No substitutions or equal products will be allowed on this Project.
 - (b) 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) Specified products are provided to Church Projects under a National Account Program. Use these products to preserve advantages that accrue to Owner from those programs. No substitutions or equal products will be allowed on this Project.
 - 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 convenience to Contractor as 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 or Owner Representative by Addendum.
 - 2) Type Two: Use specified products / manufacturers unless approval to use other products and manufacturers has been obtained from Architect or Owner Representative 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 will conform to Contract Document requirements.

SECTION 01 6400 OWNER-FURNISHED PRODUCTS

A. Administrative Requirements:

1. Install items furnished by Owner or receive and store in safe condition items purchased directly by Owner according to requirements of Contract Documents.

SECTION 01 6600 DELIVERY, STORAGE, AND HANDLING REQUIREMENTS

- A. Administrative Requirements:
1. Deliver, store, and handle products according to manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft.
- B. Delivery, Storage, and Handling:
1. Delivery and Acceptable 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.
 - 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.
 2. 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 weather tight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

SECTION 01 7000 EXECUTION REQUIREMENTS

- A. Administrative Requirements:
1. Require installer of each major component to inspect both substrate and conditions under which the Work is to be done:
 - a. Notify Owner in writing of unsatisfactory conditions.
 - b. Do not proceed until unsatisfactory conditions have been corrected.
- B. Common Installation Provisions:
1. Provide attachment and connection devices and methods necessary for securing the Work:
 - a. Secure the Work true to line and level.
 - b. Allow for expansion and building movement.
 2. Recheck measurements and dimensions before starting each installation.
 3. Design, furnish, and install all shoring, bracing, and sheathing as required for safety and for proper execution of the Work and, unless otherwise required, remove same when the Work is completed.
 4. Where mounting heights are not shown, install individual components at standard mounting heights recognized within industry or local codes for that application. Refer questionable mounting height decisions to Owner for final decision.
- C. Protection:
1. Cover and protect furniture, equipment, and fixtures from soiling and damage when demolition the Work is performed in rooms and areas from which such items have not been removed.
- D. Completion Inspection:
1. Upon 100 percent completion of Project, Contractor will request Substantial Completion Inspection.
 2. Owner will conduct Substantial Completion Inspection in presence of Contractor and furnish list of items to be corrected.
 3. Contractor will notify Owner in writing when items have been corrected.

SECTION 01 7400 CLEANING AND WASTE MANAGEMENT

- A. Disposal Of Waste:

1. Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in landfill or incinerator acceptable to authorities having jurisdiction:
 - a. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
 - b. Remove and transport debris in manner that will prevent spillage on adjacent surfaces and areas.
 2. Burning: Do not burn waste materials.
 3. Disposal: Transport waste materials off Owner's property and legally dispose of them.
- B. Progress Cleaning:
1. Keep premises broom-clean during progress of the Work.
 2. 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.
 3. Clean and maintain completed construction as frequently as necessary throughout construction period.
 4. Remove waste materials and rubbish caused by employees, subcontractors, and contractors under separate contract with Owner and dispose of legally.
- C. Final Cleaning:
1. Clean each surface or unit to condition expected in normal, commercial-building cleaning and maintenance program. Comply with manufacturer's instructions. Remove all rubbish from under and about building and leave building clean and habitable.
 2. In addition to general cleaning noted above, perform cleaning for all trades at completion of the Work in areas where construction activities have occurred.
 3. If Contractor fails to clean up, Owner may do so and charge cost to Contractor.

SECTION 01 7700 CLOSEOUT PROCEDURES

- A. General:
1. 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.
 2. 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.
 3. Date of Substantial Completion shall not occur until completion of construction work, unless agreed to by Architect / Owner's Representative and included on Certificate of Substantial Completion.
- B. Preliminary Closeout Review:
1. When Architect, Owner and Contractor agree that project is ready for closeout, Pre-Substantial Inspection shall be scheduled. Preparation of floor substrate to receive carpeting and any work which could conceivably damage or stain carpet must be completed, as carpet installation will be scheduled immediately following this inspection.
 2. Prior to this inspection, completed test and evaluation reports for HVAC system and font, where one occurs, are to be provided to Project Manager, Architect, and applicable consultants.
 3. Architect, Owner and Contractor review completion of punch list items. When Owner and Architect confirm that Contractor has achieved Substantial Completion of The Work, Owner, Architect and Contractor will execute Certificate of Substantial Completion that contains:
 - a. Punch list of items requiring completion and correction will be created.
 - b. Time frame for completion of punch list items will be established, and date for Substantial Completion Inspection shall be set.
- C. Substantial Completion Inspection:
1. When Architect, Owner and Contractor agree that project is ready for Substantial Completion, an inspection is held. Punch list created at Pre-Substantial Inspection is to be substantially complete.
 2. Prior to this inspection, Contractor shall discontinue or change over and remove temporary facilities from the site, along with construction tools, mock-ups and similar elements.
 3. Architect, Owner and Contractor review completion of punch list items. When Owner and Architect confirm that Contractor has achieved Substantial Completion of The Work, Owner, Architect and Contractor will execute Certificate of Substantial Completion that contains:
 - a. Date of Substantial Completion.

- b. Punch List Work not yet completed, including seasonal and long lead items.
 - c. Amount to be withheld for completion of Punch List Work.
 - d. Time period for completion of Punch List Work.
 - e. Amount of liquidated damages set forth in Supplementary Conditions to be assessed if Contractor fails to complete Punch List Work within time set forth in Certificate.
4. Contractor shall present Closeout Submittals to Architect and place tools, spare parts, extra stock, and similar items required by Contract Documents in locations as directed by Facilities Manager.
- D. Final Acceptance Meeting:
1. When punch list items except for any seasonal items or long lead items which will not prohibit occupancy are completed, Final Acceptance Meeting is held.
 2. Owner, Architect and Contractor execute Owner's Project Closeout - Final Acceptance form, and verify:
 - a. All seasonal and long lead items not prohibiting occupancy, if any, are identified, with committed to completion date and amount to be withheld until completion.
 - b. Owner's maintenance personnel have been instructed on all system operation and maintenance as required by the Contract Documents.
 - c. Final cleaning requirements have been completed.
 3. If applicable, once any seasonal and long lead items are completed, Closeout Inspection is held where Owner and Architect verify that The Work has been satisfactorily completed, and Owner, Architect and Contractor execute Closeout portion of the Project Closeout - Final Acceptance form.
 4. When Owner and Architect confirm that The Work is satisfactorily completed, Architect will authorize final payment.

SECTION 01 7800 CLOSEOUT SUBMITTALS

- A. Administrative Requirements:
1. Project Record Documents:
 - a. Do not use record documents for construction purposes:
 - 1) Protect from deterioration and loss in secure, fire-resistive location.
 - 2) Provide access to record documents for reference during normal Working hours.
 - b. Maintain clean, undamaged set of Drawings. Mark set to show actual installation where installation varies from the Work as originally shown. Give particular attention to concealed elements that would be difficult to measure and record at later date:
 - 1) Mark record sets with red erasable pencil. Use other colors to distinguish between variations in separate categories of the Work.
 - 2) Mark new information that is important to Owner, but was not shown on Contract Drawings.
 - 3) Note related Change Order numbers where applicable.
 2. As Built Record Drawings:
 - a. Provide two full-size sets of prints and PDF file of As Built Record Drawings to Facilities Management Office, printed from the updated AutoCAD drawing files or updated Revit model files, as specified by Owner, that have been modified to show actual dimensions and location of equipment, material, utility lines, and other work as actually constructed, based upon information provided by Contractor. Architect will submit updated As Built Record Drawings in PDF (ISO32000 format) to Owner. In addition, Architect will submit to Owner updated AutoCAD as built record drawing files with associated plot style tables or the Revit as built record model files, as specified by Owner.
- B. Operations And Maintenance Manual:
1. General:
 - a. Include closeout submittal documentation as required by Contract Documentation. Include only closeout submittals as defined in individual specification section.
 - b. Submittal Format: Digital copies unless otherwise noted, required for each individual specification section that include 'Closeout Submittals'.
 2. Project Manual:
 - c. 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: (digital format only).
 4. Operations and Maintenance Data (digital format only):
 - a. Operations and maintenance submittals includes cleaning instructions, maintenance instructions, operations instructions, equipment list, and parts lists.
 5. Warranty Documentation: Digital format of final, executed warranties.
 6. Record Documentation:
 - a. Documentation includes Certifications, color and pattern selections, Design Date, Geotechnical Evaluation Reports (soils reports), Manufacture Reports, Literature or cut sheets, Shop Drawings, Source Quality Control, Special Procedures, and Testing and Inspection Reports.
 7. Software: Audio and Video System software, programming and set-files.
 8. Irrigation Plan: Laminated and un-laminated reduced sized hard copies.
 9. Landscape Management Plan (LMP):
 - a. Irrigation Section:
 - (1) Documentation required by Sections under 32 8000 Heading: Irrigation.
 - b. Landscaping Section:
 - (1) Documentation required by Sections under 32 8000 Heading: Irrigation.
- C. Warranties:
1. 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.
 2. Delivery of guarantees and warranties will not relieve Contractor from obligations assumed under other provisions of Contract Documents.

END OF SECTION

DIVISION 04: MASONRY

04 0500 COMMON WORK RESULTS FOR MASONRY

- 04 0513 CEMENT AND LIME MASONRY MORTARING: STRUCTURAL MASONRY
- 04 0516 MASONRY GROUTING: STRUCTURAL MASONRY
- 04 0519 MASONRY ANCHORS AND INSERTS
- 04 0520 MASONRY REINFORCING

04 2000 UNIT MASONRY

- 04 2223 ARCHITECTURAL CONCRETE UNIT MASONRY: STRUCTURAL MASONRY

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SECTION 04 0513**CEMENT AND LIME MASONRY MORTARING: Structural Masonry****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Quality of masonry mortar used on Project.
- B. Related Requirements:
 - 1. Section 01 1200: 'Multiple Contract Summary' for Owner Furnished Testing and Inspecting Services.
 - 2. Section 01 3100: 'Project Management and Coordination' for pre-installation conference.
 - 3. Section 01 4000: 'Quality Requirements' for administrative and procedural requirements for quality assurance and quality control.
 - 4. Section 01 4301: 'Quality Assurance – Qualifications' establishes minimum qualification levels required.
 - 5. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
 - 6. Section 01 7800: 'Closeout Submittals'.
 - 7. Sections Under 04 2000 Heading: Furnish and install mortar.

1.2 REFERENCES

- A. Definitions:
 - 1. Mortar: Plastic mixture of cementitious materials, fine aggregate and water. See ASTM C270.
- B. Reference Standards:
 - 1. ASTM International:
 - a. ASTM C144-11, 'Standard Specification for Aggregate for Masonry Mortar'.
 - b. ASTM C150/C150M-16, 'Standard Specification for Portland Cement'.
 - c. ASTM C207-06(2011), 'Standard Specification for Hydrated Lime for Masonry Purposes'.
 - d. ASTM C270-14a, 'Standard Specification for Mortar for Unit Masonry'.
 - 2. International Building Code (IBC) (2015 or latest approved edition):
 - a. 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'.
 - b. Chapter 21, 'Masonry' for materials, design, construction and quality of masonry.
 - 3. Masonry Standards Joint Committee (MSJC) - The Masonry Society (TMS) / American Concrete Institute (ACI) / American Society of Civil Engineers (SEI/ASCE):
 - a. TMS 402-08/ACI 530-08/ASCE 5-08, 'Building Code Requirements and Specification for Masonry Structures and Commentary'.
 - b. TMS 602-08/ACI 530.1-08/ASCE 6-08, 'Specification for Masonry Structures and Commentary'.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference: In addition to agenda items specified in Section 01 3100, review following:
 - 1. Coordinate pre-installation conference in conjunction with all other Division 04 Specifications in this Project that require pre-installation conferences.

2. Review Section 01 4523 for Testing and Inspection administrative requirements and responsibilities and Field Quality Control tests and inspections required of this section.
 - a. Review requirements and frequency of testing and inspections.

B. Scheduling:

1. Notify Testing Agency and Architect twenty four (24) hours minimum before placing mortar.

1.4 SUBMITTALS

A. Informational Submittals:

1. Source Quality Control Submittals:

- a. If pre-mixed wet mortar or pre-blended dry mortar mix are to be used, provide certification from Manufacturer or Supplier verifying that mixes meet specification requirements.
- b. If site mixed / blended mortar is to be used, provide written description of proposed method of measuring and mixing of materials.

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 Inspecting Reports of mortar.

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 mortar:
 - a. Owner will employ testing agencies to perform testing and inspection for mortar 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

2.1 SYSTEM

A. Performance:

1. Minimum Compressive Strength at 28 Days:
 - a. Type S: 1800 psi (12.4 MPa).

B. Materials:

1. Portland Cement:
 - a. Meet requirements of ASTM C150/C150M, Type II Low Alkali unless approved otherwise in writing by Architect.
2. Hydrated Lime:
 - a. Meet requirements of ASTM C207, Type S.
3. Aggregate:
 - a. Standard Mortar:
 - 1) Natural or manufactured sand meeting requirements of ASTM C144 and following:
 - a) Fineness modulus: 1.6 to 2.5 percent.
 - b) Water demand, ratio by weight: 0.65 percent maximum.
 - c) Grading:

Sieve	Sieve	Percent Passing	
		Natural Sand	Manufactured Sand
No. 4	4.750 mm	100	100
No. 8	2.360 mm	95 to 100	95 to 100
No. 16	1.191 mm	70 to 100	70 to 100
No. 30	0.594 mm	40 to 75	40 to 75
No. 50	0.297 mm	10 to 35	20 to 40
No. 100	0.150 mm	2 to 15	10 to 25
No. 200	0.075 mm	none	0 to 10

- 4. Water:
 - a. Clean and free of acids, alkalis, and organic materials.
- 5. Admixtures:
 - a. Use no admixtures, except for color pigments specified below, 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.
- C. Mixes:
 - 1. General:
 - a. Heat water and sand to 140 deg F (60 deg C) maximum if temperature is below 40 deg F (4.4 deg C).
 - 2. Unit Masonry Mortar: Type 'N':
 - a. Parts by Volume:

Portland Cement	1
Hydrated Lime	1/2
Damp Loose Sand:	2-1/4 minimum to three maximum, times sum of volumes of cement and lime used. Maintain sand piles in damp, loose condition.
 - 3. Unit Masonry Mortar: Type 'S':
 - a. Parts by Weight:

Portland Cement	94 lbs	43 kg
Hydrated Lime	20 lbs	9 kg
Dry Sand	360 lbs min. to 480 lbs max.	163 kg min. to 218 kg max.

PART 3 - EXECUTION

3.1 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. Masonry (Mortar):
 - a. Testing Agency shall check reinforcing steel placement prior to grouting; quality of block placement and appearance; mortar work; and shall monitor all grouting operations in accordance to Level 2 requirements of International Building Code (IBC).
 - b. Inspections shall include placement of mortar. Required verification and inspection Level 1 of masonry construction as referenced in IBC Section 17 'Special Inspections And Tests' and in accordance with TMS 402/ACI 530.1/ASCE 5 and TMS 602/ACI 530.1/ASCE 6. Periodic and continuous inspections include:

- 1) Compliance with required inspection provisions of construction documents and approved submittals (periodic).
 - 2) Verification of f_m and f_{AAC} prior to construction and for every 5,000 sq. ft. (465 sq. m), during construction (periodic).
 - 3) Verification of proportions of materials in premixed or preblended mortar as delivered to site (periodic).
 - 4) Following shall be verified to ensure compliance:
 - (a) Proportions of site-prepared mortar for bonded tendons (periodic).
 - (b) Placement of masonry units and construction of mortar joints (periodic).
 - (c) Placement of reinforcement, connectors and prestressing tendons and anchorages (periodic).
 - (d) Size and location of structural elements (periodic).
 - (e) Type, size and location of anchors, including other details of anchorage of masonry to structural members, frames or other construction (continuous).
 - (f) Specified size, grade and type of reinforcement, anchor bolts, prestressing tendons and anchorages (periodic).
 - (g) Welding of reinforcing bars (continuous).
 - (h) Preparation, construction and protection of masonry during cold weather (temperature below 40 deg F (4.4 deg C)) or hot weather (temperature above 90 deg F (32 deg C)) (periodic).
 - (i) Application and measurement of prestressing force (continuous).
 - 5) Preparation of any required mortar specimens shall be observed (continuous).
- c. During construction, masonry units and masonry mortar shall be tested for every 5,000 sq. ft. (465 sq. m), or portion thereof, of masonry constructed.
 - d. Inspection and test results will be reported in writing to Owner's Representative, Architect, Consulting Engineer and Contractor within twenty four (24) hours after inspection or test. Reports shall contain project identification number and date of service, location of service.
- B. Non-Conforming Work:
1. Remove and replace defective material at Architect's direction and at no additional cost to Owner.

END OF SECTION

SECTION 04 0516**MASONRY GROUTING: Structural Masonry****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Quality of masonry grout used on Project.
- B. Related Requirements:
 - 1. Section 01 1200: 'Multiple Contract Summary' for Owner Furnished Testing and Inspecting Services.
 - 2. Section 01 3100: 'Project Management and Coordination' for pre-installation conference.
 - 3. Section 01 4000: 'Quality Requirements' for administrative and procedural requirements for quality assurance and quality control.
 - 4. Section 01 4301: 'Quality Assurance – Qualifications' establishes minimum qualification levels required.
 - 5. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
 - 6. Section 01 7800: 'Closeout Submittals'.
 - 7. Sections under 04 2000 heading: Furnish and install masonry grout.

1.2 REFERENCES

- A. Reference Standards:
 - 1. ASTM International:
 - a. ASTM C94/C94M-16, 'Standard Specification for Ready-Mixed Concrete'.
 - b. ASTM C150/C150M-16, 'Standard Specification for Portland Cement'.
 - c. ASTM C207-06(2011), 'Standard Specification for Hydrated Lime for Masonry Purposes'.
 - d. ASTM C404-11, 'Standard Specification for Aggregates for Masonry Grout'.
 - e. ASTM C476-16, 'Standard Specification for Grout for Masonry'.
 - f. ASTM C1019-16, 'Standard Test Method for Sampling and Testing Grout'.
 - 2. International Building Code (IBC) (2015 or latest approved edition):
 - a. 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'.
 - b. Chapter 21, 'Masonry' for materials, design, construction and quality of masonry.
 - 3. Masonry Standards Joint Committee (MSJC) - The Masonry Society (TMS) / American Concrete Institute (ACI) / American Society of Civil Engineers (SEI/ASCE):
 - a. TMS 402-13/ACI 530-13/ASCE 5-13, 'Building Code Requirements and Specification for Masonry Structures and Commentary'.
 - b. TMS 602-13/ACI 530.1-13/ASCE 6-13, 'Specification for Masonry Structures and Commentary'.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference: In addition to agenda items specified in Section 01 3100, review following:
 - 1. Coordinate pre-installation conference in conjunction with all other Division 04 Specifications in this Project that require pre-installation conferences.

2. Review Section 01 4523 for Testing and Inspection administrative requirements and responsibilities and Field Quality Control tests and inspections required of this section.
 - a. Review requirements and frequency of testing and inspections.

B. Scheduling:

1. Notify Testing Agency and Architect twenty four (24) hours minimum before placing grout.

1.4 SUBMITTALS

A. Informational Submittals:

1. Source Quality Control Submittals:
 - a. If pre-blended dry grout is to be used, provide certification from Manufacturer or Supplier verifying that mixes meet specification requirements.
 - b. If grout is to be mixed in field, provide written description of proposed procedure for measuring and mixing of materials.

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 Inspecting Reports of grout.

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 grout:
 - a. Owner will employ testing agencies to perform testing and inspection for grout 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

2.1 SYSTEM

A. Performance

1. Minimum Compressive Strength for laboratory cured specimens at 28 Days:
 - a. 2000 psi (13.8 MPa).

B. Materials:

1. Portland Cement:
 - a. Meet requirements of ASTM C150/C150M.
 - b. Use Type II Low Alkali in exterior walls and in walls subject to moisture, unless approved otherwise in writing by Architect.
2. Hydrated Lime:
 - a. Meet requirements of ASTM C207, Type S.
3. Aggregate:
 - a. Meet requirements of ASTM C404, Table 1.
 - 1) Grading Requirements for Fine Aggregate, Natural, Size 2.

Sieve	Sieve	Percent Passing
No. 4	4.750 mm	100
No. 8	2 360 mm	95 - 100
No. 16	1 191 mm	60 - 100
No. 30	0.595 mm	35 - 70
No. 50	0.297 mm	15 - 35
No. 100	0.150 mm	2 - 15

2) Grading Requirements for Coarse Aggregate, Size 8.

Sieve	Sieve	Percent Passing
1/2 Inch	12 7 mm	100
3/8 Inch	9.5 mm	85 - 100
No. 4	4.750 mm	10 - 30
No. 8	2 360 mm	0 - 10
No. 16	0.150 mm	0 - 5

4. Water:

- a. Clean and free of acids, alkalis, and organic materials.

5. Admixtures:

- a. No additives are allowed which will increase air entrainment. Other additives may be used as approved in writing by Architect before use.

C. Mixes:

1. Procedure:

- a. Use of pre-blended dry grout mix is allowed only with submission of certification that material specification requirements have been complied with.
- b. Use method of measuring and mixing materials that will ensure consistently proportioned grout batches throughout installation of masonry work. No measuring of materials by 'shovels full' is permitted for field mixed grout.
- c. Batch, mix, and deliver transit-mixed grout in accordance with requirements of ASTM C94/C94M.

2. Proportions by Volume:

- a. Water: Enough to give creamy pouring consistency, usually slump of between 8 and 10.

Material	Fine Grout		Coarse Grout	
Portland Cement	One cu ft	0.028 cu m	One cu ft	0.028 cu m
Hydrated Lime (optional)	1/10 cu ft	0.0028 cu m	1/10 cu ft	0.0028 cu m
Damp, Loose Sand	2-1/4 to 3 cu ft	0.063 to 0.084 cu m	2-1/4 to 3 cu ft	0.063 to 0.084 cu m
Pea Gravel	none	none	1 to 2 cu ft	0.028 to 0.056 cu m

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Use fine grout for cavities 2 inches (50 mm) and smaller in smallest dimension. Use coarse grout for cavities greater than 2 inches (50 mm) in smallest dimension.

3.2 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. Masonry (Grout):
 - a. Testing Agency shall check reinforcing steel placement prior to grouting; quality of block placement and appearance; and shall monitor all grouting operations in accordance to Level 2 requirements of International Building Code (IBC).
 - b. Testing Agency shall provide inspection of grout used in masonry bearing walls in accordance with ASTM C1019.
 - c. Inspections shall include placing grout. Required verification and inspection Level 1 of masonry construction as referenced in IBC Section 17 'Special Inspections And Tests' and in accordance with TMS 402/ACI 530.1/ASCE 5 and TMS 602/ACI 530.1/ASCE 6. Periodic and continuous inspections include:
 - 1) Compliance with required inspection provisions of construction documents and approved submittals (periodic).
 - 2) Verification of f_m and f_{AAC} prior to construction and for every 5,000 sq. ft. (465 sq. m), during construction (periodic).
 - 3) Verification of proportions of materials in premixed or preblended mortar and grout as delivered to site (periodic).
 - 4) Verification of slump flow and VSI as delivered to site for self-consolidating grout (continuous).
 - 5) Following shall be verified to ensure compliance:
 - (a) Proportions of site-prepared mortar, grout and prestressing grout for bonded tendons (periodic).
 - (b) Placement of reinforcement, connectors and prestressing tendons and anchorages (periodic).
 - (c) Grout space prior to grout (continuous).
 - (d) Placement of Grout: (continuous).
 - (e) Placement of prestressing grout (continuous).
 - (f) Size and location of structural elements (periodic).
 - (g) Type, size and location of anchors, including other details of anchorage of masonry to structural members, frames or other construction (continuous).
 - (h) Specified size, grade and type of reinforcement, anchor bolts, prestressing tendons and anchorages (periodic).
 - (i) Welding of reinforcing bars (continuous).
 - (j) Preparation, construction and protection of masonry during cold weather (temperature below 40 deg F (4.4 deg C)) or hot weather (temperature above 90 deg F (32 deg C)) (periodic).
 - (k) Application and measurement of prestressing force (continuous).
 - 6) Preparation of any required grout specimens and mortar specimens shall be observed (continuous).
 - d. During construction, masonry units and masonry grout shall be tested for every 5,000 sq. ft. (465 sq. m), or portion thereof, of masonry constructed.
 - e. Inspection and test results will be reported in writing to Owner's Representative, Architect, Consulting Engineer and Contractor within twenty four (24) hours after inspection or test. Reports shall contain project identification number and date of service, location of service.

B. Non-Conforming Work:

1. Remove and replace defective material at Architect's direction and at no additional cost to Owner.

END OF SECTION

SECTION 04 0519**MASONRY ANCHORS AND INSERTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
 - 1. Cast-in anchors for masonry.
 - 2. Adhesive anchors and inserts for masonry.
 - 3. Drilled-in mechanical anchors for masonry.
 - 4. Screw anchors for masonry.
 - 5. Masonry anchors and inserts not specified elsewhere.

- B. Related Requirements:
 - 1. Section 01 1200: 'Multiple Contract Summary' for Owner Furnished Testing and Inspecting Services.
 - 2. Section 01 3100: 'Project Management and Coordination' for pre-installation conference.
 - 3. Section 01 4000: 'Quality Requirements' for administrative and procedural requirements for quality assurance and quality control.
 - 4. Section 01 4301: 'Quality Assurance – Qualifications' for 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 7800: 'Closeout Submittals'.
 - 7.

1.2 REFERENCES

- A. Association Publications:
 - 1. International Code Council (IBC):
 - a. IBC Chapter 17, 'Structural Tests and Special Inspections'.

- B. Reference Standards:
 - 1. American Concrete Institute:
 - a. ACI 355.4-11, 'Qualification of Post-Installed Adhesive Anchors in Concrete and Commentary'.
 - b. ACI 548.12-12, 'Specification for Bonding Hardened Concrete and Steel to Hardened Concrete with an Epoxy Adhesive'.
 - 2. ASTM International:
 - a. ASTM A307-14, 'Standard Specification for Carbon Steel Bolts and Studs, 60000 psi Tensile Strength'.
 - b. ASTM A563-15, 'Standard Specification for Carbon and Alloy Steel Nuts'.
 - c. ASTM F1554-15, 'Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength'.
 - d. ASTM F3125/F3125-15a, 'Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions'.
 - 3. International Code Council (IBC) (2015 or latest edition available):
 - a. Chapter 17, 'Structural Tests and Special Inspections' .
 - b. Chapter 21, 'Masonry' for materials, design, construction and quality of masonry.
 - c. ES Acceptance Criteria: 'Concrete Anchor Compendium':
 - 1) AC01, 'Acceptance Criteria For Expansion Anchors in Masonry Elements' (Approved Nov 2015).

- 2) AC58, 'Acceptance Criteria For Adhesive Anchors in Concrete and Masonry Elements' (approved May 2012).
- 3) AC106, 'Acceptance Criteria For Predrilled Fasteners (Screw Anchors) in Masonry' (Approved May 2012).
- 4) AC193, 'Acceptance Criteria For Mechanical Anchors in Concrete Elements' (approved Oct 2015).
- 5) AC308 'Acceptance Criteria For Post-Installed Adhesive Anchors In Concrete Elements' (approved Jan 2016).
- d. ICC/ESR-1056, 'Titen HD Screw Anchors' (reissued 03/2016).
- e. ICC/ESR-1385, 'KWIK Bolt 3 Masonry Anchor' (reissued 02/2016).
- f. ICC/ESR-1396, 'Wedge-All Anchors' (reissued 03/2016).
- g. ICC/ESR-1772, 'SET Adhesive Anchor Systems' (reissued 01/2016).
- h. ICC/ESR-2682, 'Hilti HIT HY 70 Adhesive Anchoring Systems' (reissued 08/2016).
4. Masonry Standards Joint Committee (MSJC) - The Masonry Society (TMS) / American Concrete Institute (ACI) / American Society of Civil Engineers (SEI/ASCE):
 - a. TMS 402-11/ACI 530-11/ASCE 5-11, 'Building Code Requirements and Specification for Masonry Structures and Commentary'.
 - b. TMS 602-11/ACI 530.1-11/ASCE 6-11, 'Specification for Masonry Structures and Commentary'.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference: In addition to agenda items specified in Section 01 3100, review following:
 1. Coordinate pre-installation conference in conjunction with all other Division 04 Specifications in this Project that require pre-installation conferences.
 2. Review Section 01 4523 for Testing and Inspection administrative requirements and responsibilities and Field Quality Control tests and inspections required of this section.
 - a. Review frequency of testing and inspections.
- B. Scheduling:
 1. Inspection shall be performed according to Manufacturer's submitted ICC ES Evaluation Report.
 2. Notify Testing Agency and Architect one week before installing anchors so testing may be scheduled.

1.4 SUBMITTALS

- A. Action Submittals:
 1. Product Data:
 - a. Manufacturer's product literature for each item.
- B. Informational Submittals:
 1. Test And Evaluation Reports:
 - a. ICC ES Evaluation Report indicating conformance with current applicable ICC ES Acceptance Criteria.
 2. Manufacturer's Instructions:
 - a. Manufacturer's published installation recommendations for each item.
- C. Closeout Submittals:
 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Record Documentation:
 - 1) Testing and Inspection Reports:
 - a) Testing Agency Inspecting Reports of Drilled-In Mechanical Anchors / Adhesive Anchors / Screw Anchors.

1.5 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Manufacturer:
 - a. Having sufficient capacity to produce and deliver required materials with out causing delay in work.
 - 2. Installer:
 - a. Acceptable to Manufacturer, experienced in performing work of this section and has specialized in installation of work similar to that required for this project.
- 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 Drilled-In Mechanical Anchors / Adhesive Anchors / Screw Anchors:
 - a. Owner will employ testing agencies to perform testing and inspection for Drilled-In Mechanical Anchors / Adhesive Anchors / Screw Anchors 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.
- B. Storage And Handling Requirements:
 - 1. Store materials protected from exposure to harmful weather conditions and as directed by manufacturer.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Manufactured Units:
 - 1. General:
 - a. Use hot-dipped galvanized or stainless steel with matching nuts and washers in exterior and moist interior applications unless indicated otherwise on Drawings.
 - b. Nut: Conform to requirements of ASTM A563, Grade A, Hex.
 - c. Conform to requirements of ASTM F3125/F3125 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: Conform to requirements of ASTM A307, Grade A or ASTM F1554.
 - 3. Anchor Bolts:
 - a. J-Bolts:
 - 1) Non-headed type threaded **2 inches (50 mm)** minimum conforming to requirements of ASTM F1554, Grade A.
 - 2) Anchor hook to project **2 inches (50 mm)** minimum including bolt diameter.
 - b. Headed Bolts:
 - 1) Headed type threaded **2 inches (50 mm)** minimum conforming to requirements of ASTM F1554, Grade A.
 - 4. Adhesive Anchors:
 - a. Cartridge Injection Adhesive Anchors.

- b. Products shall have current ICC ES Evaluation report conforming to current ICC ES Acceptance Criteria ICC ES AC 58 for masonry.
- c. Rod diameter and embedment length as indicated on Drawings.
- d. Type Two Acceptable Products:
 - 1) HIT-HY 70 by Hilti Fastening Systems, Tulsa, OK; www.us.hilti.com.
 - 2) SET Epoxy by Simpson Strong-Tie Co., Pleasanton, CA www.simpsonanchors.com.
 - 3) Equal as approved by Architect before installation. See Section 01 6200.
5. Drilled-In Mechanical Anchors (Expansion Bolts):
 - a. Products shall have current ICC ES Evaluation report conforming to current ICC ES Acceptance Criteria ICC ES AC 01 for masonry.
 - b. Type Two Acceptable Products:
 - 1) Kwik Bolt 3 by Hilti Fastening Systems, Tulsa, OK www.us.hilti.com.
 - 2) Wedge-All by Simpson Strong-Tie Co., Pleasanton, CA www.simpsonanchors.com.
 - 3) Equal as approved by Architect before installation. See Section 01 6200.
6. Screw Anchors:
 - a. Provide anchors with length identification markings conforming to ICC ES AC 106 for masonry.
 - b. Type Two Acceptable Products:
 - 1) Titen HD by Simpson Strong Tie Co, Dublin, CA www.strongtie.com.
 - 2) Equals as approved by Architect through shop drawing submittal before installation. See Section 01 6200.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions:
 1. Embedded Items:
 - a. Identify position of reinforcing steel and other embedded items before drilling holes for anchors. Exercise care in coring or drilling to avoid damaging existing reinforcing or embedded items. Take precautions as necessary to avoid damaging pre-stressing tendons, electrical and telecommunications conduit, and gas lines.
 - b. Notify Engineer if reinforcing steel or other embedded items are encountered during drilling.
 2. Base Material Strength: Unless otherwise specified, do not drill holes in masonry until mortar, or grout has achieved full design strength.

3.2 PREPARATION

- A. Surface Preparation:
 1. Clean surfaces prior to installation.
 2. Prepare surface in accordance with Manufacturers written recommendations.

3.3 INSTALLATION

- A. Drilled-In Anchors:
 1. General:
 - a. Drill holes with rotary impact hammer drills using carbide-tipped bits or core drills using diamond core bits.
 - b. Unless otherwise shown on Drawings, drill holes perpendicular to masonry surface.
 - c. Where anchors are to be installed in cored holes, use core bits with matched tolerances specified by Manufacturer. Cores holes may only be used if acceptable to Manufacturer.
 - d. Perform anchor installation in accordance with Manufacturer's published instructions.
 2. Adhesive Anchors:

- a. Clean holes in accordance with Manufacturer's published instructions before installation of adhesive. Follow Manufacturer's recommendations to ensure proper mixing of adhesive components.
 - b. Inject adhesive into holes proceeding from bottom of hole and progressing toward surface so as to avoid introduction of air pockets into adhesive. Inject sufficient adhesive into hole to ensure that annular gap is filled to surface.
 - c. Remove excess adhesive from surface.
 - d. Shim anchors with suitable device to center anchor in hole. Do not disturb or load anchors before Manufacturer's specified cure time has elapsed.
 - e. Observe Manufacturer's recommendations with respect to installation temperatures for adhesive anchors. Base material temperatures must be maintained above minimum temperatures allowed by Manufacturer for full required epoxy cure time.
3. Drilled-in Mechanical Anchors (Expansion Bolts):
- a. Protect threads from damage during anchor installation.
 - b. Set anchors to manufacturer's recommended torque, using 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.
4. Screw Anchors:
- a. Protect threads from damage during anchor installation.
 - b. Set anchors to manufacturer's recommended torque, using torque wrench.

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. Drill-In Mechanical Anchors / Adhesive Anchors / Screw Anchors:
 - a. 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.
 - b. Testing: Twenty five (25) percent of each type and size of drilled-in anchor shall be proof loaded by Testing Agency's testing laboratory or as directed by Architect. Adhesive anchors will not be torque tested unless otherwise directed by Architect. If more than ten (10) percent of tested anchors fail to achieve specified torque or proof load within limits defined on Drawings, all anchors of same diameter and type as failed anchors shall be tested at Contractors expense, unless otherwise instructed by Architect.
 - 1) Torque will be applied with calibrated torque wrench.
 - 2) Proof loads will be applied with calibrated hydraulic ram. Displacement of adhesive anchors at proof load shall not exceed $D/10$, where D is nominal anchor diameter.

B. Non-Conforming Work:

1. Remove and replace misplaced or malfunctioning anchors.
2. Fill empty anchor holes and patch failed anchor locations with high-strength, non-shrink, non-metallic grout acceptable to Architect.
3. Anchors that fail to meet proof load or installation torque requirements will be regarded as malfunctioning.
4. Repair damage to adjacent materials caused by product installation.

3.5 CLEANING

- A. Waste Management:
 - 1. Disposal of rubbish, debris, and packaging materials.

3.6 PROTECTION

- A. General:
 - 1. Protect installed products from damage during construction.

END OF SECTION

SECTION 04 0520**MASONRY REINFORCING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
 - 1. Masonry horizontal joint reinforcing.
 - 2. Steel reinforcing bars.
- B. Related Requirements:
 - 1. Sections under 04 2000 heading: Installation.

1.2 REFERENCES

- A. Reference Standards:
 - 1. ASTM International:
 - a. ASTM A153/A153M-16, 'Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware'.
 - b. ASTM A615/A615M-16, 'Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement'.
 - c. ASTM A951/A951M-16, 'Standard Specification for Steel Wire for Masonry Joint Reinforcement'.
 - d. ASTM A1064/A1064M-16a, 'Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete'.
 - e. ASTM D1784-11, 'Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds'.
 - f. ASTM D2240-15, 'Standard Test Method for Rubber Property-Durometer Hardness'.
 - 2. Masonry Standards Joint Committee (MSJC) - The Masonry Society (TMS) / American Concrete Institute (ACI) / American Society of Civil Engineers (SEI/ASCE):
 - a. TMS 402-13/ACI 530-13/ASCE 5-13, 'Building Code Requirements and Specification for Masonry Structures and Commentary'.
 - b. TMS 602-13/ACI 530.1-13/ASCE 6-13, 'Specification for Masonry Structures and Commentary'.

1.3 SUBMITTALS

- A. Informational Submittals:
 - 1. Certificates:
 - a. Mill certificate.
 - 2. Fabricator Instructions:
 - a. Reinforcing bar placement drawings.
 - b. Product Data for Credit MR 5:
 - 1) For products and materials that comply with requirements for regionally manufactured and regionally extracted and manufactured materials.
 - 2) Include statement indicating cost for each regionally manufactured material.
 - 3) Include statement indicating location of manufacturer and distance to Project for each regionally manufactured material.
 - 4) Include statement indicating location of manufacturer and point of extraction, harvest, or recovery for each raw material used in regionally extracted and manufactured materials.
 - 5) Indicate distance to Project and fraction by weight of each regionally manufactured material that is regionally extracted.

1.4 DELIVERY, HANDLING, AND STORAGE

- A. Delivery And Acceptance Requirements:
 - 1. Steel reinforcing bars shall be free of heavy rust scales and flakes, and other bond-reducing coatings at time of delivery and placing.
 - 2. Separate steel reinforcing bars by size and tag with manufacturer's heat or test identification number.
 - 3. Tag continuous joint reinforcing with Manufacturer's name, wire size, and ASTM / CSA specification.
- B. Storage And Handling Requirements:
 - 1. Properly protect reinforcing on site after delivery.

PART 2 - PRODUCTS

2.1 SYSTEMS

- A. Materials:
 - 1. Design Criteria:
 - a. Steel reinforcing bars shall have grade identification marks and meet requirements of ASTM A615/A615M, Grade 60 minimum. All but No. 2 bars shall be deformed type.
 - b. Continuous Joint Reinforcing:
 - 1) 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.
 - 2) Size: **2 inches (50 mm)** less than nominal thickness of wall.
 - 3) Rod Size:
 - a) Side rods: **9 gauge (3.7 mm)**.
 - b) Cross rods: **9 gauge (3.7 mm)**.
 - 4) Corners And Tee Sections: Prefabricated of material and design similar to main reinforcement.
 - c. Single-Wythe Masonry:
 - 1) Seismic Design Category. All seismic zones except where preferred grouted re-bars and bond beams are used:
 - a) Design Criteria:
 - (1) Comply with Seismic Zone Conformance of IBC, TMS 402-11/ACI 530-11/ASCE 5-11, and ASTM A951/A951M.
 - (2) Cold-drawn steel conforming to ASTM A1064/A1064M.
 - (3) Finish: Hot-dipped galvanized as per ASTM A153/A153M (**1.5 oz/ft (42.5 grams/305 mm)**).
 - b) Class One Quality Standard:
 - (1) No. 120 Truss-Mesh by Hohmann & Barnard.
 - d. Acceptable Manufacturers:
 - 1) Heckman Building Products Inc, Chicago, IL www.heckmannbuildingprods.com.
 - 2) Hohmann & Barnard, Hauppauge, NY www.h-b.com.
 - 3) Masonry Reinforcing Corporation of America, Charlotte, NC www.wirebond.com.
 - 4) Equal system as approved by Architect before use. See Section 01 6200.
- B. Fabrication:
 - 1. Fabricate and bend steel reinforcing bars according to 'ACI Detailing Manual' (2004 edition or latest available) and details on Drawings.

2.2 ACCESSORIES

- A. Rebar Positioners:
 - 1. Design Criteria:

- a. Position rebar vertically in cell of CMU.
 - b. Cold-drawn steel conforming to ASTM A1064/A1064M.
 - c. Wire diameter: 9 gauge (1.48 inch or 3.7 mm).
 - d. Finish: Hot-dipped galvanized as per ASTM A153/A153M (1.5 oz/ft (42.5 grams/305 mm)).
2. Class One Quality Standards:
 - a. Single Curtain: No. RB Rebar Positioners by Hohmann & Barnard.
 - b. Double Curtain: No. RB-Twin Rebar Positioners by Hohmann & Barnard.
 3. Acceptable Manufacturers:
 - a. Heckman Building Products Inc, Chicago, IL www.heckmannbuildingprods.com.
 - b. Hohmann & Barnard, Hauppauge, NY www.h-b.com.
 - c. Masonry Reinforcing Corporation of America, Charlotte, NC www.wirebond.com.
 - d. Equal system as approved by Architect before use. See Section 01 6200.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Interface With Other Work:
 1. Coordinate with Division 03 for placement of dowels out of foundations for masonry reinforcing.

3.2 CLEANING

- A. Waste Management:
 1. Disposal of rubbish, debris, and packaging materials.

END OF SECTION

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SECTION 04 2223**ARCHITECTURAL CONCRETE UNIT MASONRY: Structural Masonry****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
1. Furnish and install architectural concrete unit masonry as described in Contract Documents.
 2. Furnish and install anchor bolts and embedded anchors as described in Contract Documents.
- B. Products Installed But Not Furnished Under This Section:
1. Anchor bolts.
 2. Elastomeric joint sealants.
 3. Foamed in place insulation.
 4. Grout.
 5. Metal lintels and miscellaneous structural steel.
 6. Mortar.
 7. Reinforcement bars.
- C. Related Requirements:
1. Section 01 1200: 'Multiple Contract Summary' for Owner Furnished Testing and Inspecting Services.
 2. Section 01 3100: 'Project Management and Coordination' for pre-installation conference.
 3. Section 01 4000: 'Quality Requirements' for administrative and procedural requirements for quality assurance and quality control.
 4. Section 01 4301: 'Quality Assurance – Qualifications' for minimum qualification levels required.
 5. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
 6. Section 03 2100: 'Reinforcement Bars'.
 7. Sections Under 04 0000 Heading: Masonry:
 - a. Pre-installation conference held jointly with other masonry related sections.
 8. Section 04 0513: 'Cement and Lime Masonry Mortaring' for quality of mortar.
 9. Section 04 0516: 'Masonry Grouting' for quality of grout.
 10. Section 04 0519: 'Masonry Anchors and Inserts' for anchor bolts used in masonry.
 11. Section 05 1223: 'Structural Steel For Buildings' for metal Lintels.
 12. Section 07 1900: 'Water Repellent' for sealing masonry after cleaning.
 13. Section 07 2119: 'Foamed-In-Place Insulation'.
 14. Section 07 9213: 'Elastomeric Joint Sealants'.

1.2 REFERENCES

- A. Association Publications:
1. American Concrete Institute:
 - a. ACI 530/530.1-13, 'Building Code Requirements and Specification for Masonry Structures and Related Commentaries'.
 2. The Brick Industry Association, Reston VA: 'Technical Notes on Brick Construction' (July 2012), www.gobrick.com.
 - a. Technical Notes on Brick Construction 1, 'Cold and Hot weather Construction' (June 2006).
 - b. Technical Notes on Brick Construction 3, 'Overview of Building Code Requirements for Masonry Structures (ACI 530-02/ASCE 5-02/TMS 402-02) and Specification for Masonry Structures (ACI 530.1-02/ASCE 6-02/TMS 602-02)'.
 - c. Technical Notes on Brick Construction 20, 'Cleaning Brickwork' (June 2006).
 - d. Technical Notes on Brick Construction 23, 'Stains - Identification and Prevention' (June 2006).

- e. Technical Notes on Brick Construction 23A, 'Efflorescence - Causes and Prevention' (June 2006).
- B. Definitions:
1. Efflorescence: Deposit or encrustation of soluble salts, generally white and most commonly consisting of calcium sulfate that may form on surface of stone, brick, concrete, or mortar when moisture moves through and evaporates on masonry. Often caused by free alkalis leached from mortar, grout, adjacent concrete, or in clays.
 2. Cold Weather, as referred to in this Section, is four (4) hours with ambient temperature below **40 deg F (4.4 deg C)** in 24-hour period.
 3. Grout: Mixture of cementitious material and aggregate to which sufficient water is added to produce placing consistency without segregation of constituents.
 4. Hot Weather, as referred to in this Section, is ambient air temperature above **100 deg F (38 deg C)** or ambient air temperature above **90 deg F (32 deg C)** with wind velocity **8 mph (13 kph)** or greater.
 5. Mortar: Plastic mixture of cementitious materials, fine aggregate and water. See ASTM C270 or ASTM C476.
- C. Reference Standards:
1. ASTM International:
 - a. ASTM C90-16, 'Standard Specification for Loadbearing Concrete Masonry Units'.
 - b. ASTM C150/C150M-16, 'Standard Specification for Portland Cement'.
 - c. ASTM C270-14a, 'Standard Specification for Mortar for Unit Masonry'.
 - d. ASTM C331/C331M-14, 'Standard Specification for Lightweight Aggregates for Concrete Masonry Units'.
 - e. ASTM C476-16, 'Standard Specification for Grout for Masonry'.
 - f. ASTM C1019-16, 'Standard Test Method for Sampling and Testing Grout'.
 2. International Building Code (IBC) (2015 or latest approved edition):
 - a. 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'.
 - b. Chapter 21, 'Masonry' for materials, design, construction and quality of masonry.
 3. Masonry Standards Joint Committee (MSJC) - The Masonry Society (TMS) / American Concrete Institute (ACI) / American Society of Civil Engineers (SEI/ASCE):
 - a. TMS 402-13/ACI 530-13/ASCE 5-13, 'Building Code Requirements and Specification for Masonry Structures and Commentary'.
 - b. TMS 602-13/ACI 530.1-13/ASCE 6-13, 'Specification for Masonry Structures and Commentary'.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference:
1. Participate in pre-installation conference held jointly with other Division 04 'Masonry' specifications in this Project that require pre-installation conferences.
 2. Schedule pre-installation conference during construction of mockup.
 3. In addition to agenda items specified in Section 01 3100, review following:
 - a. Review storage and handling requirements.
 - b. Review cold and hot weather procedure requirements.
 - c. Review protection requirements.
 - d. Review masonry cleaning requirements.
 - e. Review clean up requirements.
 - f. 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 placing masonry units, reinforcing or grout.

1.4 SUBMITTALS

- A. Informational Submittals:
 1. Certificates:
 - a. Prior to construction, certificates for materials used in masonry construction indicating compliance with contract documents are to be submitted. This is "Unit Strength Method" approach.
 2. Source Quality Control Submittals:
 - a. Manufacturer's certification that units meet compressive strength specified requirements.
- 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 Inspecting Reports of structural masonry.

1.5 QUALITY ASSURANCE

- A. Qualifications:
 1. Installer: Requirements of Section 01 4301 applies, but not limited to following:
 - a. Minimum of five (5) years experience on successfully completed projects of similar nature.
- 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 structural masonry:
 - a. Owner will employ testing agencies to perform testing and inspection for structural masonry 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, HANDLING, AND STORAGE

- A. Delivery And Acceptance Requirements:
 1. Check, carefully unload, and deliver material to site in such manner as to avoid soiling, damaging, or snipping.
 2. Do not use damaged masonry units, damaged components of structure, or damaged packaged 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. Do not use cementitious materials that have become contaminated.
 - b. 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.

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. Protect from damage until installation.
4. Masonry units:
 - a. Store material on planks clear of ground which may contain soluble salts and protect from damage, dirt, or disfigurement.
 - b. 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. Reinforcement:
 - a. Protect reinforcement, ties, and metal accessories from permanent distortions, elements and store off ground.

1.7 FIELD CONDITIONS

- A. Ambient Conditions:
 1. Cold Weather and Hot Weather Limitations:
 - a. Follow requirements of TMS 402/ACI 530/ASCE 5-11 and TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 SYSTEM

- A. Design Criteria:
 1. Minimum Compressive Strength of (2000 psi 13.8 MPa).
- B. Materials:
 1. Mortar: Type 'S' mortar as specified in Section 04 0513.
 2. Concrete Masonry Units:
 - a. Design Criteria:
 - 1) Meet requirements of ASTM C90, lightweight classification:
 - a) 85 lbs per cu ft (1 362 kg per cu meter) minimum weight classification.
 - b) Lightweight aggregates conforming to ASTM C331/C331M.
 - c) Do not use re-crushed masonry units as aggregate.
 - 2) Outside Corners: Square-edged, except where bull nose is indicated on Contract Drawings.
 - 3) Use special shapes for lintels, corners, jambs, sash, control joints, headers, bonding, etc, as required.
 - 4) Uniform color and textures with unbroken edges. Smooth face, except where shown otherwise on Contract Drawings.

2.2 ACCESSORIES

- A. Construction Cleaning Compounds:
 1. Type Two 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.
 - c. Equal as approved by Architect before use. See Section 01 6200.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification Of Conditions:
 - 1. Verify substrates have been properly prepared.
 - 2. Verify built-in items are in proper location, and ready for roughing into masonry.
 - 3. Notify Architect of any unsatisfactory preparation before proceeding.
 - a. Do not install masonry over unsuitable conditions.
 - b. Commencement of Work by installer is considered acceptance of substrate.

3.2 PREPARATION

- A. Coordinate placement of reinforcement, anchors and accessories, flashings and weep holes and other moisture control products specified in other sections.
- B. Provide temporary bracing during installation of masonry work. Maintain bracing in place until building structure provides permanent support.

3.3 INSTALLATION

- A. General:
 - 1. Place masonry, mortar and grout in accordance with TMS 602/ACI 530.1/ASCE 6.
 - 2. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
 - 3. Masonry cutting:
 - a. Make cuts proper size to accommodate work of other trades.
 - b. Cut openings for electrical devices using cover plates no larger than can be covered by standard size plate.
 - c. Replace unit masonry in which larger than necessary openings are cut.
 - d. Do not patch openings with mortar or other material.
 - 4. Step back unfinished work for joining with new work.
 - a. Use toothing only with Architect's approval.
 - 5. Built-In Work:
 - a. As work progresses, install masonry flashings and weep holes and other built-in work specified in other sections.
- B. Laying:
 - 1. Layout:
 - a. Running bond except where indicated otherwise.
 - 2. Joints:
 - a. Tool concave: Fill completely except where indicated differently.
 - b. Do not tool until mortar has taken initial set.
 - c. Point holes in joints. Fill and tool properly.
 - 3. Concrete Masonry Units:
 - a. Lay masonry units dry. Do not lay masonry on frozen material.
 - b. Align cells or cavities to preserve an unobstructed cavity for grouting.
 - c. Full bedding required on both webs and face shell under first course. Other courses need only face shell bedding except where bedding is needed to control flow of grout.
 - d. Do not allow excess mortar to block cells receiving grout.
 - e. Do not allow excess mortar to block cells receiving grout or foamed-in-place insulation.
- C. Reinforcing:
 - 1. Reinforcing shall be free of material that may destroy bond.
 - 2. Steel Reinforcing Bars:
 - a. Place steel as shown on Contract Drawings.

- b. Splice reinforcing steel as shown on Contract Drawings.
 - c. Place reinforcing and dowels before pouring grout.
 - d. Dowel vertical reinforcing bars out of structure below with bars of same size and spacing.
 - e. Place horizontal bars in **8 inch (200 mm)** deep bond beam units at top of wall and at **48 inches (1 200 mm)** on center between. Continue bond beam units and reinforcement uninterrupted around corners and across wall intersections.
 - f. Place special vertical bars of same size as normal vertical reinforcement at corners and jambs of openings and recesses where bond beams are interrupted and at beam bearing locations not otherwise detailed.
 - g. Unless detailed otherwise, place special horizontal bars of same size as normal reinforcing above and below openings. Extend bars **24 inches (600 mm)** minimum beyond opening.
3. Rebar Positioners:
- a. Before grouting, secure masonry reinforcing steel in place before grouting with rebar positioners at top of first course and bottom of top course minimum.
 - b. Install intermediary positioners for every 192 bar diameters maximum between positioners.
 - c. Locate intermediary positioners with approximately equidistant spacing in wall when number required has been determined.
- D. Grouting:
1. CMU Cells.
 - a. Place grout in **48 inch (1 200 mm)** maximum lifts.
 - b. Consolidate grout by means of mechanical vibrator. Do not use cell reinforcing to rod grout.
 - c. Before loss of plasticity, mechanically reconsolidate grout.
 2. Grout hollow metal door frames solid.
 3. Provide grout-leveling bed for support of wall plates.
- E. Foamed Insulation:
1. Install in ungrouted cells in exterior walls.
- F. Special Techniques:
1. General:
 - a. Comply with cold-weather and hot weather requirements contained in TMS 402/ACI 530/ASCE 5-11 and TMS 602/ACI 530.1/ASCE 6.
 - b. Ideal mortar temperature is **70 deg F ± 10 deg F (21 deg C ± 6 deg C)**. Mixing temperature should be maintained within **10 deg F (6 deg C)**.
 - c. Cold weather:
 - 1) Do not lay masonry in Cold Weather unless authorized by Architect.
 - 2) Minimum temperature of units when laid: **20 deg F (minus 7 deg C)**.
 - 3) The following options may be used in cold weather construction:
 - a) Change to higher type of mortar required in ASTM C270 (Example: If ASTM type N mortar is specified for normal temperature, change to type S or type M.).
 - b) Increase the protection time where required for twenty four (24) hour to forty eight (48) hour with no change being made in the type of mortar.
 - c) Without changing the mortar type and maintaining twenty four (24) hour protection, replace Type I portland cement in the mortar with type III, ASTM C150/C150M.
 - d) Do not use frozen materials or materials mixed or coated with ice or frost. Keep materials free of ice and snow. Do not lay masonry on frozen material. Remove and replace unit masonry damaged by frost or by freezing conditions.
 - e) Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is **40 deg F (4.4 deg C)** and higher and will remain so until masonry has dried, but not less than seven (7) days after completing cleaning.
 - d. Hot weather:
 - 1) During hot weather, shading masonry materials and equipment reduces mortar and grout temperatures. Scheduling construction to avoid hotter periods of day should be considered.
 - a) To improve flexural bond strength, sand piles should be kept cool and in damp, loose condition by sprinkling and by covering with plastic sheet to limit evaporation.
 2. Cold Weather Requirements. Implement approved cold weather procedures and comply with following:

- a. Preparation requirements. Comply with following requirements prior to conducting masonry work:
 - 1) Do not lay masonry units having either temperature below 20 deg F (minus 7 deg C) or containing frozen moisture, visible ice, or snow on their surface.
 - 2) Remove visible ice and snow from top surface of existing foundations and masonry to receive new construction. Heat these surfaces above freezing, using methods that do not result in damage.
- b. Construction requirements. These requirements apply to work in progress and are based on ambient air temperature. Do not heat water or aggregates used in mortar or grout above 140 deg F (60 deg C). Comply with following requirements when following ambient air temperatures exist:
 - 1) Air temperature 40 deg F (4.4 deg C) to 32 deg F (0 deg C):
 - a) Heat sand or mixing water to produce mortar temperatures between 40 deg F (4.4 deg C) and 120 deg F (49 deg C) at time of mixing. Grout does not require heated materials, unless temperature of materials is below 32 deg F (0 deg C):
 - 2) Air temperature below 32 deg F (0 deg C) to 25 deg F (minus 3.9 deg C):
 - a) Heat sand and mixing water to produce mortar temperatures between 40 deg F (4.4 deg C) and 120 deg F (49 deg C) at time of mixing.
 - b) Maintain mortar temperature above freezing until used in masonry. Heat grout aggregates and mixing water to produce grout temperature between 70 deg F (21.1 deg C) and 120 deg F (49 deg C) at time of mixing. Maintain grout temperature above 70 deg F (21.1 deg C) at time of grout placement. Heat masonry units to minimum temperature of 40 deg F (4.4 deg C) before installing thin-bed mortar.
 - 3) Air temperatures below 25 deg F (minus 3.9 deg C) to 20 deg F (minus 7 deg C). Comply with the following:
 - a) Heat sand and mixing water to produce mortar temperatures between 40 deg F (4.4 deg C) and 120 deg F (49 deg C) at time of mixing.
 - b) Maintain mortar temperature above freezing until used in masonry. Heat grout aggregates and mixing water to produce grout temperature between 70 deg F (21.1 deg C) and 120 deg F (49 deg C) at time of mixing. Maintain grout temperature above 70 deg F (21.1 deg C) at time of grout placement. Heat masonry units to minimum temperature of 40 deg F (4.4 deg C) before installing thin-bed mortar.
 - c) Heat masonry surfaces under construction to 40 deg F (4.4 deg C) and use windbreaks or enclosures when wind is in excess of 15 mph (24 kph). Heat masonry to minimum of 40 deg F (4.4 deg C) prior to grouting.
 - 4) Air temperature below 20 deg F (minus 7 deg C). Comply with the following:
 - a) Heat sand and mixing water to produce mortar temperatures between 40 deg F (4.4 deg C) and 120 deg F (49 deg C) at time of mixing.
 - b) Maintain mortar temperature above freezing until used in masonry. Heat grout aggregates and mixing water to produce grout temperature between 70 deg F (21.1 deg C) and 120 deg F (49 deg C) at time of mixing. Maintain grout temperature above 70 deg F (21.1 deg C) at time of grout placement. Heat masonry units to minimum temperature of 40 deg F (4.4 deg C) before installing thin-bed mortar.
 - c) Heat masonry surfaces under construction to 40 deg F (4.4 deg C) and use windbreaks or enclosures when wind is in excess of 15 mph (24 kph). Heat masonry to minimum of 40 deg F (4.4 deg C) prior to grouting.
 - d) Provide enclosures and auxiliary heat to maintain air temperature above 32 deg F (0 deg C) within enclosure.
- c. Protection: These requirements apply after masonry is place and are based on anticipated minimum daily temperature for grouted masonry and anticipated mean daily temperature for ungrouted masonry. Protect completed masonry in following manner:
 - 1) Maintain temperature of masonry units above 32 deg F (0 deg C) for first four (4) hours after thin-bed mortar application.
 - 2) Mean daily air temperature 40 deg F (4.4 deg C) to 25 deg F (minus 3.9 deg C):
 - a) Protect masonry from rain or snow for twenty four (24) hour by covering with weather-resistive membrane.

- 3) Mean daily air temperature below 25 deg F (minus 3.9 deg C) to 20 deg F (minus 7 deg C):
 - a) Completely cover masonry with insulating blankets or equal protection for twenty four (24) hours after completion of work. Extend time period to forty eight hours for grouted masonry, unless only cement in grout is Type III portland cement.
 - 4) Mean daily air temperature below 20 deg F (minus 7 deg C) and below:
 - a) Maintain newly constructed masonry temperature above 32 deg F (0 deg C) for at least twenty four (24) hours after being completed by using heated enclosures, electric heating blankets, infrared lamps, or other acceptable methods. Extend time period to forty eight (48) hours for grouted masonry, unless only cement in grout is Type III portland cement.
3. Hot Weather Requirements. Implement approved hot weather procedures and comply with following:
- a. Preparation. Comply with following requirements prior to conducting masonry work:
 - 1) When ambient air temperature exceeds 100 deg F (37.8 deg C), or exceeds 90 deg F (32.2 deg C) with wind velocity greater than 8 mph (12.9 kph):
 - a) Maintain sand piles in damp, loose condition.
 - b) Provide necessary conditions and equipment to produce mortar having a temperature below 120 deg F (49 deg C).
 - 2) When ambient temperature exceeds 115 deg F (46.1 deg C), or exceeds 105 deg F (40.6 deg C) with wind velocity greater than 8 mph (12.9 kph), implement following requirements:
 - a) Maintain sand piles in damp, loose condition.
 - b) Provide necessary conditions and equipment to produce mortar having a temperature below 120 deg F (49 deg C).
 - c) Shade materials and mixing equipment from direct sunlight.
 - b. Construction. While masonry work is in progress:
 - 1) When ambient air temperature exceeds 100 deg F (37.8 deg C), or exceeds 90 deg F (32.2 deg C) with wind velocity greater than 8 mph (12.9 kph):
 - a) Maintain temperature of mortar and grout below 120 deg F (49 deg C).
 - b) Flush mixer, mortar transport container, and mortar boards with cool water before they come into contact with mortar ingredients or mortar.
 - c) Maintain mortar consistency by retempering with cool water.
 - d) Use mortar with two (2) hours of initial mixing.
 - e) Spread thin-bed mortar no more than 4 feet (1.20 m) ahead of masonry units.
 - f) Set masonry units within one (1) minute after spreading thin-bed mortar.
 - 2) When ambient temperature exceeds 115 deg F (46.1 deg C), or exceeds 105 deg F (40.6 deg C) with a wind velocity greater than 8 mph (12.9 kph), implement following requirements:
 - a) Maintain temperature of mortar and grout below 120 deg F (49 deg C).
 - b) Flush mixer, mortar transport container, and mortar boards with cool water before they come into contact with mortar ingredients or mortar.
 - c) Maintain mortar consistency by retempering with cool water.
 - d) Use mortar with two (2) hours of initial mixing.
 - e) Spread thin-bed mortar no more than 4 feet (1.20 m) ahead of masonry units.
 - f) Set masonry units within one (1) minute after spreading thin-bed mortar.
 - g) Use cool mixing water for mortar and grout. Ice is permitted in mixing water prior to use. Do not permit ice in mixing water when added to other mortar or grout materials.
 - 3) Protection:
 - a) When ambient air temperature exceeds 100 deg F (37.8 deg C), or exceeds 90 deg F (32.2 deg C) with wind velocity greater than 8 mph (12.9 kph):
 - (1) Fog spray newly constructed masonry until damp, at least three (3) times a day until masonry is three (3) days old.
- G. Tolerances:
1. Masonry work shall be true to vertical and horizontal planes within 1/8 inch (3 mm) in 10 feet (3 meters), non-cumulative.
 2. Maintain 3/8 inch (9.5 mm) mortar joints throughout.

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. Masonry (Masonry Units, Reinforcement, Mortar and Grout):
 - a. Testing Agency shall check reinforcing steel placement prior to grouting; quality of block placement and appearance; mortar work; and shall monitor all grouting operations in accordance to Level 2 requirements of International Building Code (IBC).
 - b. Testing Agency shall provide inspection of grout used in masonry bearing walls in accordance with ASTM C1019.
 - c. Inspections shall include placing masonry units, reinforcing, mortar or grout. Required verification and inspection Level 1 of masonry construction as referenced in IBC Section 17 'Special Inspections And Tests' and in accordance with TMS 402/ACI 530.1/ASCE 5 and TMS 602/ACI 530.1/ASCE 6. Periodic and continuous inspections include:
 - 1) Compliance with required inspection provisions of construction documents and approved submittals (periodic).
 - 2) Verification of f_m and f_{AAC} prior to construction and for every 5,000 sq. ft. (465 sq. m), during construction (periodic).
 - 3) Verification of proportions of materials in premixed or preblended mortar and grout as delivered to site (periodic).
 - 4) Verification of slump flow and VSI as delivered to site for self-consolidating grout (continuous).
 - 5) Following shall be verified to ensure compliance:
 - (a) Proportions of site-prepared mortar, grout and prestressing grout for bonded tendons (periodic).
 - (b) Placement of masonry units and construction of mortar joints (periodic).
 - (c) Placement of reinforcement, connectors and prestressing tendons and anchorages (periodic).
 - (d) Grout space prior to grout (continuous).
 - (e) Placement of Grout: (continuous).
 - (f) Placement of prestressing grout (continuous).
 - (g) Size and location of structural elements (periodic).
 - (h) Type, size and location of anchors, including other details of anchorage of masonry to structural members, frames or other construction (continuous).
 - (i) Specified size, grade and type of reinforcement, anchor bolts, prestressing tendons and anchorages (periodic).
 - (j) Welding of reinforcing bars (continuous).
 - (k) Preparation, construction and protection of masonry during cold weather (temperature 40 deg F (4.4 deg C)) or hot weather (temperature above 90 deg F (32 deg C)) (periodic).
 - (l) Application and measurement of prestressing force (continuous).
 - 6) Preparation of any required grout specimens and/or prisms shall be observed (continuous).
 - d. During construction, masonry units, masonry grout, masonry mortar and masonry prisms shall be tested for every 5,000 sq. ft. (465 sq. m), or portion thereof, of masonry constructed.
 - e. Inspection and test results will be reported in writing to Owner's Representative, Architect, Consulting Engineer and Contractor within twenty four (24) hours after inspection or test. Reports shall contain project identification number and date of service, location of service.

B. Non-Conforming Work:

1. Remove and replace defective material at Architect's direction and at no additional cost to Owner.

3.5 PROTECTION

- A. General:
1. During construction, all walls to protect from weather and to prevent accumulation of water in cores of CMU, should be kept dry by covering top of wall with a strong, water-resistant membrane at end of each day or shutdown period. Covering should overhang wall by at least **24 inches (610 mm)** on each side, and should be secured against wind.
 2. Covering should remain in place until top of cavity wall is completed or protected by adjacent materials.
 3. Protect masonry with covering during rainy weather.
- B. Freezing:
1. In cold weather, all materials and walls should be properly protected against freezing including storing of materials, preparation of mortar, heating of masonry units, laying precautions, and protection of Work. Follow recommendations for cold weather of Masonry Standards Joint Committee (MSJC) - The Masonry Society (TMS) / American Concrete Institute (ACI) / American Society of Civil Engineers (SEI/ASCE) TMS 402/ACI 530/ASCE 5-11 and TMS 602/ACI 530.1/ASCE 6.
 2. Remove all masonry deemed frozen or damaged.
- C. Brace masonry walls until walls attain adequate strength and are tied into building structure.
- D. Do not allow structural loading of masonry walls until walls attain adequate strength.

3.6 CLEANING

- A. General:
1. Clean CMU as outlined in Brick Industry Association Technical Notes on Brick Construction 20, 'Cleaning Brickwork'.
 2. After mortar has hardened, wet masonry and clean with specified cleaning compound. Use stiff fibered brush for application. Rinse masonry surfaces with water immediately after cleaning. Leave masonry clean, free of mortar daubs, and with tight mortar joints.
 3. Wash adjacent non-masonry surfaces. Use detergent and soft brushes or cloth.
 4. Sweep and rake adjacent pavement and grounds to remove mortar and debris. Where necessary, pressure wash pavement surfaces to remove mortar, dust, dirt, and stains.
- B. Waste Management:
1. Clean up masonry debris and remove from site.

END OF SECTION

DIVISION 06: WOOD, PLASTICS, AND COMPOSITES

06 0500 COMMON WORK RESULTS OF WOOD, PLASTICS, AND COMPOSITES

06 0573 PRESERVATIVE WOOD TREATMENT

06 1000 ROUGH CARPENTRY

06 1011 WOOD FASTENINGS

06 1100 WOOD FRAMING

06 2000 FINISH CARPENTRY

06 2001 COMMON FINISH CARPENTRY REQUIREMENTS

06 2024 DOOR, FRAME, AND FINISH HARDWARE INSTALLATION

END OF TABLE OF CONTENTS

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SECTION 06 0573**PRESERVATIVE WOOD TREATMENT****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Quality of wood preservative treatment where specified.
- B. Related Requirements:
 - 1. Section 06 1100:
 - a. Characteristics of wood to be pressure-treated.
 - b. Furnishing and installing of pressure-treated wood.

1.2 REFERENCES

- A. Definitions:
 - 1. 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.
 - 2. 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.
- B. Reference Standards:
 - 1. American Wood Protection Association:
 - a. AWPA U1-12, 'Use Category System: User Specification For Treated Wood'.
 - 2. International Building Code (IBC) (2015 or latest approved edition by AHJ):
 - a. Chapter 23, 'Wood':
 - 1) Section 2300, 'Minimum Standards and Quality':
 - a) 2303.1, 'General':
 - (1) 2303.1.8, 'Preservative-Treated Wood'.
 - 2) Section 2400, 'General Construction Requirements':
 - a) 2304.11, 'Protection Against Decay and Termites':
 - (1) 2311.2, 'Wood Used Above Ground'.
 - (2) 2311.4, 'Wood In Contact With The Ground'.

1.3 SUBMITTALS

- A. Informational Submittals:
 - 1. Certificate: Certificate of pressure treatment showing compliance with specification requirements and including information required under IBC Section 2303.1.8.1, 'Identification'.

PART 2 - PRODUCTS**2.1 SYSTEMS**

- A. Manufacturers:
 - 1. Type One 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 01 6200.
- B. Performance:
1. Framing lumber grade and species shall be as specified in Section 06 1100 for particular use.
 2. 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 (4 kg per cu meter)**.
 - 2) Zinc borate meeting requirements of AWPA U1 and with retention of **0.17 lbs per cu ft (2.7 kg per cu meter)**.
 - 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.
 3. 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.

PART 3 - EXECUTION: Not Used

END OF SECTION

SECTION 06 1011**WOOD FASTENINGS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Quality of wood fastening methods and materials used for Rough Carpentry unless specified otherwise.
- B. Related Requirements:
 - 1. Section 03 1511: 'Concrete Anchors and Inserts' for Quality of Anchors and Inserts.
 - 2. Section 05 0523: 'Metal Fastenings' for Quality of bolts used for Rough Carpentry.
 - 3. Furnishing and installing of other fasteners are specified in individual Sections where installed.

1.2 REFERENCES

- A. Reference Standards;
 - 1. ASTM International:
 - a. ASTM A153/A153M-16a, 'Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware'.
 - b. ASTM D3498-03(2011), 'Standard Specification for Adhesives for Field-Gluing Plywood to Lumber Framing for Floor Systems'.
 - c. ASTM F1667-17, 'Standard Specification for Driven Fasteners: Nails, Spikes, and Staples'.

1.3 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Manufacturer's literature on framing anchors and powder actuated fasteners.
 - 2. Shop Drawings:
 - a. Submit diameter and lengths of fasteners proposed for use on Project. If length or diameter of proposed fasteners differ from specified fasteners, also include technical and engineering data for proposed fasteners including, but not limited to:
 - 1) Adjusted fastener spacing where using proposed fasteners and,
 - 2) Adjusted number of fasteners necessary to provide connection capacity equivalent to specified fasteners.
 - b. Submit on powder-actuated fasteners other than those specified in Contract Documents showing design criteria equivalents at each application.
 - c. Show type, quantity, and installation location of framing anchors. Where necessary, reference Drawing details, etc, for installation locations.

PART 2 - PRODUCTS**2.1 MANUFACTURED UNITS**

- A. Description:
 - 1. Nail Terminology:
 - a. When following nail terms are used in relation to this Project, following lengths and diameters will be understood. Refer to nails of other dimensions by actual length and diameter, not by one of listed terms:

Nail Term	Length	Diameter	Length	Diameter
8d Box	2-1/2 inches	0.113 inch	63.5 mm	2.827 mm
8d Common	2-1/2 inches	0.131 inch	63.5 mm	3.389 mm
10d Box	3 inches	0.128 inch	76.2 mm	3.251 mm
10d Common	3 inches	0.148 inch	76.2 mm	3.759 mm
16d Box	3-1/2 inches	0.135 inch	88.9 mm	3.411 mm
16d Sinker	3-1/4 inches	0.148 inch	82.6 mm	3.759 mm
16d Common	3-1/2 inches	0.162 inch	88.9 mm	4.115 mm

B. Materials:

1. Wood fastener list:
 - a. Provide VMR Suppliers with wood fastener list.
2. Fasteners:
 - a. General:
 - 1) 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.
 - b. Nails:
 - 1) Meet requirements of ASTM F1667.
 - 2) Unless noted otherwise, nails listed on Drawings or in Specifications shall be common nail diameter, except 16d nails, which shall be box diameter.
 - c. Wood Screws:
 - 1) SDS Screws:
 - a) Category Four Approved Products. See Section 01 6200 for definitions of categories.
 - (1) SDS Screws by Simpson Strong Tie Co, Dublin, CA www.strongtie.com.
 - 2) All Other: Standard type and make for job requirements.
 - d. Powder-Actuated Fasteners:
 - 1) Type One Quality Standard: Hilti X-DNI 62P8.
 - 2) Manufacturers:
 - a) Hilti, Tulsa, OK www.us.hilti.com.
 - b) Redhead Division of ITW, Wood Dale, IL www.itw-redhead.com and Markham, ON www.itwconstruction.ca.
 - c) Equals as approved by Architect through shop drawing submittal before installation. See Section 01 6200.
3. Adhesives:
 - a. Construction Mastics:
 - 1) Meet requirements of 'APA-The Engineered Wood Association' Specification AFG-01 or ASTM D3498.
 - 2) Use phenol-resorcinol type for use on pressure treated wood products.
4. 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. Type Two 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. See Section 01 6200.

PART 3 - EXECUTION

3.1 ERECTION

- A. Secure one Manufacturer approved fastener in each hole of framing anchor that bears on framing member unless approved otherwise in writing by Architect.

- B. Provide washers with bolt heads and with nuts bearing on wood.

END OF SECTION

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SECTION 06 1100**WOOD FRAMING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install wood framing and blocking as described in Contract Documents.
- B. Products Installed But Not Furnished Under This Section:
 - 1. Wood panel product sheathing.
- C. Related Requirements:
 - 1. Section 06 0573: 'Preservative Wood Treatment' for quality of preservative wood treatment.
 - 2. Sections under 06 4000 Heading: 'Architectural Woodwork' for wall blocking requirements.

1.2 REFERENCES

- A. Association Publications:
 - 1. American Lumber Standard Committee (ALSC) (Maintains NIST standard):
 - a. Voluntary Product Standard:
 - 1) PS 20-15, 'American Softwood Lumber Standard'.
 - 2. National Institute of Standards and Technology (NIST), U. S. Department of Commerce:
 - a. Voluntary Product Standard DOC PS 20-15, 'American Softwood Lumber Standard'.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference:
 - 1. Participate in MANDATORY pre-installation conference held jointly with Section 06 1636.
 - 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) Rough opening.
 - 3) Nails and nailing requirements.
 - 4) Connections.

1.4 SUBMITTALS

- A. Informational Submittals:
 - 1. Test And Evaluation Reports:
 - a. Technical and engineering data on nails to be set by nailing guns for Architect's approval of types proposed to be used as equivalents to specified hand set nails and adjusted number and spacing of pneumatically-driven nails to provide equivalent connection capacity.

1.5 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.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Dimension Lumber:
1. 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)
 - 2) **2x6 (38 mm by 140 mm)** And Wider: No. 2 or 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).
- B. Posts, Beams, And Timbers **5 Inches by 5 Inches (125 mm by 125 mm)** And Larger:
1. Design Criteria:
 - a. No. 1 or better Douglas Fir or Southern Pine.
- C. Lumber Ledgers:
1. Design Criteria:
 - a. No. 2 Douglas Fir-Larch, or Southern Pine.
- D. See Contract Drawings for additional requirements.

2.2 ACCESSORIES

- A. Blocking:
1. Sound lumber without splits, warps, wane, loose knots, or knots larger than **1/2 inch (13 mm)**.
- B. Furring Strips:
1. Utility or better.
- C. Sill Sealer:
1. Closed-cell polyethylene foam, **1/4 inch (6 mm)** thick by width of plate.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General:
1. 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. Interface With Other Work:

1. Coordinate with other Sections for location of blocking required for installation of equipment and building specialties. Do not allow installation of gypsum board until required blocking is in place.
 2. Where manufactured items are to be installed in framing, provide rough openings of dimensions within tolerances required by manufacturers of such items. Confirm dimensions where not shown on Contract Drawings.
- C. Tolerances:
1. Walls:
 - a. 1/4 inch (6 mm) in 20 feet (6 meters), non-cumulative in length of wall.
 - b. 1/8 inch (3 mm) in 10 feet (3 meters) with 1/4 inch (6 mm) maximum in height of wall.
 - c. Distances between parallel walls shall be 1/4 inch (6 mm) maximum along length and height of wall.
- D. Floors:
1. Place with crown side up.
 2. Provide accurately fitted header and trimmer joists of same size as regular joists around floor openings, unless detailed otherwise, and support by steel joist hangers.
 3. Double joists under partitions that parallel run of joists.
- E. Walls:
1. Openings: Single, bearing stud supporting header and one adjacent (king) stud continuous between top and bottom plates, unless shown otherwise.
 2. Corners And Partition Intersections: Triple studs.
 3. Top Plates In Bearing Partitions: Doubled or tripled and lapped. Stagger joints at least 48 inches (1 200 mm).
 4. Stud Walls To Masonry. Use one of the following methods:
 - a. Connect with 1/2 inch (13 mm) machine bolts 6 inches (150 mm) from top, 6 inches (150 mm) from bottom, and 48 inches (1 200 mm) maximum on center. Use three bolts minimum in height of 6 foot (1 800 mm) or higher wall.
 - b. Secure wood to masonry using continuous 1/4 inch (6 mm) minimum bead of construction adhesive and powder actuated fasteners installed at 32 inches (800 mm) on center minimum.
 5. Firestops:
 - a. Horizontal or vertical concealed spaces in walls, light coves, soffits, drop ceilings, and other features over 10 feet (3 000 mm) in length or height, and at stairs, ceiling levels, floor levels, and other junctures of horizontal to vertical concealed spaces.
 - b. Within concealed spaces of exterior wall finishes and exterior architectural elements, such as trims, cornices or projections, at maximum intervals of 20 feet (6 000 mm), length or height.
 6. Sill Plates:
 - a. Shear Walls And Bearing Walls:
 - 1) Provide specified anchor 12 inches (300 mm) maximum and 4 inches (100 mm) minimum from each end of each plate.
 - 2) Shear Walls: Fasten with anchor bolts embedded in concrete or with screw anchors.
 - 3) Bearing Walls: Fasten with anchor bolts embedded in concrete, or with screw anchors or expansion bolts in drilled holes.
 - b. Non-Structural Walls: Fasten with powder actuated fasteners.
 - c. In addition to requirements of paragraphs 'a' and 'b' above, set sill plates of interior walls measuring less than 36 inches (900 mm) in length in solid bed of specified construction adhesive, except where sill sealer is used.
 - d. Install specified seal sealer under sill plates of exterior walls of main building and of acoustically insulated interior walls.
 - e. Masonry Wall Plates:
 - 1) Anchor 2x6 and 2x8 wall plates to top of block walls with 5/8 inch (16 mm) diameter anchor bolts at 32 inches (800 mm) on center unless noted otherwise.
 - 2) Set plates on masonry bearing walls true and level to provide full bearing. Use mortar as specified in Division 04 for leveling if leveling is required.
 7. Nailing:
 - a. Stud to plate (coordinate with Contract Drawings):

2 by 4 inch nominal	38 by 89 mm	End nail, two 16d OR toe nail, four 8d
2 by 6 inch nominal	38 by 140 mm	End nail, three 16d OR toe nail, four 8d
2 by 8 inch nominal	38 by 184 mm	End nail, four 16d OR toe nail, six 8d
2 by 10 inch nominal	38 by 235 mm	End nail, five 16d OR toe nail, six 8d
1-3/4 by 5-1/2 inch LVL	44 by 140 mm LVL	End nail, three 16d OR toe nail, four 8d
1-3/4 by 7-1/4 inch LVL	44 by 184 mm LVL	End nail, four 16d OR toe nail, six 8d
1-3/4 by 9-1/4 inch LVL	44 by 235 mm LVL	End nail, five 16d OR toe nail, six 8d
1-3/4 by 11-1/4 inch LVL	44 by 286 mm LVL	End nail, six 16d OR toe nail eight 8d

- b. Top plates: Spiked together, 16d, 16 inches (400 mm) on center.
 - c. Top plates: Laps, lap members 48 inches (1200 mm) minimum and nail with 16d nails 4 inches (100 mm) on center
 - d. Top plates: Intersections, three 16d.
 - e. Backing And Blocking: Three 8d, each end.
 - f. Corner studs and angles: 16d, 16 inches (400 mm) on center.
- F. Accessory / Equipment Mounting And Gypsum Board Back Blocking (nailers) for Wood Framing):
- 1. Furnish and install blocking in wood framing required for hardware, specialties, equipment, accessories, and mechanical and electrical items, etc.
- G. Furring Strips:
- 1. On Wood or Steel: Nail or screw as required to secure firmly.
 - a. Ceiling:
 - 1) Attach furring strips to the underside of structural elements with #8 wood screws, of length to penetrate wood framing 1 inch (25 mm) minimum.
 - 2. On Concrete or Masonry:
 - a. Back up furring strips on exterior walls or walls in contact with earth with 15 lb (6.8 kg) felt strip.
 - b. Nail at 12 inches (300 mm) on center maximum.

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. Salvaged and modified existing bench, brackets and hook strip.
 - 2. Selected Building Specialties.
 - 3. Miscellaneous as specified elsewhere.
- C. Related Requirements:
 - 1. 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.
 - 2. Section 07 9213: 'Elastomeric Joint Sealants' for quality of sealants, submittal and installation requirements.
 - 3. 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.
 - 4. Sections in Division 10: Furnishing of Specialties.

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. Knape & Vogt, Grand Rapids, MI www.knapeandvogt.com or Knape & 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.

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.
- B. Items Installed But Not Furnished Under This Section: Install in accordance with requirements specified in Section furnishing item.

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. Installation for Accessories:
- D. Items Installed But Not Furnished Under This Section: Install in accordance with requirements specified in Section furnishing item.

END OF SECTION

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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 door frames 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 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Fire door installations shall meet code requirements.

1.5 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. Caulk around both sides of frames installed in exposed masonry walls 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 new or existing key cabinet.

END OF SECTION

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DIVISION 07: THERMAL AND MOISTURE PROTECTION

07 2000 THERMAL PROTECTION

07 2116 BLANKET INSULATION

07 9000 JOINT PROTECTION

07 9213 ELASTOMERIC JOINT SEALANTS

END OF TABLE OF CONTENTS

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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. 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-38 Standard
 - 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

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

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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 C1330-02(2013), 'Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants'.
 - d. ASTM C1481-12(2017) 'Standard Guide for Use of Joint Sealants with Exterior Insulation & Finish Systems (EIFS)'.
 - e. ASTM D5893/D5893M-16, 'Standard Specification for Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements'.

1.3 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 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.

3. 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.
4. 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.
 - c. Description:
 - 1) One-part acetoxy cure silicone sealant with fungicides to resist mold and mildew.
 - d. Design Criteria:
 - 1) Meet ASTM C920, Type S, Grade NS, NT, and Class 25 test requirements.
 - 2) 100 percent silicone sealant.
 - e. 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 contaminates 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 contaminates 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

DIVISION 08: OPENINGS

08 0100 OPERATION AND MAINTENANCE OF OPENINGS

08 0601 HARDWARE GROUP AND KEYING SCHEDULES

08 1000 DOORS AND FRAMES

08 1213 HOLLOW METAL FRAMES

08 1429 FLUSH WOOD DOORS: FACTORY-FINISHED, CLEAR

08 7000 HARDWARE

08 7101 COMMON FINISH HARDWARE REQUIREMENTS

08 7102 HANGING DEVICES

08 7103 SECURING DEVICES

08 7106 CLOSING DEVICES

08 7108 STOPS AND HOLDERS

08 7109 ACCESSORIES

END OF TABLE OF CONTENTS

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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 INTERIOR DOORS

A. Single Interior Doors:

- 1. Group 33:**
 - a. 1 set: Smoke Gaskets.
 - b. 1 each: Closer.
 - c. 3 each: Hinges.
 - d. 1 each: Lockset, Function F76.
 - e. 1 each: Deadbolt Function E2142.
 - f. 1 each: Stop.
 - g. 1 each: Threshold by tile installer

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.

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 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. Consumer Products Safety Commission (CPSC):
 - a. CPSC 16 CFR 1201 'Safety Standard for Architectural Glazing Materials' (January 1, 2012).
4. Hardwood, Plywood, and Veneer Association:
5. International Building Code (IBC):
 - a. 715.4, 'Fire Door and Shutter Assemblies'. (2018 or most recent edition adopted by AHJ).
6. National Fire Protection Association:
 - a. NFPA 80, 'Standard for Fire Doors and Other Opening Protectives' (2019 or most recent edition adopted by AHJ).
 - b. NFPA 101: 'Life Safety Code' (2018 or most recent edition adopted by AHJ).
 - c. NFPA 252: 'Fire Tests of Door Assemblies' (2017 or most recent edition adopted by AHJ).
7. National Particleboard Association / Composite Panel Association:
 - a. NPA A208.1-2009, 'Particleboard'.
8. Underwriters Laboratories, Inc.
 - a. UL 9, 'Fire Tests of Window Assemblies' (8th Edition).
 - b. UL 10B, 'Fire Tests of Door Assemblies' (10th Edition).

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. Test And Evaluation Reports:
 - a. Submit copies of fire tests showing accessories and configurations necessary for rated double doors to achieve ratings.
 2. 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.
 - c. Fire-rated, AWS FD 1/3:
 - 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.
 - d. Fire-Rated, AWS FD 3/4, 1, and 1-1/2:
 - 1) Mineral as standard with approved Manufacturer with inner blocking, 5 inches (125 mm) wide minimum, for closers, flush bolts, and exit devices.
 - 2) Stiles And Rails:
 - a) Sizes of stiles and rails to be Manufacturer's standard meeting fire rating, and incorporating solid hardwood stile face.
 - b) Stiles for pairs of mineral core doors shall be of material and configuration meeting required fire rating without use of metal astragal or edge.
 - 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.
 2. doors requiring lites with factory- or shop-installed lites and stops to match fire rating of door.
- 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:
 - 1) Control Sample provided by Owner:
 - 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.
 - b. Conform to National Fire Protection Standards, NFPA 80, for fire-rated doors.
 - 1) Required fire-rated doors shall bear approved labels of UL, Warnock Hersey International, or other code acceptable agency.
 - 2) Machining for hardware shall be complete before application of label.

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

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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 08 0601: 'Hardware Group and Keying Schedules'.

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 612. US-10 Satin Bronze Field verify to match existing]
 - 1) Description: Satin Bronze 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

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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) Fire-Rated Doors:
 - a) **1-3/4 inch (45 mm)** fire-rated doors in metal frames:
 - (1) Standard: **4-1/2 inches by 4-1/2 inches (115 mm by 115 mm)**.
 - (2) Wide Throw: **4-1/2 inches (115 mm)** by width required.
 - 2. Use non-removable pins on exterior opening doors.
 - 3. Hinges on exterior doors shall be solid brass, plated to achieve specified finish.
 - 4. 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**

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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. Locksets and latchsets.
- B. Related Requirements:
 - 1. Section 08 7101: Common Hardware Requirements.

1.2 REFERENCES

- A. Definitions:
 - 1. Grade 1 Heavy Duty Key-In Lever Cylindrical Lockset:
 - a. Performance Features:
 - 1) Exceeds 1,000,000 ANSI cycles.
 - 2) Clutching mechanism standard.
 - 3) Thru-bolt design and heavy-duty spring tension provides longer performance life and prevents lever sag.
 - 4) ADA-compliant thumbturn.
 - 5) Mortise case is easily field reversible.
 - 6) Pre-assembled trims with spring-loaded spindles automatically adjust to door thickness.
 - 7) Partial security separator prevents spindle manipulation.
 - 8) Anti-friction throwbolt.
 - 2. 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. 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.

PART 3 - EXECUTION

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. 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.

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 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:
 - a. Interior Wall
 - b. Hager 236W
 - c. Ives WS407CCV
 - d. Rockwood 409
 - e. 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

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

- A. Products Furnished But Not Installed Under This Section:
 - 1. Smoke Gaskets.
 - 2. Thresholds (metal) where required for wood doors.
- B. Related Requirements:
 - 1. Section 08 7101: 'Common Finish Hardware Requirements' for general finish hardware requirements and Approved Suppliers.
 - 2. 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. 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.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install smoke gaskets 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.

END OF SECTION

DIVISION 09: FINISHES

09 2000 PLASTER AND GYPSUM BOARD

09 2900 GYPSUM BOARD

09 3000 TILING

09 3013 CERAMIC TILING

09 9000 PAINTS AND COATINGS

09 9001 COMMON PAINTING AND COATING REQUIREMENTS

09 9122 INTERIOR PAINTED CMU

09 9123 INTERIOR PAINTED GYPSUM BOARD, PLASTER

09 9124 INTERIOR PAINTED METAL

09 9125 INTERIOR PAINTED WOOD

09 9324 INTERIOR CLEAR-FINISHED HARDWOOD

END OF TABLE OF CONTENTS

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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.

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 C11-16, 'Standard Terminology Relating to Gypsum and Related Building Materials and Systems'.
 - b. ASTM C475/C475M-15, 'Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board'.
 - c. ASTM C840-17, 'Standard Specification for Application and Finishing of Gypsum Board'.
 - d. ASTM C1002-16, '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-13, 'Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel'.
 - g. ASTM C1396/C1396M-14a, 'Standard Specification for Gypsum Board'.
 - h. ASTM E84-16, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
 - i. ASTM E119-16a, '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-801-07, 'Handling and Storage of Gypsum Panel Products: A Guide for Distributors, Retailers, and Contractors'.
3. International Building Code (IBC) (2015 or latest approved version):
 - a. Chapter 25, 'Gypsum Board And Plaster'.
4. National Building Code of Canada / Underwriters Laboratories of Canada:
 - a. CAN/ULC-S102: 'Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies' (7th Edition).
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; (10th 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:
 - a. Furring Channels:
 - 1) Class Two Quality Standards. See Section 01 6200 for definitions:
 - a) Walls: Galvanized DWFC-25.
 - b) Ceilings: Galvanized DWFC-20.
 - 2) Accessories as required by Manufacturer's fire tests to provide necessary fire ratings.
 - b. Corner And Edge Trim:

- 1) Metal, paper-faced metal, paper-faced plastic, or solid vinyl meeting requirements of ASTM C1047. Surfaces to receive bedding cement treated for maximum bonding.
 - c. Control Joint:
 - 1) Bent zinc sheet with V-shaped slot, perforated flanges, covered with plastic tape meeting requirements of ASTM C1047.
 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) Metal Framing:
 - (1) Light-gauge metal framing: Type S Hi-Lo, bugle or wafer head, self-tapping, rust resistant. Hi-Lo screws.
 - (2) Heavy-gauge metal framing: Type S-12 Hi-Lo, bugle or wafer head, rust resistant.
- B. Primer / Surfacer 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. Mounting Accessories:
 - 1. Furring Channels: Apply with screws through flanges into each framing member.
- D. 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.
 - 3) Metal Framed Walls: Screws **12 inches (300 mm)** on center in panel field.
 - d. Set screw heads **1/32 inch (0.8 mm)** below plane of board, but do not break face paper. If face is accidentally broken, apply additional screw **2 inches (50 mm)** away.
 - e. Screws on adjacent ends or edges shall be opposite each other.
 - f. Drive screws with shank perpendicular to face of board.
 - 4. Trim:
 - a. Corner Beads:
 - 1) Attach corner beads to outside corners.
 - a) Attach metal corner bead with staples spaced **4 inches (100 mm)** on center maximum and flat taped over edges of corner bead. Also, apply screw through edge of corner bead where wood trim will overlay corner bead.
 - b) Set paper-faced trim in solid bed of taping compound.
 - b. Edge Trim: Apply where gypsum board abuts dissimilar material. Hold channel and 'L' trim back from exterior window and door frames **1/8 inch (3 mm)** to allow for caulking.
 - 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 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'.
 - 2) Gypsum Board Surfaces to Receive: Painted Texturing - Section 09 9413: 'Interior Textured Finishing':
 - a) GA-214 Level 4: 'All and interior angles shall have tape embedded in joint compound and two separate coats of joint compound applied over all flat joints and one separate coat of joint compound applied over interior angles. Fastener heads and accessories shall be covered with three separate coats of joint compound. All joint compound shall be smooth and free of tool marks and ridges. Coat prepared surface with specified primer'.
 - 3) Gypsum Board Surfaces to Receive: Smooth Gypsum Board Surfaces:
 - a) GA-214 Level 4: 'All and interior angles shall have tape embedded in joint compound and two separate coats of joint compound applied over all flat joints and one separate coat of joint compound applied over interior angles. Fastener heads and accessories shall be covered with three separate coats of joint compound. All joint compound shall be smooth and free of tool marks and ridges. Coat prepared surface with specified primer'.
 - 4) 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'.

E. 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

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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.
 - 2. Patch existing wall tile with new to closely match existing colors 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	1 = Normal	F = Fast-Setting

(Mastics)	2 = Improved	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 ≤ 0.5mm for a C or D adhesive, and ≤ 5mm 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 ≥ 2.5mm but < 5mm; to pass S2 requirements an adhesive must be able to deform ≥ 5mm. 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 W211-15, 'Masonry or Concrete, Bonded Mortar Bed, Ceramic Tile'.
 - e. TCNA W221-15, 'Solid Backing, Mortar Bed, Ceramic Tile'.
 - f. TCNA W244c-15, 'Wood or Metal Studs, Cement Backer Board, Ceramic Tile'.
 - g. 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 and 1/2 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 Manufacture'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.
- 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.bwilde@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.
- b. Interceramic:
 - 1) LDS Project Coordinators:
 - a) First Contact: Diego Chavez, phone (214) 503-5433, fax (877) 551-1979 dichavez@interceramic.com.
 - b) Second Contact: Jose Valdez, phone (214) 503-5507, fax (877) 551-1979 jvaldez@interceramic.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.

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: **8 inches (200 mm)** square:
 - a) Cove Base: External and internal corner pieces to match with bull-nosed top:
 - (1) **6 inches by 8 inches (150 mm by 200 mm)** with bull-nosed top.
 - b) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (1) Daltile.
 - 2) Category Four Approved Colors. See Section 01 6200 for definitions of Categories:
 - 1) CD40 Grigio Granite by Daltile. (closest current color)
 - 2) [Verify to match existing] Appears to be CD38 Cadet Grey by Daltile (discontinued)
 2. Ceramic Tile:
 - a. Wall Tile:
 - 1) Walls: **4-1/4 inches by 4-1/4 inches (108 mm by 108 mm)**.
 - 2) Category Four Approved Colors. See Section 01 6200 for definitions of Categories:
 - a) Room Walls:
 - (1) 0190 Arctic White by Daltile.
 - (2) [Verify to match existing]
 - b) Accent Colors:
 - (1) 0182 Suede Grey by Daltile.
 - (2) 0DM1 Vermillion by Daltile.
 - (3) [Verify to match existing]

E. Materials:

1. Paver Tile:
 - a. Category Four Approved Products. See Section 01 6200 for definition of Categories:
 - 1) Porcealto Graniti by Daltile.
2. Wall Tile:
 - a. Category Four Approved Products. See Section 01 6200 for definition of Categories:
 - 1) Semi-Gloss or Matte by Dal-Tile.
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. 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.
5. Backer Board Joint Reinforcing: **2 inch (50 mm)** wide glass fiber mesh tape.
6. 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) ARDEX: Ardex X77.
 - b) CUSTOM: Megalite Crack Prevention Mortar or FlexBond Premium Crack Prevention Thin-set Mortar (no additives needed).
 - c) LATICRETE: 254 Platinum Thinset.
 - d) MAPEI: Ultraflex 3.
 - e) MERKRETE: 735 Premium Flex.
- d. Latex/Polymer Modified Portland Cement Mortar For Walls:
 - 1) Design Criteria:
 - a) Meet ANSI material specification requirements of ANSI 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) ARDEX: Ardex X77.
 - b) CUSTOM: Megalite Thin-Set Mortar or FlexBond Fortified Thin-Set Mortar.
 - c) LATICRETE: 254 Platinum Thinset.
 - d) MAPEI: Ultraflex 3.
 - e) MERKRETE: 735 Premium Flex.
- e. Floor Grout (Epoxy):
 - 1) Design Criteria:
 - a) Meet ANSI material specification requirements of ANSI 118.3.
 - b) Meet ANSI installation specification requirements of ANSI A108.6 and ISO material specification ISO13007 RG.
 - 2) Approved Color: [Verify to match existing]
 - a) ARDEX: 25 Stormy Mist.
 - b) CUSTOM: No. 145 Light Smoke.
 - c) LATICRETE: No. 24 Natural Grey.
 - d) MAPEI: No. 11 Sahara Beige.
 - e) MERKRETE: Pro Epoxy D-153 Buckskin.
 - 3) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) ARDEX: Ardex WA.
 - b) CUSTOM: CEG-Lite 100% Solids Commercial Epoxy Grout.
 - c) LATICRETE: SpectraLOCK PRO.
 - d) MAPEI: Kerapoxy (sanded).
 - e) MERKRETE: Pro Epoxy.
- 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: [Verify to match existing]
 - a) ARDEX: No. 01 Polar White.
 - b) CUSTOM: No. 381 Bright White.
 - c) LATICRETE: No. 44 Bright White.
 - d) MAPEI: No. 00 White.
 - e) MERKRETE: D-11 Snow White.
 - 3) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) ARDEX: Ardex FH.
 - b) CUSTOM: PolyBlend Non-Sanded Grout or Prism Color Consistent Grout.

- c) LATICRETE: 1600 Series Unsanded Dry Set Wall Grout with 1776 Grout Admix Plus additive.
- d) MAPEI: Keracolor-U Unsanded Polymer-Modified Grout.
- e) MERKRETE: Non-Sanded ColorGrout, latex modified.
- g. Waterproofing Membrane:
 - 1) Design Criteria:
 - a) Meet ANSI installation specification requirements of ANSI 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) ARDEX: Ardex 8+9.
 - (2) MAPEI: Mapelastc 315.
 - b) Liquid applied, latex based:
 - (1) CUSTOM: RedGard Waterproofing or Crack Prevention Membrane or FractureFree Crack Prevention Membrane.
 - (2) LATICRETE: Hydro Ban.
 - (3) MAPEI: Mapelastc AquaDefense.
 - (4) MERKRETE: Hydro-Guard SP-1.
- 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) ARDEX: Ardex 8+9 with SK Mesh Tape.
 - (2) CUSTOM: Crack Buster Pro Crack Prevention Mat Underlayment, with Peel & Stick Primer.
 - (3) LATICRETE: Blue 92 Anti-Fracture Membrane.
 - (4) MAPEI: Mapeguard 2, and Primer SM.
 - (5) MERKRETE: Hydro-Guard SP-1.
 - b) Liquid applied, latex based:
 - (1) CUSTOM: RedGard Waterproofing and Crack Prevention Membrane or FractureFree Crack Prevention Membrane.
 - (2) LATICRETE: Hydro Ban.
 - (3) MAPEI: Mapelastc AquaDefense.
 - (4) MERKRETE: Fracture Guard 5000.
- i. Stone Thresholds:
 - 1) Texture and color variation shall be within limits established by Architect's approved sample.
 - 2) Free of defects that would materially impair strength, durability, and appearance.
 - 3) Finish: 80 grit exterior hone.
 - 4) White marble, one (1) piece, **7/8 inch (22 mm)** thick by **2 1/2 inches (64 mm)** by door opening width. Cross-section to meet handicap accessibility requirements.

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

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. Framed Walls: TCNA W245 with waterproof membrane.
 - d. 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 On Walls:
 1. On Mortar Bed Over CMU:
 - a. Apply mortar bed to required thickness of **3/8 inch (10 mm)** minimum to **3/4 inch (19 mm)**.
 - b. Properly cure before installing tile.
 2. On Glass Mat Gypsum Tile Backer Over Framing:
 - a. Embed fiberglass reinforcing tape at joints with mortar used to adhere tile.
 3. Dampen dry backings as determined by environmental conditions and Manufacturer's recommendations to achieve cure.
 4. Allow for sealant joints full height at room corners in wall tile. Insert temporary filler in expansion joints.
 5. Install wall tile directly atop bull-nosed paver tile base.
- G. 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.
- H. 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.
- I. 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.
- J. 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

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SECTION 09 9001

COMMON PAINTING AND COATING REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To:
 - 1. Common procedures and requirements for field-applied painting and coating.
- B. Related Requirements:
 - 1. Section 05 0503: 'Shop-Applied Metal Coatings' for quality of shop priming of steel and iron.
 - 2. Section 07 9213: 'Elastomeric Joint Sealants' for quality of Elastomeric Joint Sealants.
 - 3. Sections under 09 9000 heading 'Paints and Coatings'.
 - a. Pre-Installation conferences held jointly with Section 09 9001.
 - 4. Divisions 22 and 23: Painting of plumbing and HVAC identification, refrigerant line insulation, and duct interiors.

1.2 REFERENCES

- A. Definitions:
 - 1. Damage Caused By Others: Damage caused by individuals other than those under direct control of Painting Applicator (MPI(a), PDCA P1.92).
 - 2. Gloss Levels:
 - a. 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.

- 3. Properly Painted Surface:
 - a. 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).
- 4. 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:
 - 1. 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.

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.
- 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.
 - h. Color Levels:
 - 1) Color Level II:
 - a) Number and placement of interior and exterior paint colors and gloss levels shall be as defined by Color Level II from MPI Manual, PDCA P3-93 as modified in following paragraph.
 - b) No more than one paint color or gloss level will be selected for same substrate within designated interior rooms or exterior areas.
- 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.
 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.
- 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 9122**INTERIOR PAINTED CMU****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Preparing and painting new and existing interior CMU walls 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. Manufacturer:
 - 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. Rest Rooms and Custodial Rooms:
 - a. New Surfaces: Use MPI(a) INT 4.2F Waterborne Epoxy Finish system.
 - b. Previously Finished Surfaces: Use MPI(r) RIN 4.2E Waterborne Epoxy Finish system.
 - 2. All Other:
 - a. New Surfaces: Use MPI(a) INT 4.2D Latex Finish system.
 - b. Previously Finished Surfaces: Use MPI(r) REX 4.2H Latex Finish system.
 - 3. New Surfaces:
 - a. Use MPI(a) INT 4.2D 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. Block Filler, Over New Masonry Only: MPI Product 4: 'Block Filler, Latex, Interior/Exterior'.
 - 2. Finish Coats: 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. Existing Painted Surfaces:
 - 1. Remove deteriorated existing paint by scraping or sanding. Wash surfaces that have been defaced with marking pens, crayons, lipstick, etc, with solvent recommended by Paint Manufacturer. Spot prime such surfaces.
 - 2. Sand areas of existing sound paint if necessary for bonding of new paint system. Clean existing painted surfaces, sanded or not, with mild soap and water, or with tri-sodium phosphate (TSP).
 - 3. Fill large holes with patching and small holes and cracks with spackle.
 - 4. Apply one coat primer to scraped and sanded areas.
 - 5. Apply one finish coat. Completely cover voids in masonry block but do not fill.

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 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. 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) Remaining Painted Surfaces: Gloss Level 5.
- D. Materials:
- 1. Primers:
 - a. MPI Product 50, 'Primer Sealer, Latex, Interior'.
 - 2. Finish Coats:
 - a. 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 9124**INTERIOR PAINTED METAL****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Preparing and painting new and existing interior 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. Ferrous Metal:
 - a. New Surfaces: Use MPI(a) INT 5.1B Waterborne Light Industrial Finish system.
 - b. Previously Finished Surfaces: Use MPI(r) RIN 5.1B Waterborne Light Industrial Finish system.
 - 2. Galvanized Metal:
 - a. New Surfaces: Use MPI(a) INT 5.3J Latex Finish system
 - b. Previously Finished Surfaces: Use MPI(r) RIN 5.3AH Latex Finish system.
 - 3. Aluminum:
 - a. New Surfaces: Use MPI(a) INT 5.4E Waterborne Light Industrial Finish system.
 - b. Previously Finished Surfaces: Use MPI(r) REX 5.4E Light Industrial Finish system.
- C. Performance:
 - 1. Design 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. Gloss / Sheen Level Required: Gloss Level 5.
- D. Materials:
 - 1. Primers:
 - a. Ferrous Metal: MPI Product 107, 'Primer, Rust-Inhibitive, Water Based'.
 - b. Galvanized Metal: MPI Product 134: 'Primer, Galvanized, Water Based'.

- c. Aluminum: MPI Product 95: 'Primer, Quick Dry, for Aluminum'.
2. Finish Coats: MPI Product 153: 'Light Industrial Coating, Interior, Water Based, Semi-Gloss (MPI Gloss Level 5)'.

PART 3 - EXECUTION

3.1 APPLICATION

- A. General:
 1. See appropriate paragraphs of Section 09 9001.
 2. Systems specified are in addition to prime coats furnished under other Sections.
- B. New Surfaces: Remove rust spots by sanding and immediately spot prime. If all traces of rust cannot be removed, apply rust blocker recommended by Paint Manufacturer before applying full primer coat.
- C. Existing Painted Surfaces:
 1. 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.
 2. 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.
 3. Clean existing sound painted surfaces as well as scraped and sanded existing painted surfaces as recommended by Paint Manufacturer.
 4. Apply prime coat over entire surface to be painted.
 5. Lightly sand entire surface.
 6. Clean surface as recommended by Paint Manufacturer.
 7. Apply finish coats.

END OF SECTION

SECTION 09 9125**INTERIOR PAINTED WOOD****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Preparing and painting new and existing woodwork and wood floors not requiring transparent finish, 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, providing they meet VOC requirements in force where Project is located.
- B. Description:
 - 1. Systems:
 - a. All Other:
 - 1) New Surfaces: Use MPI(a) INT 6.3T or U Latex Finish system.
 - 2) Previously Finished Surfaces: MPI(r) Rin 6.3U 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. Woodwork:
 - a. Primer Coat: MPI Product 39, 'Primer, Latex, for Interior Wood' or MPI Product 45, 'Primer Sealer, Alkyd, Interior'.
 - b. Finish Coats: MPI Product 153, 'Light Industrial Coating, Interior, Water Based, Semi-Gloss (MPI Gloss Level 5)'.

PART 3 - EXECUTION**3.1 APPLICATION**

- A. General: See appropriate paragraphs of Section 09 9001.
- B. Interface With Other Work:
 - 1. Properly clean and paint light cove interiors before installation of light fixtures.
 - 2. Where back-priming is required, apply one (1) coat of primer.
- C. New Surfaces:
 - 1. Spot prime nail holes, cracks, and blemishes before and after puttying.
 - 2. Apply stain blocker or other product recommended by Paint Manufacturer to knots before applying primer coat.
- D. Existing Painted Surfaces:
 - 1. 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 wood areas on woodwork.
 - 2. Wash surfaces that have been defaced with marking pens, crayons, lipstick, etc, with solvent recommended by Paint Manufacturer. Spot prime such surfaces.
 - 3. 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 08 1429: 'Interior Flush Wood Doors'.
 - 2. 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 Owner selected sample.
 - 2) Performance standard: Owner provided sample will be sample of existing stained wood from project.

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

DIVISION 10: SPECIALTIES

10 1000 INFORMATION SPECIALTIES

10 1495 MISCELLANEOUS INTERIOR SIGNAGE

10 2000 INTERIOR SPECIALTIES

10 2813 COMMERCIAL TOILET ACCESSORIES

10 2814 BABY-CHANGING STATION

END OF TABLE OF CONTENTS

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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. 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

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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, Mother's Room:
 - a. Grab Bars.
 - b. Mirrors.
 - c. Sanitary Napkin Disposal Container.
 - d. Shelf.
 - e. Single Robe Hook.
 - 2. Salvage and reinstall existing grab bars as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 06 1100: 'Wood Framing' for blocking.
 - 2. Section 06 2001: 'Common Finish Carpentry Requirements' for installation.
- C. Related Products Furnished and Installed By Owner:
 - 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. Warranty Documentation:
 - 1) Final, executed copy of Warranty for each product.
 - b. 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 FINISHED PRODUCTS

- A. Category One Approved Products (Furnished and Installed by Owner):
 - 1. Automatic Touchless Towel Dispensers:
 - 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. 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.
 - b. Sanitary Napkin Disposal Container:
 - 1) Design Criteria:
 - a) Surface mounted type 304, 22 gauge stainless steel with #4 satin finish. Seamless construction with radius and hemmed edges.
 - b) Stainless steel piano hinge.
 - 2) 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.
 - c. Single Robe Hook:
 - 1) Surface mounted type 304, 22 gauge stainless steel with #4 satin finish.
 - 2) Concealed mounting bracket.
 - 3) Stainless steel locking setscrew on bottom.
 - 4) 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.
 - d. Grab Bars:
 - 1) Configuration shown on Contract Drawings. Include center support for longer lengths when required:
 - 2) Design Criteria:
 - a) Comply with ADA guidelines and ADAAG accessible design for structural strength and local and state codes.
 - b) Concealed mount.

- c) 18 ga (1.27 mm), type 304 stainless steel tubing.
 - d) 1-1/2 inch (38 mm) diameter.
 - e) Provide center support when required.
 - f) Snap-on flange covers.
 - g) Peened (non-slip) finish.
 - h) Sustain loads in excess of 900 lbs (408 kg).
- 3) 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. 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 10 2814**BABY-CHANGING STATION****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But Is Not Limited To:
 - 1. Coordination and sequencing of Owner-Furnished baby-changing station as described in Contract Documents.
- B. Products Installed But Not Supplied Under This Section:
 - 1. Baby-changing station.
- C. Related Sections:
 - 1. Section 01 6400: 'Owner-Furnished Products', Owner will furnish baby-changing station. PART 2 PRODUCTS of this Section establish quality of materials for information of Contractor, Architect, and Owner's representatives.
 - 2. Section 06 1100: 'Wood Framing' for blocking in wood stud framed walls for baby-changing stations.
 - 3. Section 09 2216: 'Non-Structural Metal Framing' for blocking in metal framed walls for baby-changing stations.

1.2 REFERENCES

- A. Reference Standards:
 - 1. American National Standards Institute:
 - a. ANSI Z535.4-2011. 'Product Safety Signs and Labels'.
 - 2. ASTM International:
 - a. ASTM G21-15, 'Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi'.
 - b. ASTM F2285-04(2016), 'Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use'.
 - 3. International Code Council / American National Standards Institute:
 - a. ICC/ANSI A117.1-2009, 'Accessible and Usable Buildings and Facilities'.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the efforts of various trades affected by Work of this Section.
 - 2. Coordinate completions of solid blocking in walls.
- B. Sequencing:
 - 1. Install baby-changing stations after following has been completed:
 - a. Adjacent walls and ceilings are finished and painted.

1.4 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Provide product literature or cut sheet on baby-changing station.
- B. Informational Submittals:

1. Certificates:
 - a. Manufacturer to provide \$10,000,000 minimum 'Certificate of Liability Insurance' policy.
 - 1) Policy on file at Church Headquarters. For questions, notify Mark Douglass at markdouglass@ldschurch.org.
 2. Manufacturer Instructions:
 - a. Printed installation instructions.
- 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 for defects in material and workmanship.
 - b. Record Documentation:
 - 1) Manufacturers Documentation:
 - a) Manufacturer's literature or cut sheets.

1.5 WARRANTY

- A. Manufacturer Warranty:
1. Manufacturer's standard warranty for baby-changing station to be free from defects in material and workmanship under normal use and service, with proper maintenance, for five (5) years.

PART 2 - PRODUCTS

2.1 OWNER-FURNISHED PRODUCTS

- A. Category Two VMR Approved Manufacturers. See Section 01 6200 for definition of Categories.
1. Koala, Denver, CO www.koalabear.com.
- B. Baby Changing Station:
1. Description:
 - a. Molded high impact polyethylene with integral straps for securing baby.
 2. Design Criteria:
 - a. Manufacture to provide 'Certificate of Liability Insurance' policy.
 - b. Antimicrobial bed surface
 - c. Support **200 lbs (90 kg)** with minimal deflection.
 - d. Meet ADA regulations of ICC/ANSI A117.1 when properly installed.
 - e. Conform to ANSI Z535.4 for safety signs and labels, ASTM G21 for antifungal standards, and ASTM F2285 for consumer safety performance standard.
 3. Approved Products. See Section 01 6200 for definition of Categories:
 - a. Horizontal: Koala Kare model number KB200 by Koala.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification Of Conditions:
1. Verify that solid blocking has been installed in wall framing where changing station is to be installed.
 2. Do not install unit by any other means other than screws or lag bolts into solid blocking.

3.2 INSTALLATION

- A. Install items in accordance with Manufacturer's submitted, written instructions for screws or lag bolts into solid substrate capable of supporting 200 lbs (90 kg). Install using mounting devices proper for base structure.

END OF SECTION

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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 0719 PLUMBING PIPING INSULATION

22 1000 PLUMBING PIPES AND PUMPS

- 22 1116 DOMESTIC WATER PIPING
- 22 1119 DOMESTIC WATER PIPING SPECIALTIES
- 22 1313 FACILITY SEWERS
- 22 1319 FACILITY SANITARY SEWER SPECIALTIES

22 4000 PLUMBING FIXTURES

- 22 4213 COMMERCIAL WATER CLOSETS AND URINALS
- 22 4216 COMMERCIAL LAVATORIES AND SINKS

END OF TABLE OF CONTENTS

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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 05 0523: 'Metal Fastening' for quality and requirements for welding.
 - 2. Section 07 9213: 'Elastomeric Joint Sealant' for quality at building exterior.
 - 3. Sections Under 09 9000 Heading: 'Paints And Coatings' for painting of plumbing items requiring field painting.
 - 4. Section 22 0548: 'Vibration And Seismic Control for Plumbing Piping and Equipment'.
 - 5. Division 26: 'Electrical' for raceway and conduit, unless specified otherwise, and line voltage wiring.
 - 6. 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 Sustainability Approvals:
 - 1. Perform work in accordance with applicable provisions of Plumbing Codes applicable to Project. Provide materials and labor necessary to comply with rules, regulations, and ordinances.
 - 2. In case of differences between building codes, laws, local ordinances, utility company regulations, and Contract Documents, the most stringent shall govern. Notify Architect in writing of such differences before performing work affected by such differences.
 - 3. Identification:
 - a. Motor and equipment name plates as well as applicable UL / ULC and AGA / CGA labels shall be in place when Project is turned over to Owner.
- B. Qualifications. Requirements of Section 01 4301 applies, but not limited to following:
 - 1. Plumbing Subcontractor:
 - a. Company specializing in performing work of this section.
 - 1) Minimum five (5) years experience in plumbing installations.
 - 2) Minimum five (5) satisfactorily completed installations in past three (3) years of projects similar in size, scope, and complexity required for this project before bidding.
 - b. Upon request, submit documentation.
 - 2. Installer:
 - a. Licensed for area of Project.
 - b. Designate one (1) individual as project foremen who shall be on site at all times during installation and experienced with installation procedures required for this project.
 - c. Upon request, submit documentation.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
 - 1. Accept valves on site in shipping containers with labeling in place.
 - 2. Provide temporary protective coating on cast iron and steel valves.
 - 3. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- 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.
- 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. Demolition Requirements:

1. Remove existing water closets, urinals, sinks, floor drains and other existing work not shown to remain.

B. 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.

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. Products Installed But Not Furnished Under This Section:
 - 1. Paint identification for gas piping used in HVAC equipment.
- C. Related Requirements:
 - 1. Section 05 0523: 'Metal Fastening' for quality and requirements for welding.
 - 2. Sections Under 09 9000 Heading: Painting of mechanical items requiring field painting.
 - 3. Slots and openings through floors, walls, ceilings, and roofs provided under other Divisions in their respective materials.
 - 4. Section 23 0529: 'Hangers And Supports For HVAC Piping And Equipment' for gas piping used with HVAC equipment.
 - 5. 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 (50 mm)** 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 (64 mm)** 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 (50 mm)** 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 (64 mm)** 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	Rod Diameter	Pipe Size
3/8 inch	2 inches and smaller	10 mm	50 mm and smaller
1/2 inch	2-1/2 to 3-1/2 inches	13 mm	64 mm to 88 mm
5/8 inch	4 to 5 inches	16 mm	100 mm to 125 mm
3/4 inch	6 inches	19 mm	150 mm
7/8 inch	8 to 12 inches	22 mm	200 mm to 300 mm

- 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
2	5/8 Inch	Six	Four	Three	Two	0	0	0
2	5/8 Inch	Nine	Seven	Five	Three	Two	Two	0
2	5/8 Inch	Twelve	Nine	Seven	Five	Three	Two	Two

Rods		Number of Pipes per Hanger for Each Pipe Size						
Number	Diameter	50mm	64mm	75mm	100mm	125mm	150mm	200mm
2	10 mm	Two	0	0	0	0	0	0
2	13 mm	Three	Three	Two	0	0	0	0
2	16 mm	Six	Four	Three	Two	0	0	0
2	19 mm	Nine	Seven	Five	Three	Two	Two	0
2	22 mm	Twelve	Nine	Seven	Five	Three	Two	Two

- 1) Size trapeze angles so bending stress is less than **10,000 psi (69 MPa)**.
- e. Riser Clamps For Vertical Piping:
 - 1) Type Two Acceptable Products:
 - a) Anvil Fig. 261.
 - b) Equals by Cooper B-Line.
- f. Concrete Inserts:
 - 1) Individual Inserts:

- a) Suitable for special nuts size **3/8 inch (9.5 mm)** through **7/8 inch (22 mm)** with yoke to receive concrete reinforcing rods, and with malleable iron lugs for attaching to forms.
- b) Type Two Acceptable Products:
 - (1) Anvil Fig. 282.
 - (2) Equals by Cooper B-Line.
- 2) Continuous Inserts:
 - a) Class Two Quality Standard: Equal to Unistrut P-3200 series.
- g. Steel Deck Bracket:
 - 1) Class Two Quality Standard: Equal to Unistrut P1000 with clamp nut, minimum **6 inch (150 mm)** 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 (2 400 mm)** on center maximum for pipe **1-1/4 inches (32 mm)** or larger and **72 inches (1 800 mm)** on center maximum for pipe **1-1/8 inch (29 mm)** or less.
 - 2) Support thermoplastic pipe at **48 inches (1 200 mm)** on center maximum.
 - 3) Support PEX pipe at **32 inches (800 mm)** 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.
 - d. Insulate hangers for copper pipe from piping by means of at least two layers of Scotch 33 plastic tape.
 2. Gas piping Identification:
 - a. Apply paint identification for gas piping used with HVAC equipment as specified in Section 23 0553.

END OF SECTION

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SECTION 22 0719

PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To:
 - 1. Furnish and install insulation on hot and cold water lines, fittings, valves, and accessories as described in Contract Documents.
 - 2. Furnish and install insulation on roof drain piping 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		
170 - 180 Deg F	Up to 1-1/4 In	1-1/2 to 2 In	Over 2 In
170 - 180 Deg F	One In	1-1/2 In	2 In
140 - 160 Deg F	1/2 In	One In	1-1/2 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 (13 mm) 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 (13 mm) 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.
 - c)
4. PP-R Piping, Above And Below Grade:
 - a. Insulation:
 - 1) 1/2 inch (13 mm) 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.
5. PVC or ABS Piping, Above And Below Grade - Facility Storm Drain:
 - a. Insulation:
 - 1) 1/2 inch (13 mm) 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. Piping up to **1-1/4 inch (32 mm)** Diameter:
 - a. Adhere 'factory applied vapor barrier jacket lap' smoothly and securely at longitudinal laps with white vapor barrier adhesive.
 - b. Adhere **3 inch (76 mm)** wide self-sealing butt joint strips over end joints.
 4. Piping **1-1/2 inches (38 mm)** Diameter And Larger:
 - a. Use broken-joint construction in application of two-layer covering.
 - b. Fill cracks and depressions with insulating cement mixed to thick plastic paste.
 - 1) Apply by hand in several layers to make up total specified thickness.
 - 2) Final layer shall have smooth uniform finish before application of covering.
 5. Fittings, Valves, And Accessories:
 - a. Do not apply insulation over flanged joints or victaulic couplings until piping has been brought up to operating temperature and flange bolts have been fully tightened. Insulate valves so wheel, stem, and packing nut are exposed.
 - b. 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.
 - c. Piping Up To **1-1/4 Inch (32 mm)** Diameter:
 - 1) Cover insulation with one piece fitting cover secured by stapling or taping ends to adjacent pipe covering.
 - 2) Alternate Method:
 - a) Insulate fittings, valves, and accessories with one inch of insulating cement and vapor seal with two **1/8 inch (3 mm)** wet coats of vapor barrier mastic reinforced with glass fabric extending **2 inches (50 mm)** onto adjacent insulation.
 - d. Piping **1-1/2 inches (38 mm)** To **2 Inches (50 mm)**:
 - 1) Insulate with hydraulic setting insulating cement or equal, to thickness equal to adjoining pipe insulation.
 - 2) Apply final coat of fitting mastic over insulating cement.
 - e. Piping **2-1/2 inch (64 mm)** And Larger:
 - 1) Insulate with segments of molded insulation securely wired in place and coated with skim coat of insulating cement.
 - 2) Apply fitting mastic, fitting tape and finish with final coat of fitting mastic.
 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 (1.64 mm)** by **6 inch (150 mm)** long galvanized shields at each pipe hanger to protect pipe insulation from crushing by clevis hanger.
 - 3) Provide **22 ga (0.85 mm)** by **6 inch (150 mm)** long galvanized shield at each pipe hanger to protect insulation from crushing by Unistrut type hanger.
 - c. At Pipe Hangers:
 - 1) Provide rigid calcium silicate insulation (**100 psi (690 kPA)** compressive strength) at least **2 inches (50 mm)** beyond shield.
 7. Protect insulation wherever leak from valve stem or other source might drip on insulated surface, with aluminum cover or shield rolled up at edges and sufficiently large in area and of shape that dripping will not splash on surrounding insulation.
- B. Below Grade Piping:
1. Slip underground pipe insulation onto pipe and seal butt joints.
 2. Where slip-on technique is not possible, slit insulation, apply to pipe, and seal seams and joints.

END OF SECTION

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SECTION 22 1116**DOMESTIC WATER PIPING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
1. Perform excavating and backfilling required by work of this Section.
 2. Furnish and install potable water piping complete with necessary valves, connections, and accessories inside building and connect with outside utility lines **5 feet (1 50 m)** from building perimeter as described in Contract Documents.
- B. Related Requirements:
- a. Pre-installation conference held jointly with other concrete related sections.
 2. Section 22 0501: 'Common Piping Requirements'.
 3. Section 22 0719: 'Plumbing Piping Insulation'.

1.2 REFERENCES

- A. Reference Standards:
1. American National Standards Institute / American Society of Sanitary Engineers:
 - a. ANSI/ASSE 1003-2009, 'Water Pressure Reducing Valves for Domestic Water Distribution Systems'.
 - b. ANSI/ASSE 1017-2009, 'Performance Requirements for Temperature Actuated Mixing Valves for Hot Water Distribution Systems'.
 - c. ANSI/ASSE 1070-2015, 'Performance Requirements for Water Temperature Limiting Devices'.
 2. American Water Works Association:
 - a. AWWA C904-16, 'Cross-Linked Polyethylene (PEX) Pressure Pipe, 1/2 inch (12 mm) Through 3 inch (76 mm) for Water Service'.
 3. ASTM International:
 - a. ASTM B88-14, 'Standard Specification for Seamless Copper Water Tube'.
 - b. ASTM E84-15b, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
 - c. ASTM F876-15a, 'Standard Specification for Crosslinked Polyethylene (PEX) Tubing'.
 - d. ASTM F877-11a, 'Standard Specification for Crosslinked Polyethylene (PEX) Hot- and Cold-Water Distribution Systems'.
 - e. ASTM F1807-15, 'Standard Specification for Metal Insert Fittings Utilizing a Copper Crimp Ring for SDR9 Cross-linked Polyethylene (PEX) Tubing and SDR9 Polyethylene of Raised Temperature (PE-RT) Tubing'.
 - f. ASTM F2023-15, 'Standard Test Method for Evaluating the Oxidative Resistance of Crosslinked Polyethylene (PEX) Tubing and Systems to Hot Chlorinated Water'.
 - g. ASTM F2389-15, 'Standard Specification for Pressure-rated Polypropylene (PP) Piping Systems'.
 4. NSF International Standard:
 - a. NSF P171, 'Protocol for Chlorine Resistance of Plastic Piping Materials' (1999).
 5. NSF International Standard / American National Standards Institute:
 - a. NSF/ANSI 14-2015, 'Plastic Piping System Components and Related Materials'.
 - b. NSF/ANSI 61-2015, 'Drinking Water System Components - Health Effects'.
 - c. NSF/ANSI 372-2016, 'Drinking Water System Components - Lead Content'.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Qualifications:
 - 1. Manufacturer Qualifications:
 - a. PP-R pipe and PP-RCT pipe:
 - 1) Certified by NSF International.
 - 2. Installers Qualifications:
 - a. PP-R pipe and PP-RCT pipe:
 - 1) Certified by Manufacturer.

1.4 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Manufacturer's Literature:
 - 1) PEX pipe and PEX pipe fittings.
 - 2) PP-R pipe and PP-R pipe fittings.
 - 3) PP-RCT pipe and PP-RCT pipe fittings.
 - 2. Samples:
 - a. PEX pipe fitting.
- B. Informational Submittals:
 - 1. Test And Evaluation Reports:
 - a. Written report of sterilization test.

1.5 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Meet NSF International Standards for materials or products that come into contact with drinking water, drinking water treatment chemicals, or both for chemical contaminants and impurities that are indirectly imparted to drinking water from products, components, and materials used in drinking water systems.
 - 2. California only: California Assembly Bill 1953 (AB1953) Compliant for Lead Free

1.6 WARRANTY

- A. Manufacturer Warranty:
 - 1. Manufacturer's Warranty covering property damage caused by defective product including renovation costs or replacement costs.

PART 2 - PRODUCTS

2.1 SYSTEMS

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Aquatherm, Inc., Lindon, UT www.aquathermpipe.com.
 - b. Acorn Controls, City of Industry, CA www.acorneng.com
 - c. Cash Acme, Cullman, AL www.cashacme.com
 - d. Chicago Faucets, Des Plaines, IL, www.chicagofaucets.com.
 - e. Cla-Val Company, Costa Mesa, CA or Cla-Val Canada Ltd, Beamsville, ON www.cla-val.com.
 - f. Conbraco Industries Inc, Matthews, NC www.conbraco.com or Conbraco (Honeywell Ltd), Scarborough, ON (416) 293-8111.

- g. Hammond Valve, New Berlin, WI www.hammondvalve.com.
- h. Handy & Harmon Products Div, Fairfield, CT www.handyharmon.com or Handy and Harmon of Canada Ltd, Rexdale, ON (800) 463-1465 or (416) 675-1860.
- i. Harris Products Group, Cincinnati, OH www.harrisproductsgroup.com.
- j. Honeywell Inc, Minneapolis, MN www.honeywell.com.
- k. Leonard Valve Co, Cranston, RI www.leonardvalve.com.
- l. Milwaukee Valve Co, New Berlin, WI www.milwaukeevalve.com.
- m. Nibco Inc, Elkhart, IN www.nibco.com.
- n. Nupi Americas, Early Branch, SC www.nupiamericas.com.
- o. Rehau, Leesburg, VA www.rehau-na.com.
- p. Sloan Valve Co, Franklin Park, IL www.sloanvalve.com.
- q. Spence Engineering Co, Walden, NY www.spenceengineering.com.
- r. Symmons Industries, Braintree, MA www.symmons.com.
- s. Uponor Inc, Apple Valley, MN www.uponor-usa.com.
- t. Viega ProPress, Wichita, KS www.viega-na.com.
- u. Watts Regulator Co, Andover, MA www.wattsreg.com.
- v. Wilkins (Zurn Wilkins), Paso Robles, CA www.zurn.com.
- w. Zurn PEX, Inc., Commerce, TX www.zurnpex.com.

B. Materials:

- 1. Design Criteria:
 - a. All drinking water products, components, and materials above and below grade used in drinking water systems must meet NSF International Standards for Lead Free.
 - b. No CPVC allowed.
- 2. Pipe:
 - a. Copper:
 - 1) Above-Grade:
 - a) Meet requirements of ASTM B88, Type L.
 - 2) Below-Grade:
 - a) Meet requirements of ASTM B88, Type K. **3/4 inch (19 mm)** minimum under slabs.
 - b) **2 inches (50 mm)** And Smaller: Annealed soft drawn.
 - c) **2-1/2 inches (64 mm)** And Larger: Hard Drawn.
 - b. Cross-Linked Polyethylene (PEX):
 - 1) Certified with NSF International against NSF Standards NSF/ANSI 14, NSF/ANSI 61, NSF/ANSI 372, and NSF P171 Protocol.
 - 2) Copper tube size (CTS) outside dimensions and Standard Dimension Ratio (SDR) of 9.
 - 3) Pressure rated for **160 psi (1.10 MPa)** at **73 deg F (22.8 deg C)**, **100 psi (0.69 MPa)** at **180 deg F (82 deg C)**, and **80 psi (0.552 MPa)** at **200 deg F (93 deg C)**.
 - 4) Marked with Manufacturer's name, design pressure and temperature ratings, and third party certification stamp for NSF-PW.
 - 5) Manufactured by Engel or peroxide method (PEX-A) or by silane method (PEX-B).
 - 6) 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.
 - c. Polypropylene-Random (PP-R):
 - 1) Above-Grade:
 - a) Meet requirements of ASTM F2389 and be certified by NSF International per ASTM F2389, NSF/ANSI 14, and NSF/ANSI 61.
 - b) Aquatherm: SDR 7.4 Greenpipe faser for domestic hot water and SDR 7.4 or SDR 11 greenpipe for domestic cold water. Aquatherm Lilac SDR 11 purple piping for recycled/reclaimed water systems.
 - c) Nupi Americas: Clima pipe for domestic Hot water SDR-7.3 or cold water SDR 11 Nupi Niron Monolayer purple pipe for recycled/ reclaimed water Systems.
 - 2) Below-Grade:
 - a) Meet requirements of ASTM F2389 and be certified by NSF International per ASTM F2389, NSF/ANSI 14, and NSF/ANSI 61.

- b) Aquatherm: SDR 7.4 Greenpipe faser for domestic hot water and SDR 7.4 or SDR 11 greenpipe for domestic cold water. Aquatherm Lilac SDR 11 purple piping for recycled/reclaimed water systems.
 - c) Nupi Americas: Clima pipe for domestic Hot water SDR-7.3 or cold water SDR 11 Nupi Niron Monolayer purple pipe for recycled/ reclaimed water Systems.
 - 3) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) Aquatherm Greenpipe, Greenpipe faser, and Lilac by Aquatherm.
 - b) Nupi Americas Clima pipe, and Nupi Niron.
- 3. Fittings:
 - a. For Copper Pipe: Wrought copper.
 - b. For PEX Pipe:
 - 1) 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.
 - c. For PP-R Pipe:
 - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) Greenpipe by Aquatherm.
 - b) Niron Clima by Nupi Americas.
- 4. Connections For Copper Pipe:
 - a. Above-Grade:
 - 1) Sweat copper type with 95/5 or 96/4 Tin-Antimony solder, Bridgit solder, or Silvabrite 100 solder. Use only lead-free solder.
 - 2) Viega ProPress System
 - b. Below Grade:
 - 1) Brazed using following type rods:
 - a) Copper to Copper Connections:
 - (1) AWS Classification BCuP-4 Copper Phosphorus (6 percent silver).
 - (2) AWS Classification BCuP-5 Copper Phosphorus (15 percent silver).
 - 2) Copper to Brass or Copper to Steel Connections: AWS Classification BAg-5 Silver (45 percent silver).
 - 3) Do not use rods containing Cadmium.
 - 4) Brazing Flux:
 - a) Approved Products:
 - (1) Stay-Silv white brazing flux by Harris Product Group.
 - (2) High quality silver solder flux by Handy & Harmon.
 - 5) Joints under slabs acceptable only if allowed by local codes.
- 5. Connections For PP-R Pipe:
 - a. Above-Grade:
 - 1) Socket-fusion, fusion-outlet, electrofusion, butt welding, and mechanical transition fittings including threaded adapters, groove adapters, and flanges.
 - b. Below-Grade:
 - 1) All joints shall be fusion-welded or electro-fusion welded PP-RCT except that flanges may be used when connecting to other piping systems. Mechanical fittings shall not be used below grade.
 - 2) Joints under slabs acceptable only if allowed by local codes.
- 6. Ball Valves:
 - a. Use ball valves exclusively unless otherwise specified. Ball valves shall be by single manufacturer from approved list below.
 - b. Valves shall be two-piece, full port for 150 psi (1.03 MPa) SWP.
 - 1) Operate with flow in either direction, suitable for throttling and tight shut-off.
 - 2) Body: Bronze, 150 psig (1.03 MPa) wsp at 350 deg F (177 deg C) and 400 psig (2.76 MPa) wog.
 - 3) Seat: Bubble tight at 100 psig (0.69 MPa) under water.
 - c. Class One Quality Standard: Nibco T585 or S585.
 - 1) Equal by Conbraco 'Apollo,' Hammond, Milwaukee, or Watts.
 - d. PP-R piping if used:
 - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:

- a) PP-R fusion-weld ball valves by Aquatherm.
 - b) PP-RCT Fusion by Nupi Americas.
7. Combination Pressure Reducing Valve / Strainer:
- a. Integral stainless steel strainer, or separate 'Y' strainer installed upstream of pressure reducing valve.
 - b. Meet ANSI/ASSE 1003 or CSA B356 requirements.
 - c. Built-in thermal expansion bypass check valve.
 - d. Class One Quality Standard: Watts LFU5B:
 - 1) Equal by Cash Acme, Cla-Val Hi Capacity, Conbraco 36C, Honeywell-Braukmann, Spence Hi Capacity, Watts, or Wilkins. See Section 01 6200.
8. Mixing Valve For Lavatories:
- a. Solid brass construction and CSA B125 certified.
 - b. Includes integral check valves and inlet screen. Features advanced paraffin-based actuation technology.
 - c. Flow of **5.7 GPM (21.58 LPM)** with maximum **10 psi (69 kPA)** pressure drop. Perform to minimum flow of **0.5 GPM (1.89 LPM)** in accordance with ASSE 1070.
 - d. Set for **110 deg F (43 deg C)** Service.
 - e. Match Construction Drawings for connection sizes.
 - f. Class One Quality Standard: Powers LFLM495. See Section 01 6200.
 - g. Acceptable Manufacturers: Acorn, Chicago Faucets, 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. PP-R Piping:
 - a. Test in accordance with Manufacturer's instructions prior to covering.
 - 1) Provide documentation.

3.3 CLEANING

- A. Sterilize potable water system with solution containing 200 parts per million minimum of available chlorine and maintaining pH of 7.5 minimum. Introduce chlorinating materials into system in manner approved by Architect/Engineer. Allow sterilization solution to remain for twenty-four (24) hours and open and close valves and faucets several times during that time.
- B. After sterilization, flush solution from system with clean water until residual chlorine content is less than 0.2 parts per million.
- C. Water system will not be accepted until negative bacteriological test is made on water taken from system. Repeat dosing as necessary until such negative test is accomplished.

END OF SECTION

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SECTION 22 1119**DOMESTIC WATER PIPING SPECIALTIES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install miscellaneous potable water piping specialties as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 22 0501: 'Common Plumbing Requirements'.

1.2 REFERENCES

- A. Reference Standards:
 - 1. NSF International Standard / American National Standards Institute:
 - a. NSF/ANSI 61-2014a, 'Drinking Water System Components - Health Effects'.
 - b. NSF/ANSI 372-2011, 'Drinking Water System Components - Lead Content'.

1.3 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Meet NSF International Standards for materials or products that come into contact with drinking water, drinking water treatment chemicals, or both for chemical contaminants and impurities that are indirectly imparted to drinking water from products, components, and materials used in drinking water systems.

PART 2 - PRODUCTS**2.1 ACCESSORIES**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Ashcroft, Stratford, CT www.ashcroftinc.com.
 - b. H O Trerice, Oak Park, MI www.hotco.com.
 - c. IPS Corporation, Compton, CA www.ipscorp.com.
 - d. Josam Co, Michigan City, IN www.josam.com.
 - e. Jay R. Smith Manufacturing Co, Montgomery, AL www.jrsmith.com.
 - f. Prier Products, Inc., Grandview, MD www.prier.com.
 - g. Proset Systems Inc., Lawrenceville, GA www.prosetsystems.com.
 - h. Sioux Chief Manufacturing Co, Peculiar, MO www.siouxchief.com.
 - i. Sure Seal, Tacoma, WA www.thesureseal.com.
 - j. Wade (Division of Tyler Pipe), Tyler, TX www.wadedrains.com.
 - k. Watts Drainage, Spindale, NC www.watts.com or Watts Industries, Burlington, ON, Canada www.wattscda.com.
 - l. Weiss Instruments, Inc., Holtsville, NY www.weissinstruments.com.
 - m. Woodford Manufacturing, Colorado Springs, CO www.woodfordmfg.com.
 - n. Zurn Cast Metals, Erie, PA or Zurn Industries Limited, Mississauga, ON www.zurn.com.
- B. Materials:

1. Trap Guard Trap Seal:
 - a. Design Criteria:
 - 1) Not required to meet NSF International Standards for Lead Free.
 - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Trap Guard by Proset:
 - a) Install per Manufacturer's recommendations.
 - 2) Sure Seal by Sure Seal:
 - a) Install per Manufacturer's recommendation.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Gauges: Connect to pipe with **1/4 inch (6 mm)** connections utilizing gauge cocks.

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.
 - 2. Perform excavation and backfill required by work of this Section.
- B. Related Requirements:
 - 1. Section 22 0501: 'Common Plumbing Requirements'.
 - 2. Section 22 1319: 'Facility Sanitary Sewer Specialties' for furnishing of sewer specialties.

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. American National Standards Institute / American Water Works Association:
 - a. ANSI/AWWA C110/A21.10-12, 'Ductile-Iron and Gray-Iron Fittings'.
 - b. ANSI/AWWA C111/A21.11-12, 'Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings'.
 - c. ANSI/AWWA C115/A21.15-11, 'Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges'.
 - d. ANSI/AWWA C116/A21.16-15, 'Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings for Water Supply Service'.
 - e. ANSI/AWWA C150/A21.50-14, 'Thickness Design of Ductile-Iron Pipe'.
 - f. ANSI/AWWA C151/A21.51-09, 'Ductile-Iron Pipe, Centrifugally Cast, for Water'.
 - g. ANSI/AWWA C153/A21.53-11, 'Ductile-Iron Compact Fittings for Water Service'.
 - 2. American Water Works Association (AWWA):
 - a. AWWA M41, 'Ductile-Iron Pipe and Fittings' (3rd Edition).
 - 3. ASTM International:
 - a. ASTM A74-15, 'Standard Specification for Cast Iron Soil Pipe and Fittings'.
 - b. ASTM A888-15, 'Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications'.
 - c. ASTM C564-14, 'Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings'.
 - d. ASTM D2235-04(2011), 'Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings'.
 - e. ASTM D2321-14, 'Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications'.
 - f. ASTM D2564-12, 'Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems'.
 - g. ASTM D3034-14, 'Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings'.
 - h. ASTM F628-12, 'Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe With a Cellular Core'.
 - i. ASTM F656-15, 'Standard Specification for Primers for Use in Solvent Cement Joints of Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings'.

- j. ASTM F891–10, 'Standard Specification for Coextruded Poly(Vinyl Chloride) (PVC) Plastic Pipe With a Cellular Core'.
4. Cast Iron Soil Pipe Institute:
 - a. CISPI Standard 301-09, 'Standard Specification for Hubless Cast Iron Soil Pipe End Fittings for Sanitary & Storm Drain, Waste, and Vent Piping Applications'.
 - b. CISPI 310-11, 'Standard Specification for Couplings for use in connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications'.
 - c. CISPI Handbook. 'Cast Iron Soil Pipe and Fittings Handbook' (2006).
5. International Code Council:
 - a. ICC IPC-2015, 'International Plumbing Code'.

PART 2 - PRODUCTS

2.1 SYSTEMS

A. Manufacturers:

1. Manufacturer Contact List:
 - a. American Brass & Iron (AB&I), Oakland, CA www.abifoundry.com.
 - b. Clamp-All Corp, Haverhill, MA www.clampall.com.
 - c. Anaco-Husky, Corona, CA www.anaco-husky.com.
 - d. Josam Co, Michigan City, IN www.josam.com.
 - e. Jay R. Smith Manufacturing Co, Montgomery, AL www.jrsmith.com.
 - f. MG Piping Products Co, Stanton, CA www.mgcoupling.com.
 - g. Mifab Manufacturing Inc, Chicago, IL www.mifab.com.
 - h. Mission Rubber Co., Corona, CA www.missionrubber.com.
 - i. Wade Div Tyler Pipe, Tyler, TX www.wadedrains.com.
 - j. Watts Drainage, Spindale, NC www.watts.com or Watts Industries, Burlington, ON, Canada www.wattscda.com.
 - k. Zurn Cast Metals, Erie, PA or Zurn Industries Limited, Mississauga, ON www.zurn.com.

B. Performance:

1. Design Criteria:
 - a. Minimum size of waste piping installed under floor slab on grade shall be **2 inches (50 mm)**.

C. Materials:

1. Use materials and fittings to match and tie in with existing piping on site.
2. 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.
3. Piping And Fittings: ABS Schedule 40 cellular core plastic pipe and pipe fittings meeting requirements of ASTM F628, joined with pipe cement meeting requirements of ASTM D2235.
 - a. Furnish wall cleanouts with chrome wall cover and screw.
4. Cast Iron Buried Piping:
 - a. Approved Types: Service weight, single-hub or no-hub type cast iron soil pipe meeting requirements of ASTM A74.
 - b. Joint Material:
 - 1) Single-Hub: Rubber gaskets meeting requirements of ASTM C564.
 - 2) No-Hub:
 - a) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - b) American Brass & Iron: SuperGrip 304.
 - c) Anaco-Husky: Husky SD 4000 coupling.
 - d) Clamp-All: Neoprene gaskets with type 304 stainless steel clamp and 24 ga type 304 stainless steel housing.
 - e) Mission Rubber: Heavy weight coupling.

- f) MG Piping: MG Coupling.
- g) Mifab: MI-XHUB – Heavy duty shielded coupling type 301 or 304 stainless steel.
- 5. Cast Iron Above Grade Piping And Vent Lines:
 - a. Approved Types:
 - 1) Service weight, single-hub or no-hub type cast iron soil pipe meeting requirements of ASTM A74.
 - 2) Vent lines **2-1/2 inches (64 mm)** or smaller may be Schedule 40 galvanized steel.
 - b. Joint Material:
 - 1) Single-Hub: Rubber gaskets meeting requirements of ASTM C564.
 - 2) No-Hub Pipe: Neoprene gaskets with stainless steel cinch bands.
- 6. Cast Iron Fittings:
 - a. Cast Iron Pipe: Hub and spigot, except fittings for no-hub pipe shall be no-hub, and meet requirements of ASTM A74.
 - 1) Joint Material: Rubber gaskets meeting requirements of ASTM C564.
 - 2) Galvanized Pipe: Screwed Durham tarred drainage type.
 - b. Traps installed on cast iron bell and spigot pipe shall be service weight cast iron. Traps installed on threaded pipe shall be recess drainage pattern type.
 - c. P-Traps:
 - 1) Trap shall have clean out plug if installed in other than slab on grade.
 - 2) Type Two Acceptable Products.
 - a) JR Smith: 7220 deep seal cast iron.
 - b) Mifab: MI-950.
 - c) Zurn: Zurn Z-1000.
 - d) Equal as approved by Architect before installation. See Section 01 6200.
- 7. Cleanouts:
 - a. Furnish wall cleanouts with chrome wall cover and screw.
 - b. Type Two Acceptable Products:
 - 1) Finish Floors:
 - a) Josam: 56010.
 - b) J. R. Smith: 4023.
 - c) Mifab: C1100C-R-1.
 - d) Wade: W-6000.
 - e) Watts: CO-200-R.
 - f) Zurn: Z-1402.
 - 2) Finished Wall:
 - a) Josam: 58790.
 - b) J. R. Smith: 4530.
 - c) Mifab: C1460RD.
 - d) Wade: W8560E.
 - e) Watts: CO-460-RD.
 - f) Zurn: Z-1446.
 - 3) General Purpose:
 - a) Josam: 58900.
 - b) J. R. Smith: 4400.
 - c) Mifab: C1300-MF
 - d) Wade: W8550E.
 - e) Watts: CO-380.
 - f) Zurn: Z-1440.
 - 4) Equal as approved by Architect before installation. See Section 01 6200.

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. Metal Pipe And Fittings:
1. Provide depression under bell of each joint to maintain even bearing of sewer pipe.
 2. Connect to street main as required by local authorities.
 3. Use jacks to make-up gasketed joints.
 4. Do not caulk threaded work.
 5. Use torque wrench to obtain proper tension in cinch bands when using hubless cast iron pipe. Butt ends of pipe against centering flange of coupling.
- C. 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.
- D. Install piping so cleanouts may be installed as follows:
1. Where shown on Drawings and near bottom of each stack and riser.
 2. At every 135 degrees of accumulative change in direction for horizontal lines.
 3. Every **100 feet (30 meters)** of horizontal run.
 4. 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.
- E. 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.
- F. 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.

- G. Furnish and install firestopping at penetrations of fire-rated structures as required under Sections 07 8400 and 22 0501.
- H. 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. Metal Pipe System: After backfilling and compacting of trenches is complete but before placing floor slab, fill waste and vent system with water to roof level or **10 feet (3 meters)** minimum, and show no leaks for two hours. Uncover pipe and correct leaks and defective work. Re-backfill and compact and re-test.
 - 3. Thermoplastic Pipe System:
 - a. Before backfilling and compacting of trenches, Fill waste and vent system with water to roof level or **10 feet (3 meters)** minimum, and show no leaks for two hours. Correct leaks and defective work.
 - b. After backfilling and compacting of trenches is complete but before placing floor slab, re-test as specified above. Uncover pipe and correct leaks and defective work. Re-backfill and compact and re-test.

END OF SECTION

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SECTION 22 1319**FACILITY SANITARY SEWER SPECIALTIES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under this Section as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 09 3013: 'Ceramic Tile' for floor drains in ceramic tile floors.
 - 2. Section 22 0501: 'Common Plumbing Requirements'.
 - 3. Section 22 1119: 'Domestic Water Piping Specialties'.
 - 4. Section 22 1313: 'Facility Sanitary Sewers' for installation of miscellaneous sanitary sewer specialties.

PART 2 - PRODUCTS**2.1 SYSTEMS**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Josam Co, Michigan City, IN www.josam.com.
 - b. Jay R. Smith Manufacturing Co, Montgomery, AL www.jrsmith.com.
 - c. Mifab Manufacturing Inc, Chicago, IL www.mifab.com.
 - d. Proset Systems, Lawrenceville, GA www.prosetsystems.com.
 - e. Sioux Chief Manufacturing Co, Peculiar, MO www.siouxchief.com.
 - f. Sureseal Manufacturing, Tacoma WA www.thesureseal.com.
 - 1) Contact Information:
 - a) All Areas except Idaho and Utah: Rick Ensley (253) 564-0624, rick@thesureseal.com.
 - b) Idaho and Utah Areas: Mark Evans, phone (801) 748-1222, mark@franklinjames.com.
 - g. Wade Div Tyler Pipe, Tyler, TX www.wadedrains.com.
 - h. Watts Drainage, Spindale, NC www.watts.com or Watts Industries, Burlington, ON, Canada www.wattscda.com.
 - i. Zurn Industries, LLC, Erie PA www.zurn.com. or Zurn Industries Ltd, Mississauga, ON (905) 795-8844.
- B. Performance:
 - 1. Design Criteria:
 - a. All materials NOT required to be low lead compliant.
- C. Components:
 - 1. Drains And Drain Accessories:
 - a. Floor Drain FD-1:
 - 1) Approved types with deep seal trap and chrome plated 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. Condensate Receptor:

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

a) Trap seal by Sureseal. Provide model number to match floor drain.

b. 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 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.
 - 2. Salvage and reinstall existing 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 A112.19.2-2013/CSA B45.1-13, 'Ceramic Plumbing Fixtures'.

1.3 SUBMITTALS

- A. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Operation and Maintenance Data:
 - 1) Sensor Operated operation and maintenance manuals.

PART 2 - PRODUCTS**2.1 ASSEMBLIES**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. American Standard Brands, Piscataway, NJ www.americanstandard-us.com or American Standard Canada, Mississauga, ON www.americanstandard.ca.
 - b. AMTC - Advanced Modern Technologies Corp, Woodland Hills, CA www.amtcorporation.com.
 - c. Bemis Manufacturing Co, Sheboygan Falls, WI www.bemismfg.com.
 - d. Beneke by Sanderson Plumbing Products, Columbus, MS www.sppi.com.
 - e. Church Seat Co, Sheboygan Falls WI www.churchseats.com.
 - f. Delany Flush Valves, Charlottesville, VA www.delanyproduct.com.

- g. Delta Faucet Co, Indianapolis, IN www.deltafaucet.com or Delta Faucet Canada, London, ON (519) 659-3626.
 - h. Dearborn Brass, Cleveland, OH www.dearbornbrass.com.
 - i. Gerber Plumbing Fixtures LLC, Woodridge, IL www.gerberonline.com.
 - j. Josam Co, Michigan City, IN www.josam.com.
 - k. Jay R. Smith Mfg. Co, Montgomery, AL www.jrsmith.com.
 - l. Kohler Co Plumbing Div, Kohler, WI www.us.kohler.com.
 - m. McGuire Manufacturing Co, Cheshire, CT www.mcguiremfg.com.
 - n. Mifab Manufacturing Inc, Amherst, NY www.mifab.com.
 - o. Moen Incorporated, North Olmsted, OH, or Moen Canada, Oakville, ON www.moen.com.
 - p. Olsonite Corp, Newnan, GA www.olsonite.net or Olsonite Co Ltd, Tilbury, ON (519) 682-1240.
 - q. Sloan Valve Co, Franklin Park, IL www.sloanvalve.com.
 - r. South Fork Manufacturing, Coalville, UT (801) 953-3001 www.dirt-grabber.com.
 - s. Toto U.S.A., Inc., Morrow, GA www.totousa.com
 - t. Wade Div Tyler Pipe, Tyler, TX www.wadedrains.com.
 - u. Watts Drainage, Spindale, NC www.wattsdrainage.com or Watts Industries, Burlington, ON, Canada www.wattscda.com.
 - v. Zurn Industries, LLC, Erie PA www.zurn.com. or Zurn Industries Ltd, Mississauga, ON (905) 795-8844.
- B. Performance:
- 1. Design Criteria:
 - a. Meet or exceed ASME A112.19.2/CSA B45.1 for Vitreous China Plumbing Fixtures.
 - b. Interior exposed pipe, valves, and fixture trim, including trim behind custom casework doors, shall be chrome plated.
 - c. All materials NOT required to be low lead compliant.
 - d. Do not use toilets with effective flush volume of less than **1.28 gallons (4.8 liters)**.
- C. Materials:
- 1. Water Closets:
 - a. Floor Mounted With Tank:
 - 1) Handicap Accessible Fixture:
 - a) Water usage of **1.6 gallons (6 liters)** per flush.
 - b) **18 inch (450 mm)** maximum rim height.
 - c) MaP Score of 1000 grams.
 - (1) Salvage and reinstall existing.
 - 2. Water Closet Accessories:
 - a. Seats:
 - 1) Provide split front type with check hinge.
 - (1) Salvage and reinstall existing.
 - 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'.
 2. Support fixture hanger or arm free of finished wall.
- C. Provide each individual fixture supply with accessible chrome-plated stop valve with hand wheel.
- D. 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

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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 A117.1-2009, 'Standard for Accessible and Usable Buildings and Facilities'.
 - 2. American Society of Mechanical Engineers / Canadian Standards Association (CSA Group):
 - a. ASME A112.18.1-2012/CSA B125.1-12, 'Plumbing Supply Fittings'.
 - b. ASME A112.19.1-2013/CSA B45.2-13, 'Enamelled cast iron and enamelled steel plumbing fixtures'.
 - c. ASME A112.19.3-2008/CSA B45.4-08 (R2013), 'Stainless steel plumbing fixtures'.
 - 3. NSF International Standard / American National Standards Institute:
 - a. NSF/ANSI 61-2015, '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.
 - 2. California only: California Assembly Bill 1953 (AB1953) Compliant for Lead Free.

1.4 SUBMITTALS

- A. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Warranty Documentation:
 - 1) Final, executed copy of Warranty.

1.5 WARRANTY

- A. Manufacturer Warranty:
 - 1. Manufacturer's standard Warranty against material or Manufacturing defects.

PART 2 - PRODUCTS

2.1 ASSEMBLIES

A. Manufacturers:

1. Manufacturer Contact List:
 - a. American Standard Brands, Piscataway, NJ www.americanstandard-us.com or American Standard Canada, Mississauga, ON www.americanstandard.ca.
 - b. Brocar Products Inc, Cincinnati, OH www.brocar.com.
 - c. CECO, Huntington Park, CA www.cecosinks.com.
 - d. Chicago Faucet Co, Des Plaines, IL www.chicagofaucets.com.
 - e. Dearborn Brass, Tyler, TX www.dearbornbrass.com.
 - f. Delta Faucet Co, Indianapolis, IN www.deltafaucet.com or Delta Faucet Canada, London, ON (519) 659-3626.
 - g. Engineered Brass Co. (EBC) (Just Manufacturing Co.), Franklin Park, IL www.justmfg.com.
 - h. Elkay Manufacturing Co, Oak Brook, IL www.elkay.com.
 - i. Gerber Plumbing Fixtures LLC, Woodridge, IL www.gerberonline.com.
 - j. Josam Co, Michigan City, IN www.josam.com.
 - k. Jay R. Smith Manufacturing Co, Montgomery, AL www.jrsmith.com.
 - l. Just Manufacturing Co, Franklin Park, IL www.justsinks.com.
 - m. Keeney Manufacturing Co, Newington, CT www.keeneymfg.com.
 - n. Kindred USA, Midland, ON www.kindred-sinkware.com.
 - o. Kohler Co Plumbing Div, Kohler, WI www.us.kohler.com.
 - p. McGuire Manufacturing Co, Cheshire, CT www.mcguiremfg.com.
 - q. Mifab Manufacturing Inc, Amherst, NY www.mifab.com.
 - r. Moen Incorporated, North Olmsted, OH, or Moen Canada, Oakville, ON www.moen.com.
 - s. Omni Flow Controls, Harbor City, CA www.chronomite.com or www.omniflowcontrols.com.
 - t. Plumberex Specialty Products, Palm Springs, CA www.plumberex.com.
 - u. Sloan Valve Co, Franklin Park, IL www.sloanvalve.com.
 - v. Speakman Company, New Castle, DE www.speakmancompany.com.
 - w. Symmons, Braintree, MA www.symmons.com.
 - x. T & S Brass & Bronze Works Inc, Travelers Rest, SC www.tsbrass.com.
 - y. TrueBro Inc, Collierville, TN www.truebro.com.
 - z. Wade Div Tyler Pipe, Tyler, TX www.wadedrains.com.
 - aa. Watts Drainage, Spindale, NC www.wattsdrainage.com or Watts Industries, Burlington, ON, Canada www.wattscda.com.
 - bb. Zurn Commercial Brass, Sanford, NC www.zurn.com or Zurn Industries Ltd, Mississauga, ON (905) 795-8844.
 - cc. Zurn Cast Metal, Erie, PA www.zurn.com.

B. Performance:

1. Design Criteria:
 - a. Interior exposed pipe, valves, and fixture trim, including trim behind custom casework doors, shall be chrome plated.
 - b. Faucets and other fixture fittings shall conform to requirements of ASME A112.18.1/CSA B125.1.
 - c. Lavatories shall conform to requirements of:
 - 1) Enamelled cast iron and enamelled steel fixtures.
 - a) ASME A112.19.1/CSA B45.2.
 - b) CSA B45.2/ASME A112.19.1.

C. Components:

1. Lavatories And Fittings:
 - a. Standard and Handicap Accessible Self Supporting Lavatories:
 - 1) Size: **20 by 18 inches** (500 by 450 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 Handicap 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 Handicap Accessible Lavatories:
 - a) Description:
 - (1) Provide protection on water supply pipes and on trap.
 - b) Design Criteria:
 - (1) Not required to meet NSF International Standards for Lead Free.
 - c) 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.

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 and counter top fixtures to countertop 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. Self-Supporting Lavatories: Install using carriers. Support carrier free of finished wall.
- G. Install Safety Covers on all under sink / lavatories with exposed water supply pipes and traps.
- H. Install Handicap Accessible Lavatories as per ADA height mounting requirements.

3.2 CLEANING

- A. Polish chrome finish at completion of Project.

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 0713 DUCT INSULATION

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

END OF TABLE OF CONTENTS

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SECTION 23 0501**COMMON HVAC REQUIREMENTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Common requirements and procedures for HVAC systems.
 - 2. Responsibility for proper operation of electrically powered equipment furnished under this Division.
 - 3. Interface with Testing And Balancing Agency.
 - 4. Furnish and install sealants relating to installation of systems installed under this Division.
 - 5. Furnish and install Firestop Penetration Systems for HVAC system penetrations as described in Contract Documents.
 - 6. Furnish and install sound, vibration, and seismic control elements.
- B. Products Furnished But Not Installed Under This Section:
 - 1. Sleeves, inserts, and equipment for mechanical systems installed under other Sections.
- C. Related Requirements:
 - 1. Section 05 0523: 'Metal Fastening' for quality and requirements for welding.
 - 2. Section 07 9213: 'Elastometric Joint Sealant' for quality of sealants used at building exterior.
 - 3. Section 07 9219: 'Acoustical Joint Sealants' for quality of acoustical sealants.
 - 4. Sections Under 09 9000 Heading: Painting of mechanical items requiring field painting.
 - 5. Division 26: Raceway and conduit, unless specified otherwise, line voltage wiring, outlets, and disconnect switches.
 - 6. 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. 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 T7350 thermostat 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.

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 (240 km) from Project site is used, provide service / warranty work agreement for warranty period with local HVAC sub-contractor approved by Architect. Include copy of service / warranty agreement in warranty section of Operation And Maintenance Manual.

PART 2 - PRODUCTS

2.1 COMPONENTS

- A. Components shall bear Manufacturer's name and trade name. Equipment and materials of same general type shall be of same make throughout work to provide uniform appearance, operation, and maintenance.
- B. Pipe And Pipe Fittings:
1. Use domestic made pipe and pipe fittings on Project.
 2. Weld-O-Let and Screw-O-Let fittings are acceptable.
- C. Sleeves:
1. In Framing: Standard weight galvanized iron pipe, Schedule 40 PVC, or 14 ga (2 mm) galvanized sheet metal two sizes larger than bare pipe or insulation on insulated pipe.
 2. In Concrete And Masonry: Sleeves through outside walls, interior shear walls, and footings shall be schedule 80 black steel pipe with welded plate.
- D. Valves:
1. Valves of same type shall be of same manufacturer.

PART 3 - EXECUTION

3.1 INSTALLERS

A. Acceptable Installers:

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 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.
 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. Electrical Coordination:
1. The contractor shall verify motor voltages with the electrical drawings before ordering motorized equipment and controls. Motor name plate voltage shall be NEMA standard 200 volt for 208 volt three phase system and shall be NEMA standard 200 volt for 208 volt three phase or signal phase. Starter heaters installed shall be coordinated with the name plate data.

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 (9 meters) of straight run.
 - 2) Provide 12 inch (300 mm) offset below roof line in each vent line penetrating roof.
 3. Provide sleeves around pipes passing through concrete or masonry floors, walls, partitions, or structural members. Do not place sleeves around soil, waste, vent, or roof drain lines passing through concrete floors on grade. Seal sleeves with specified sealants.
 - a. Sleeves through floors shall extend 1/4 inch (6 mm) above floor finish in mechanical equipment rooms above basement floor. In other rooms, sleeves shall be flush with floor.
 - b. Sleeves through floors and foundation walls shall be watertight.
 4. Provide spring clamp plates (escutcheons) where pipes run through walls, floors, or ceilings and are exposed in finished locations of building. Plates shall be chrome plated heavy brass of plain pattern and shall be set tight on pipe and to building surface.
 5. Remove dirt, grease, and other foreign matter from each length of piping before installation.
 - a. After each section of piping used for movement of water or steam is installed, flush with clean water, except where specified otherwise.
 - b. Arrange temporary flushing connections for each section of piping and arrange for flushing total piping system.
 - c. Provide temporary cross connections and water supply for flushing and drainage and remove after completion of work.
- E. Penetration Firestops: Install Penetration Firestop System appropriate for penetration at HVAC system penetrations through walls, ceilings, roofs, and top plates of walls.
- F. Sealants:
1. Seal openings through building exterior caused by penetrations of elements of HVAC systems.
 2. Furnish and install acoustical sealant to seal penetrations through acoustically insulated walls and ceilings.

3.5 REPAIR / RESTORATION

- A. Each Section of this Division shall bear expense of cutting, patching, repairing, and replacing of work of other Sections required because of its fault, error, tardiness, or because of damage done by it.
1. Patch and repair walls, floors, ceilings, and roofs with materials of same quality and appearance as adjacent surfaces unless otherwise shown.
 2. Surface finishes shall exactly match existing finishes of same materials.

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. 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.

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. Sections Under 09 9000 Heading: Painting of mechanical items requiring field painting.
 - 3. 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.cooperblineline.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
5/8 inch	4 to 5 inches
3/4 inch	6 inches
7/8 inch	8 to 12 inches

- b. Support rods for multiple pipes supported on steel angle trapeze hangers shall be in accordance with following table:

Rods		Number of Pipes per Hanger for Each Pipe Size						
No.	Diameter	2 Inch	2.5 Inch	3 Inch	4 Inch	5 Inch	6 Inch	8 Inch
2	3/8 Inch	Two	0	0	0	0	0	0
2	1/2 Inch	Three	Three	Two	0	0	0	0
2	5/8 Inch	Six	Four	Three	Two	0	0	0

2	5/8 Inch	Nine	Seven	Five	Three	Two	Two	0
2	5/8 Inch	Twelve	Nine	Seven	Five	Three	Two	Two

- 1) Size trapeze angles so bending stress is less than 10,000 psi (69 Mpa).

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.

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 (2 400) mm on center maximum for pipe 1-1/4 inches (32 mm) or larger and 72 inches (1 800 mm) on center maximum for pipe 1-1/8 inch (28 mm) or less.
 - 2) Support thermoplastic pipe at 48 inches (1 200 mm) 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 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, diffuser drops, and duct silencers same as ductwork.

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 07 9219: 'Acoustical Joint Sealants' for quality of acoustic sealant.
 - 2. 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' (Third Edition).

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference: Schedule conference immediately before installation of ductwork.

1.4 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data: Specification data on sealer and gauze proposed for sealing ductwork.
 - 2. Samples: Sealer and gauze proposed for sealing ductwork.
- B. Informational Submittals:
 - 1. Manufacturer Instructions:
 - a. Installation manuals providing detailed instructions on assembly, joint sealing, and system pressure testing for leaks.

PART 2 - PRODUCTS**2.1 ASSEMBLIES**

- A. Performance:
 - 1. Design Criteria:
 - a. Standard Ducts: Construction details not specifically called out in Contract Documents shall conform to applicable requirements of SMACNA, 'HVAC Duct Construction Standards - Metal and Flexible'.
- B. Materials:
 - 1. Duct Hangers:
 - a. **One inch (25 mm)** by **18 ga (1.27 mm)** galvanized steel straps or steel rods as shown on Drawings, and spaced not more than **96 inches (2 400 mm)** apart. Do not use wire hangers.

- b. Attaching screws at trusses shall be **2 inch (50 mm)** No. 10 round head wood screws. Nails not allowed.
- c. Attach threaded rod to steel joist with Anvil Steel washer plate Fig. 60. Double nut connection.

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. Products Installed But Not Furnished Under This Section:
 - 1. Duct smoke detectors.
- C. Related Requirements:
 - 1. Section 23 0713: 'Duct Insulation' for thermal Insulation for ducts, plenum chambers, and casings.
 - 2. Section 23 3001: 'Common Duct Requirements'.

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' (Third Edition).
- B. Reference Standards:
 - 1. ASTM International:
 - a. ASTM A653/A653M-13, 'Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process'.
 - b. ASTM E84-14, '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'; (2010 - Tenth Edition).

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, DP 1030 or DP 1015 by Design Polymerics, Fountain Valley, CA www.designpoly.com.
 - 3) PROseal, FIBERseal, EVERseal, or EZ-seal by Ductmate Industries, Inc., Charleroi, PA www.ductmate.com.
 - 4) SAS by Duro Dyne, Bay Shore, NY or Duro Dyne Canada, Lachine, QB www.durodyne.com.
 - 5) Iron Grip 601 by Hardcast Inc, Wylie, TX www.hardcast.com.
 - 6) MTS100 or MTS 200 by Hercules Mighty Tough, Denver CO, www.herculesindustries.com.
 - 7) 15-325 by Miracle / Kingco, Div ITW TACC, Rockland, MA www.taccint.com.
 - 8) 44-39 by Mon-Eco Industries Inc, East Brunswick, NJ www.mon-ecoindustries.com.
 - 9) Airseal Zero by Polymer Adhesive Sealant Systems Inc, Weatherford, TX www.polymeradhesives.com.
 - 10) Airseal #22 Water Base Duct Sealer by Polymer Adhesive Sealant Systems Inc, Weatherford, TX www.polymeradhesives.com.
3. Duct Sealer For Exterior Ducts:
 - a. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Two Part II Sealing System including RTA-50 liquid adhesive and DT-5300 for **3 inch (76 mm)** and DT 5400 for **4 inch (100 mm)** tape by Hardcast Inc, Wylie, TX www.carlislehvac.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. Round Duct:

- 1) Spiral Seam:
 - a) 28 ga (0.38 mm) minimum for ducts up to and including 14 inches (355 mm) in diameter.
 - b) 26 ga (0.46 mm) minimum for ducts over 14 inches (355 mm) and up to and including 26 inches (660 mm) in diameter.
- 2) Longitudinal Seam:
 - a) 28 ga (0.38 mm) minimum for ducts up to and including 8 inches (200 mm) in diameter.
 - b) 26 ga (0.46 mm) minimum for ducts over 8 inches (200 mm) and up to 14 inches (355 mm) in diameter.
 - c) 24 ga (0.61 mm) minimum for ducts over 14 inches (355 mm) up to and including 26 inches (660 mm) in diameter.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Metal duct surface must be clean and free of moisture, contamination and foreign matter before applying duct sealer for interior and exterior ducts.

3.2 INSTALLATION

- A. Install internal ends of slip joints in direction of flow. Seal transverse and longitudinal joints air tight using specified duct sealer as per Manufacturer's written instructions. Cover horizontal and longitudinal joints on exterior ducts with two layers of specified tape installed with specified adhesive.
- B. Securely anchor ducts and plenums to building structure with specified duct hangers attached with screws. Do not hang more than one duct from a duct hanger. Brace and install ducts so they shall be free of vibration under all conditions of operation.
- C. Ducts shall not bear on top of structural members.
- D. Paint ductwork visible through registers, grilles, and diffusers flat black.
- E. Properly flash where ducts protrude above roof.
- F. Under no conditions will pipes, rods, or wires be allowed to penetrate ducts.
- G. Where ducts are shown connecting to concrete or masonry openings and along edges of plenums at floors and walls, provide continuous 2 by 2 by 1/4 inches (50 by 50 by 6 mm) galvanized angle iron.
 1. Bolt angle iron to structure and make airtight by applying sealant between angle and structure.
 2. Bolt or weld sheet metal at these locations to angle and caulk airtight.
 3. Apply two coats of aluminum paint to angles after installation.

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 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 Filters Inc, Baltimore, MD www.afinc.com.
 - d. Air-Rite Manufacturing, Bountiful, UT (801) 295-2529.
 - e. American Warming & Ventilating, Holland, OH www.american-warming.com.
 - f. Arrow United Industries, Wyalusing, PA www.arrowunited.com.
 - g. Cain Manufacturing Company Inc, Pelham, AL www.cainmfg.com.
 - h. C & S Air Products, Fort Worth, TX www.csairproducts.com.
 - i. CertainTeed Corp, Valley Forge, PA www.certainteed.com.
 - j. Cesco Products, Florence, KY www.cescoproducts.com.
 - k. Daniel Manufacturing, Ogden, UT (801) 622-5924.
 - l. Design Polymeric, Fountain Valley, CA www.designpoly.com.
 - m. Ductmate Industries Inc, East Charleroi, PA www.ductmate.com.
 - n. Duro Dyne, Bay Shore, NY www.durodyne.com.
 - o. Dyn Air Inc. Lachine, QB www.dynair.ca
 - p. Elgen Manufacturing Company, Inc. East Rutherford, NJ www.elgenmfg.com
 - q. Flexmaster USA Inc, Houston, TX www.flexmasterusa.com.
 - r. Greenheck Corp, Schofield, WI www.greenheck.com.
 - s. Gripnail Corp, East Providence, RI www.gripnail.com.
 - t. Hardcast Inc, Wylie, TX www.hardcast.com.
 - u. Hercules Industries, Denver, CO, www.herculesindustries.com.
 - v. Honeywell Inc, Minneapolis, MN www.honeywell.com.
 - w. Industrial Acoustics Co, Bronx, NY www.industrialacoustics.com.

- x. Johns-Manville, Denver, CO www.jm.com.
- y. Kees Inc, Elkhart Lake, WI www.kees.com.
- z. Knauf Fiber Glass, Shelbyville, IN www.knauffiberglass.com.
- aa. Manson Insulation Inc, Brossard, QB www.isolationmanson.com.
- bb. Metco Inc, Salt Lake City, UT (801) 467-1572 www.metcospiral.com.
- cc. Miracle / Kingco, Rockland, MA www.taccint.com.
- dd. Mon-Eco Industries Inc, East Brunswick, NJ www.mon-ecoindustries.com.
- ee. Nailor Industries Inc, Houston, TX www.nailor.com.
- ff. Owens Corning, Toledo, OH www.owenscorning.com.
- gg. Polymer Adhesive Sealant Systems Inc, Irving, TX www.polymeradhesives.com.
- hh. Pottorff Company, Fort Worth, TX www.pottorff.com.
- ii. Ruskin Manufacturing, Kansas City, MO www.ruskin.com.
- jj. Sheet Metal Connectors Inc, Minneapolis, MN www.smconnectors.com.
- kk. Tamco, Stittsville, ON www.tamco.ca.
- ll. Techno Adhesive, Cincinnati, OH www.technoadhesives.com.
- mm. Titus, Richardson, TX (972) 699-1030. www.titus-hvac.com
- nn. McGill AirSeal, Columbus, OH www.mcgillairseal.com.
- oo. United Enertech Corp, Chattanooga, TN www.unitedenertech.com.
- pp. Utemp Inc, Salt Lake City, UT (801) 978-9265.
- qq. Ventfabrics Inc, Chicago, IL www.ventfabrics.com.
- rr. Ward Industries, Grand Rapids MI www.wardind.com.
- ss. Young Regulator Co, Cleveland, OH www.youngregulator.com.

B. Materials:

1. Acoustical Liner System:

a. Duct Liner:

- 1) **One inch (25 mm) thick, 1-1/2 lb (0.68 kg) density fiberglass** conforming to requirements of ASTM C1071. Liner will not support microbial growth when tested in accordance with ASTM C1338.
- 2) 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 Polymerics: 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 (93 deg C)**.
 - 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. Dampers And Damper Accessories:
- a. Volume Dampers:
 - 1) Rectangular Duct:
 - a) Factory-manufactured **16 ga (1.6 mm)** galvanized steel, single blade and opposed blade type with **3/8 inch (9.5 mm)** axles and end bearings. Blade width **8 inches (200 mm)** maximum. Blades shall have **1/8 inch (3 mm)** clearance all around.
 - b) Damper shall operate within acoustical duct liner.
 - c) Provide channel spacer equal to thickness of duct liner.
 - d) Dampers above removable ceiling and in Mechanical Rooms shall have locking quadrant on bottom or side of duct. Otherwise, furnish with concealed ceiling damper regulator and cover plate.
 - e) 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 (1.0 mm)** galvanized steel, single blade with **3/8 inch (9.5 mm)** axles and end bearings.
 - b) For use in outside air ducts.
 - c) 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.
- b. Backdraft Dampers:
- 1) Backdraft blades shall be nonmetallic neoprene coated fiberglass type.
 - 2) Stop shall be galvanized steel screen or expanded metal, **1/2 inch (13 mm)** mesh.
 - 3) Frame shall be galvanized steel or extruded aluminum alloy.
 - 4) 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: BD30.
 - d) Pottorff: BD-51.
 - e) Ruskin: NMS2.
 - f) Utemp: BFEA.
4. Duct Silencers:
- a. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Air Filters: AIRSAN.
 - 2) Industrial Acoustic.
 - 3) Titus.
 - 4) McGill AirSeal.
5. Branch Tap for Flexible Ductwork:
- a. Factory-manufactured rectangular-to-round 45 degree leading tap fabricated of **24 ga (0.635 mm)** zinc-coated lock-forming quality steel sheets meeting requirements of ASTM A653, with G-90 coating.
 - b. One inch wide mounting flange with die formed corner clips, pre-punched mounting holes, and adhesive coated gasket.
 - c. Manual Volume Damper:
 - 1) Single blade, **22 ga (0.79 mm)** minimum
 - 2) **3/8 inch (9.5 mm)** minimum square rod with brass damper bearings at each end.
 - 3) Heavy-duty locking quadrant on **1-1/2 inch (38 mm)** high stand-off mounting bracket attached to side of round duct.
 - d. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) ST-1HD by Air-Rite:
 - a) Nylon damper bearings approved for Air-Rite.
 - 2) STO by Flexmaster.
 - 3) HET by Sheet Metal Connectors.
- C. Fabrication:
1. Duct Liner:
- a. Install mat finish surface on airstream side. Secure insulation to cleaned sheet metal duct with continuous 100 percent coat of adhesive and with **3/4 inch (19 mm)** long mechanical fasteners **12 inches (300 mm)** on center maximum unless detailed otherwise on Drawings. Pin all duct liner.
 - b. Accurately cut liner and thoroughly coat ends with adhesive. Butt joints tightly. Top and bottom sections of insulation shall overlap sides. If liner is all one piece, folded corners shall be tight against metal. Ends shall butt tightly together.
 - c. Coat longitudinal and transverse edges of liner with adhesive.

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. Relief air.
 - f. Exhaust air.
 - g. Elbows, fittings, and diffuser drops greater than 12 inches (300 mm) in length.
 - h. Concrete underfloor boxes.
 2. Do not install acoustic lining in round ducts.
- B. Flexible Connections: Install flexible inlet and outlet duct connections to each furnace.
- C. Access Doors In Ducts:
1. Install at each manual outside air damper and at each motorized damper. Locate doors within 6 inches (150 mm) of installed dampers.
 2. Install within 6 inches (150 mm) 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

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SECTION 23 3401**EXHAUST FANS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install exhaust fans as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 23 3001: 'Common Duct Requirements'.
 - 2. Division 26: Control device and electrical connection.

1.2 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Bear AMCA seal and UL label.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Manufacturer Contact List:
 - 1. Acme Engineering & Manufacturing Corp, Muskogee, OK www.acmefan.com.
 - 2. Broan-Nu Tone LLC, Harford, WI www.broan.com.
 - 3. Carnes Co., Verona, MI www.carnes.com.
 - 4. Loren Cook Co., Springfield, MO www.lorencook.com.
 - 5. Soler & Palau (S&P USA Ventilation Systems, LLC), Jacksonville FL www.solerpalau-usa.com.

2.2 MANUFACTURED UNITS

- A. Ceiling Mounted Exhaust Fans:
 - 1. Acoustically insulated housings. Sound level rating of 5.0 sones maximum for CFM and static pressure listed on Contract Drawings.
 - 2. Include chatterproof integral back-draft damper with no metal-to-metal contact.
 - 3. True centrifugal wheels.
 - 4. Entire fan, motor, and wheel assembly shall be easily removable without disturbing housing.
 - 5. Suitably ground motors and mount on rubber-in shear vibration isolators.
 - 6. Provide wall or roof cap, as required.
 - 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.
 - e. Soler & Palau: FF.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Anchor fan units securely to structure or to curb.

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 0526 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
- 26 0533 RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS
- 26 0613 ELECTRICAL EQUIPMENT MOUNTING HEIGHT SCHEDULE

26 2000 LOW-VOLTAGE ELECTRICAL TRANSMISSION

- 26 2726 WIRING DEVICES

26 5000 LIGHTING

- 26 5100 INTERIOR LIGHTING

END OF TABLE OF CONTENTS

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SECTION 26 0501**COMMON ELECTRICAL REQUIREMENTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. General electrical system requirements and procedures.
 - 2. Perform excavating and backfilling work required by work of this Division as described in Contract Documents.
 - 3. Make electrical connections to equipment provided under other Sections.
- B. Products Furnished But Not Installed Under This Section:
 - 1. Anchor bolts and templates for exterior lighting equipment bases.

1.2 REFERENCES

- A. Reference Standards:
 - 1. National Fire Protection Association / American National Standards Institute:
 - a. NFPA 70, National Electric Code (NEC).
 - 2. National Electrical Manufacturing Association Standards (NEMA):
 - a. NEMA 250, '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.
 - 2. Coordinate with other trades for disconnect of power to equipment.
- 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 2726: 'Wiring Devices'.
 - 2) Section 26 2816: 'Enclosed Switches And Circuit Breakers'.
 - 3) Section 26 5100: 'Interior Lighting Fixtures'.
 - 4) Section 26 5200: 'Emergency Lighting' for battery units.
 - c. Do not purchase equipment before approval of product data.
- 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.
 - c) Provide tritium exit sign tabulations for each exit sign installed on Project including following:
 - (1) Serial number.
 - (2) Expiration number.
 - (3) Installed building location (example – chapel north rear exit, north corridor east end, main west foyer, etc.).

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 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 (Fire) 70, 'National Electric Code (NEC)' (2014 Edition 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. 480Y / 277 Volt System:
 - 1) Brown: Phase A.
 - 2) Orange: Phase B.
 - 3) Yellow: Phase C.
 - 4) Gray: Neutral.
 - 5) Green: Ground.
 - c. 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.

- d. 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. Metal Clad Cable (MC) may be used as restricted below:
 - a. Copper conductors.
 - b. Sizes #12 through #8.
 - c. Use only in indoor dry locations where:
 - 1) Not subject to damage.
 - 2) Not in contact with earth.
 - 3) Not in concrete.
- C. Standard Connectors:
1. Conductors No. 8 And Smaller: Steel spring wire connectors.
 2. Conductors Larger Than No. 8: Pressure type terminal lugs.
 3. Connections Outside Building: Watertight steel spring wire connections with waterproof, non-hardening sealant.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General:
1. Conductors and cables shall be continuous from outlet to outlet.
 2. Do not use direct burial cable.
- B. Line Voltage Conductors:
1. Install conductors in raceway where indicated on Contract Drawings. Run conductors of different voltage systems in separate conduits.
 2. Route circuits at own discretion, however, circuiting shall be as shown in Panel Schedules. Group circuit homeruns to panels as shown on Contract Drawings.
 3. Neutrals:
 - a. On three-phase, 4-wire systems, do not use common neutral for more than three circuits.
 - b. On single-phase, 3-wire systems, do not use common neutral for more than two circuits.
 - c. Run separate neutrals for each circuit where specifically noted on Contract Drawings.
 - d. Where common neutral is run for two or three home run circuits, connect phase conductors to breakers in panel which are attached to separate phase legs:
 - 1) Provide breaker tie so that all circuits that share common neutral are simultaneously disconnected.
 - 2) Neutral conductors shall be of same size as phase conductors unless specifically noted otherwise.
 4. Pulling Conductors:
 - a. Do not pull conductors into conduit until raceway system is complete and cabinets and outlet boxes are free of foreign matter and moisture.
 - b. Do not use heavy mechanical means for pulling conductors.
 - c. Use only listed wire pulling lubricants.
- C. Line Voltage Cables:
1. Route circuits at own discretion, however, circuiting and numbering shall be as shown in Panel Schedules.
 2. Support cables using approved staples, cable ties, straps, hangers, or similar fittings, spaced as required.
 3. Where installing in framing, do not bore holes in joists or beams outside center 1/3 of member depth or within 24 inches (600 mm) of bearing points. Do not bore holes in vertical framing members outside center 1/3 of member width. Holes shall be one inch diameter maximum.

4. Conceal cables within ceilings and walls of finished areas. Cables may be exposed in unfinished areas but not run on floors of mechanical equipment spaces or in such a way that they obstruct access to, operation of, or servicing of equipment.
5. Install exposed cables parallel to or at right angles to building structure lines.
6. Keep cables 6 inches (150 mm) minimum from hot water pipes.
7. Do not support cables from mechanical ducts or duct supports without Architect's written approval.
8. Prohibited procedures:
 - a. Boring holes for installation of cables in vertical truss members.
 - b. Notching of structural members for installation of cables.

END OF SECTION

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SECTION 26 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 (Fire) 70, 'National Electric Code (NEC)' (2014 Edition or most recent edition adopted by AHJ including all applicable amendments and supplements).
 - b. NFPA (Fire) 780, 'Standard for the Installation of Lightning Protection Systems' (2014 Edition or most recent edition adopted by AHJ including all applicable amendments and supplements).
 - 3. Telecommunications Industry Association:
 - a. TIA-942, 'Telecommunications Infrastructure Standard for Data Centers' (Revision A, 2014).

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. Rack and Cabinet Grounding/Earthing:
 - 1) Equipment and racks shall be bonded in accordance with methods prescribed in TIA-942.
 - 2) All grounding backbone should be #6 AWG copper cable.
 - 3) In telecommunications spaces with small number of racks or cabinets, rack/cabinet grounding/earthing jumper cable directly to telecommunications ground bus is permitted. Large spaces shall utilize mesh Common Bonding network, or overhead grounding backbone.
 - 4) Equipment racks, housings, messenger cables, and raceways:
 - a) Connect cabinets, racks, frames and terminal boards to single-point ground which is connected to building ground system proper sized, bonded and tested green insulated copper grounding conductor.
- C. Materials:
1. Grounding And Bonding Jumper Conductors: Bare copper or with green insulation.
 2. Make grounding conductor connections to ground rods and foundation ground loop using approved bolted clamps listed for such use.
 3. Service Grounding Connections And Cable Splices: Make by exothermic process.
 4. Telecommunications ground bus bar (TGB): copper.
 - a. Grounding bus bar:
 - 1) Technology Room shall be provided with telecommunications ground bus bar (TGB).
 - 2) Ground loop current potential is minimized between telecommunications equipment and electrical system to which it is attached.
 - b. All racks, metallic backboards, cable sheaths, metallic strength members, splice cases, cable trays, etc. entering or residing in Technology Room shall be grounded to respective TGB using minimum #6 AWG stranded copper bonding conductor and compression connectors.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Interface With Other Work: Coordinate with Section 03 3111 in installing grounding conductor and placing concrete. Do not allow placement of concrete before Architect's inspection of grounding conductor installation.

- B. Grounding conductors and bonding jumper conductors shall be continuous from terminal to terminal without splice. Provide grounding for following.
 - 1. Electrical service, its equipment and enclosures.
 - 2. Conduits and other conductor enclosures.
 - 3. Neutral or identified conductor of interior wiring system.
 - 4. Main panelboard, power and lighting panelboards.
 - 5. Non-current-carrying metal parts of fixed equipment such as motors, starter and controller cabinets, instrument cases, and lighting fixtures.
- C. Provide concrete-encased electrode system by embedding **20 feet (6.10 m)** minimum of No. 2/0 bare copper conductor in concrete footing that is in direct contact with the earth, **2 inches (50 mm)** minimum below concrete surface. Extend No. 2/0 copper conductor to main panel as shown on Drawings.
- D. Ground identified common conductor of electrical system at secondary side of main transformer supplying building. Ground identified grounded (neutral) conductor of electrical system on supply side of main service disconnect.
- E. Pull grounding conductors in non-metallic raceways, in flexible steel conduit exceeding **72 inches (1 800 mm)** in length, and in flexible conduit connecting to mechanical equipment.
- F. Provide grounding bushings on all feeder conduit entrances into panelboards and equipment enclosures.
- G. Bond conduit grounding bushings to enclosures with minimum #10 AWG conductor.
- H. Connect equipment grounds to building system ground.
 - 1. Use same size equipment grounding conductors as Phased conductors up through #10 AWG.
 - 2. Use NEC Table 250-95 for others unless noted otherwise in Drawings.
- I. Run separate insulated grounding cable from each equipment cabinet to electrical panel. Do not use intermediate connections or splices. Affix directly to cabinet.
- J. On motors, connect ground conductors to conduit with approved grounding bushing and to metal frame with bolted solderless lug.
- K. Ground cabinet of transformers to conduit and ground wires, if installed. Bond transformer secondary neutral conductor to cabinet.
- L. TGB shall be **1/4 inch (6.4 mm)** thick x **2 inches (50 mm)** high x **12 inches (305 mm)** long installed with insulated standoffs at location directed.
- M. Ground rack to TGB using #6 copper conductor and compression connector.

END OF SECTION

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SECTION 26 0533**RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Quality of material and installation procedures for raceway, boxes, and fittings used on Project but furnished under other Divisions.
 - 2. Furnish and install raceway, conduit, and boxes used on Project not specified to be installed under other Divisions.
- B. Related Requirements:
 - 1. Section 26 0501: 'Common Electrical Requirements' for general electrical requirements'.
 - 2. Section 27 5117: 'Audio Systems' for sound system wiring.

1.2 REFERENCES

- A. Reference Standards:
 - 1. National Fire Protection Association:
 - a. NFPA (Fire) 70, 'National Electric Code (NEC)' (2014 Edition 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) and Flexible Steel Conduit:
 - 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. 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.

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.
3. 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. 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 $\frac{1}{3}$ of member depth or within **24 inches (600 mm)** of bearing points. Do not bore holes in vertical framing members outside center $\frac{1}{3}$ 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. 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.
 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.
- E. 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. Thermostats not mounted in occupied space: As indicated on Drawings.
 - b. Remote Temperature Sensors and thermostats mounted in occupied space:
 - 1) Wall-Mounted 50 inches to top.
 - 2. Electrical:
 - a. Receptacles: 18 inches
 - b. Wall Switches: 42 inches
 - 3. Communications
 - a. Volume Control 42 inches

END OF SECTION

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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'.

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. Standard Style:

- a. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) 20 AMP, single pole:
 - a) Cooper: 2221V.
 - b) Hubbell: HBL1221-I.
 - c) Pass & Seymour: 20AC1-I.
 - d) Leviton: 1221-2I.
- 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.
- 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.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install devices flush with walls, straight, and solid to box.

END OF SECTION

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SECTION 26 5100**INTERIOR LIGHTING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install lighting system as described in Contract Documents, complete with lamps.
- B. Related Requirements:
 - 1. Section 26 0501: 'Common Electrical Requirements'.

1.2 REFERENCES

- A. Reference Standards:
 - 1. American National Standards Institute (ANSI):
 - a. ANSI C78.377-2015, '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.
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: 4100k.
- C. Factory Assembly:
1. Fixtures shall be fully assembled complete with necessary wiring, sockets, lamps, reflectors, ballasts, auxiliaries, plaster frames, recessing boxes, hangers, supports, lenses, diffusers, and other accessories essential for complete working installation.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Interface With Other Work:
1. Coordinate with Sections under 09 5000 heading to obtain symmetrical arrangement of fixtures in acoustic tile ceiling as shown on Reflected Ceiling Plan in Contract.
 2. In mechanical equipment rooms, coordinate locations of light fixtures with equipment locations to provide proper room illumination without obstruction. Suspend fixtures that must be mounted below pipes, ducts, etc, with chains or other Architect approved method.
- B. Securely mount fixtures. Support fixtures weighing **50 lbs (23 kg)** or more from building framing or structural members.
- C. Where fluorescent fixtures are shown installed end to end, provide suitable connectors or collars to connect adjoining units to appear as a continuous unit.

3.2 ADJUSTMENT

- A. Repair scratches or nicks on exposed surfaces of fixtures to match original undamaged conditions.

END OF SECTION

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