

project manual

THE CHURCH OF
JESUS CHRIST
OF LATTER-DAY SAINTS

SAT FAMILY SERVICES SANDY UT BISHOP'S STOREHOUSE

615 EAST 8400 SOUTH, SANDY, UTAH
PROJECT NUMBER: 5261066-18010106



bradley gygi architect & associates, pllc

2150 south 1300 east, suite 500 • salt lake city, utah 84106
801-747-2451

mechanical engineer

Van Boerum & Frank Associates Inc.
330 South 300 East
Salt Lake City, Utah 84111
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electrical engineer

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BIDDING REQUIREMENTS

FOR PROJECTS (U.S.)

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INVITATION TO BID (U.S.)

1. CONTRACTORS INVITED TO BID THE PROJECT:

To be announced

2. PROJECT:

SAT Family Services
Sandy UT Bishop's Storehouse
5261066-18010106

3. LOCATION:

615 East 8400 South
Sandy, 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, Project Manager
50 E. North Temple Street, COB 12
Salt Lake City, UT 84150-0012

5. CONSULTANT:

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

6. DESCRIPTION OF PROJECT:

- A. Interior finishes and reconfiguration with related plumbing, HVAC and electrical.
- 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 seventy-five (75) calendar days and will be as noted in the Agreement.

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

10. BIDDING DOCUMENTS:

- A. Bidding Documents may be examined at the following plan room locations:
 - 1) Steps for downloading from Dodge Data and Analytics:
 - 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) 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. Bidding Documents are available to invited Contractors with a deposit of \$_____ per set. Deposit will be refunded if documents are returned 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) Contractor Bid Proposal and Project Agreement (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 Contractor Bid Proposal and Project Agreement (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 titled "Contractor Bid Proposal and Project Agreement (U.S.)".
- 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 "Contractor Bid Proposal and Project Agreement (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)

END OF DOCUMENT

INFORMATION AVAILABLE TO BIDDERS (U.S.)

1. 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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CONTRACTOR BID PROPOSAL AND PROJECT AGREEMENT (U.S.)

Corporation of the Presiding Bishop of The Church of Jesus Christ of Latter-day Saints, a Utah corporation sole, ("Owner") and the undersigned Contractor ("Contractor") enter into this *Contractor Bid Proposal and Project Agreement (U.S.)* ("Agreement") and agree as follows:

1. **Property/Project.**

Property/Project Number: 5261066-18010106
Property Address ("Project Site"): 615 East 8400 South, Sandy, UT
Project Type: R&I, Interior Remodeling
Project Name ("Project"): SAT Family Services
Stake Name: Sandy UT Bishop's Storehouse

2. **Scope of the Work.** Contractor will furnish all labor, materials, and equipment necessary to complete the Work in accordance with the Contract Documents. The Work is all labor, materials, equipment, construction, and services required by the Contract Documents.
3. **Contract Documents.** Contract Documents consist of:
a. This Agreement;
b. Supplementary Conditions for Bid Proposal and Project Agreement (U.S.);
c. The Specifications (Division 01 and Divisions 03 through 28);
d. Drawings entitled and dated SAT Family Services 9 Apr 2018;
e. Addendum No. with date(s) _____; and
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 (\$_____). This is the Contractor's Bid Proposal Amount.
5. **Payment.**
a. If the Contractor's Bid Proposal Amount 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.
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, Contractor's compensation and/or the time of completion will be adjusted to reflect the change. Contractor will not commence work on any change until either: (a) Contractor and Owner have agreed in writing to the amount of the adjustment resulting from the change; 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. **Correction of Work.** 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 Substantial Completion 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 seventy-five (75) 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 other than those delays willfully caused by Owner.

9. **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. Contractor will conform to all ordinances and covenants governing the Project Site and/or Work.

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

11. **Payment of Subcontractors and Materialmen.** Contractor will promptly pay for all labor, materials, and equipment used to perform the Work.

12. **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.
 - 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 \$500,000 or Contractor's actual coverage, whichever is greater; 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.

13. **Independent Contractor Relationship.** The parties expressly agree that Contractor is not an agent or employee of Owner but is an independent contractor solely responsible for all expenses relating to Contractor's business.
14. **Comply with Intellectual Property Rights of Others.** Contractor represents and warrants that no Work (with its means, methods, goods, and services attendant thereto), provided to Owner will infringe or violate any right of any third party and that Owner may use and exploit such Work, means, methods, goods, and services without liability or obligation to any person or entity (specifically and without limitation, such Work, means, methods, goods, and services will not violate rights under any patent, copyright, trademark, or other intellectual property right or application for the same).
15. **Confidentiality / Property Rights.**
 - a. Owner will retain ownership and intellectual property rights in all plans, designs, drawings, documents, concepts, and materials provided by or on behalf of Owner to Contractor and to all work products of Contractor for or relative to Work performed under this Agreement, such products, services, and Work of Contractor constituting works made for hire. Contractor will not reuse any portions of such items provided by Owner or developed by Contractor for Owner pursuant to this Agreement, or disclose any such items to any third party without the prior written consent of Owner. Owner may withhold its consent in its' absolute discretion.
 - b. In addition, Contractor shall ensure that Contractor, Subcontractors, and the employees, agents and representatives of Contractor and its Subcontractors maintain in strict confidence, and shall use and disclose only as authorized by Owner all Confidential Information of Owner that Contractor receives in connection with the performance of this Agreement. Notwithstanding the foregoing, Contractor may use and disclose any information to the extent required by an order of any court or governmental authority, but only after it has notified Owner and Owner has had an opportunity to obtain reasonable protection for such information in connection with such disclosure. For purposes of this Agreement, "Confidential Information" means:
 - 1) The name or address of any affiliate, customer or contractor of Owner or any information concerning the transactions of any such person with Owner;
 - 2) Any information relating to contracts, agreements, business plans, budgets or other financial information of Owner to the extent such information has not been made available to the public by the Owner; and
 - 3) Any other information that is marked or noted as confidential by the Owner at the time of its disclosure.
16. **Ownership and Use of Renderings and Photographs.** Renderings representing the Work are the property of Owner. All photographs of the Work, whether taken during performance of the Work or at completion, are the property of the Owner. The Owner reserves all rights including copyrights to renderings and photographs of the Work. No renderings or photographs shall be used or distributed without written consent of the Owner.
17. **Public Statements Regarding Work or Property.** Contractor will not make any statements or provide any information to the media about the Work or Property without the prior written consent of Owner. If Contractor receives any requests for information from media, Contractor will refer such requests to Owner.
18. **No Commercial Use of Transaction or Relationship.**
 - a. 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 Work or Property, including, without limitation:
 - 1) By referring to this Agreement, Owner, or the Work or Property 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;
- 2) By using or allowing the use of any photographs of the Work or any part thereof, or of any service marks, trademarks or trade names or other intellectual property now or which may hereafter be associated with, owned by or licensed by Owner in connection with any service or product; or
 - 3) 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 Work or Property.

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

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

20. **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 attorneys fees incurred by that party in obtaining the dismissal, including without limitation copy costs, and expert and consultant fees and expenses.

21. **Termination of Agreement 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.
22. **Termination of Agreement by Owner for Cause.** Should Contractor 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, take possession of the premises and all materials, tools, and appliances thereon, and finish the Work by whatever method Owner deems expedient. In such case, 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 attorneys fees, expert fees, copy costs, and other expenses), such excess will be paid to Contractor, less any offsets and recoupment. 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.
23. **Termination of Agreement 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 and recoupment. 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.
24. **Assignment of Contract.** The parties hereto will not assign any rights or obligations under this Agreement without the prior written consent of the other party.
25. **Integration Clause.** The Contract Documents reflect the full agreement of the parties with respect to the Project and the Work and supersede all prior discussions, agreements, and representations regarding the subject matter of the Contract Documents. The Contract Documents may be amended only in a written document signed by both parties hereto.

26. **Applicable 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.
27. **Enforcement.** In the event either party commences legal action to enforce or rescind any term of the Contract Documents, the prevailing party will be entitled to recover its attorneys fees and costs, including without limitation all copy costs and expert and consultant fees and expenses, incurred in that action and on all appeals, from the other party.
28. **Bid Proposal/Agreement.** Contractor's submission to Owner of this agreement signed by Contractor will constitute Contractor's offer and bid proposal to perform the Work described in this agreement according to the terms thereof. Owner's signing of this agreement and delivery to Contractor of a signed copy will constitute acceptance of Contractor's offer and will convert this document to a binding agreement.
29. **Effective Date.** The effective date of this Agreement is the date indicated by the Owner's signature.

OWNER:

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

Signature:

Print Name: James Dzineku

Title: Project Manager

Address:
50 E. North Temple Street, COB12
Salt Lake City, UT 84150-0012

Telephone No: 801.865.5678

Facsimile No: 801.240.1494

Email: jdzineku@ldschurch.org

Effective Date:

Reviewed By:

CONTRACTOR:

(company)

Signature:

Print Name:

Title:

Address:

Telephone No:

Facsimile No:

Email:

Fed. I.D. or SSN:

License No:

Date Signed:

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EQUAL PRODUCT APPROVAL REQUEST FORM

Project Name: SAT Family Services Request Number: _____

TO: _____

FROM: _____

BID DATE: _____

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

PROPOSED EQUAL PRODUCT:

Specification Section: _____

Specified Products: _____

Proposed Product: _____

The Undersigned certifies:

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

ATTACHMENTS:

Include the following attachments -

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

SIGNED: _____

Company _____

Address _____

City, State, Zip _____

Telephone _____ FAX _____

REVIEW COMMENTS:

_____ Accepted. See Addenda Number _____.

_____ Submission Not In Compliance With Instructions. Respond to attached comments and resubmit.

_____ Proposed Equal Product Not Acceptable. Use specified products.

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

ADDITIONAL COMMENTS:

BY: _____ **DATE:** _____

SUBCONTRACTORS AND MAJOR MATERIALS SUPPLIERS LIST

Project Name: SAT Family Services

Date: _____

Stake: Sandy UT Bishop's Storehouse

Project No: 5261066-18010106

General Contractor: _____

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

VMR SUBCONTRACTORS

Other _____

Other _____

SUBCONTRACTORS AND SUPPLIERS

Demolition _____

Building Concrete _____

Structural Steel _____

Framing _____

Millwork _____

Drywall _____

Painting _____

Wall Coverings _____

Electrical _____

Sound / Satellite _____

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CONSTRUCTION MATERIAL ASBESTOS STATEMENT (U.S.)

**PROJECTS FOR:
CORPORATION OF THE PRESIDING BISHOP OF
THE CHURCH OF JESUS CHRIST OF LATTER-DAY SAINTS**

Building Name: SAT Family Services

Building Plan Type: _____

Building Address: 615 East 8400 South, Sandy, UT

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

Project Number: 5261066-18010106

Completion Date: _____

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

Project Consultant and Principal in Charge (signature) Date

Bradley Gygi Architect & Associates, PLLC
Company Name

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

General Contractor (signature) Date

Company Name

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SUPPLEMENTARY CONDITIONS

FOR CONTRACTOR BID PROPOSAL AND PROJECT AGREEMENT (U.S.)

ITEM 1 - GENERAL

1. Conditions of the Contract 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 Bid Proposal and Project Agreement, 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 - PERMITS

Delete Item 9 in the Contractor's Bid Proposal and R & I Project Agreement (U.S.) and replace with the following:

9. The Owner will pay the costs of permits, fees and improvement bonds required by local agencies necessary for the proper execution and completion of the work. Contractor shall obtain all permits and pay all fees, which will be reimbursed by the Owner without markup. These costs shall not be included in the bid amount. Contractor will conform to all ordinances and covenants governing the Project Site and/or Work.

ITEM 4 - STATE SPECIFIC SUPPLEMENTARY CONDITIONS

UTAH STATE SALES TAX:

Add the following to the Bid Proposal and Project Agreement:

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 Bid Proposal and Project Agreement:

- 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 Bid Proposal and Project Agreement:

- 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 Bid Proposal and Project Agreement with the following:

5. Payment

- a. If the Contractor's Bid Proposal Amount is over \$100,000.00, 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 03: CONCRETE

03 1000 CONCRETE FORMING AND ACCESSORIES

03 1113 STRUCTURAL CAST-IN-PLACE CONCRETE FORMING
03 1511 CONCRETE ANCHORS

03 2000 CONCRETE REINFORCING

03 2100 REINFORCEMENT BARS

03 3000 CAST-IN-PLACE CONCRETE

03 3111 CAST-IN-PLACE STRUCTURAL CONCRETE
03 3923 MEMBRANE CONCRETE CURING

03 6000 GROUTING

03 6213 NON-METALLIC NON-SHRINK GROUT
03 6300 EPOXY GROUTING

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SECTION 03 1113**STRUCTURAL CAST-IN-PLACE CONCRETE FORMING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Design, construction, and safety of formwork.
 - 2. Furnish and install required formwork ready for placing of concrete.
 - 3. Strip and dispose of formwork.
- B. Related Requirements:
 - 1. Section 03 3111: 'Cast-In-Place Structural Concrete' for:
 - a. Tolerances for placing structural concrete.
 - b. Pre-installation conference held jointly with other concrete related sections.

1.2 REFERENCES

- A. Reference Standards:
 - 1. American Concrete Institute:
 - a. ACI 318-14, 'Building Code Requirements for Structural Concrete and Commentary'.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference:
 - 1. Participate in pre-installation conference as specified in Section 03 3111.
 - 2. In addition to agenda items specified in Section 01 3100 and 31 3111, review following:
 - a. Review 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 as directed in Section 03 3111.

1.4 SUBMITTALS

- A. Informational Submittals:
 - 1. Manufacturer Instructions:
 - a. Printed application instructions for form release agents.

PART 2 - PRODUCTS**2.1 COMPONENTS**

- A. Forms: Wood, metal, or plastic as arranged by Contractor:
 - 1. Forming material shall be compatible with specified form release agents and with finish requirements for concrete to be left exposed or to receive a smooth rubbed finish.

2.2 ACCESSORIES

- A. Form Release Agents:
 - 1. Unexposed Surfaces Only: Contractor's option.
- B. Expansion / Contraction Joints:
 - 1. **1/2 inch (13 mm)** thick.
 - 2. Manufactured commercial fiber type:
 - a. Meet requirements of ASTM D1751.
 - b. Type Two Acceptable Products:
 - 1) Conflex by Knight-Celotex, Northfield, IL www.aknightcompany.com.
 - 2) Sealtight by W R Meadows Inc, Hampshire, IL www.wrmeadows.com.
 - 3) Equal as approved by Architect before installation. See Section 01 6200.
 - 3. Recycled Vinyl:
 - a. Light gray color.
 - b. Type Two Acceptable Products:
 - 1) Proflex by Oscoda Plastics Inc, Oscoda, MI www.oscodaplastics.com.
 - 2) Equal as approved by Architect before Installation. See Section 01 6200.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Forms:
 - 1. Assemble forms so forms are sufficiently tight to prevent leakage.
 - 2. Properly brace and tie forms.
 - 3. Provide temporary cleanouts at base of tall forms if used to facilitate cleaning and inspection.
 - 4. Make proper form adjustments before, during, and after concreting.
 - 5. Use new forms, or used forms that have been cleaned of loose concrete and other debris from previous concreting and repaired to proper condition. Use APA Plyform B-B Class I, or APA HDO Plyform B-B Class I, on exposed to view concrete that do not receive a smooth rubbed finish.
 - 6. Use metal cold joint forms when unable to place concrete for footings, foundations, and slabs in continuous pours.
- B. Accessories:
 - 1. General:
 - a. Provide for installation of inserts, templates, fastening devices, sleeves, and other accessories to be set in concrete before placing.
 - b. Position anchor bolts for hold-down anchors and columns and securely tie in place before placing concrete.
 - 2. Form Release / Finish Agents:
 - a. Film thickness shall be no thicker than as recommended by Manufacturer.
 - b. Allow no release / finish agent on reinforcing steel or footings.
 - 3. Expansion Joints:
 - a. Install at joints between floor slab and foundation wall where shown on Drawings.
- C. Form Removal (Slab on Grade):
 - 1. Removal of forms can usually be accomplished in twelve (12) to twenty-four (24) hours.
 - 2. If temperature is below **50 deg F (10 deg C)** or if concrete (stairs, beams, etc) depends on forms for structural support, leave forms intact for sufficient period for concrete to reach adequate strength.
 - 3. For exposed to view surfaces that receive a smooth rubbed finish, remove forms while concrete is still "green".
 - 4. Metal bars or prys should not be used. Use wood wedges, tapping gradually when necessary.

3.2 FIELD QUALITY CONTROL

A. Field Tests And Inspections:

1. Concrete Formwork:

- a. Inspections are not required and will be performed at discretion of Architect.

END OF SECTION

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SECTION 03 1511**CONCRETE ANCHORS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
 - 1. Cast-in place and post-installed concrete anchors including:
 - a. Adhesive anchors for concrete.
 - b. Expansion anchors for concrete.
 - c. J-bolts and headed cast-in-place bolts.
 - d. Screw anchors for concrete.
 - e. Concrete anchors and inserts not specified elsewhere.
 - 2. Installer responsible when inspection results of concrete anchors require corrective actions.
- B. Related Requirements:
 - 1. Section 01 1200: 'Multiple Contract Summary' for Owner Furnished Testing and Inspecting Services.
 - 2. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
 - 3. Section 03 3111: 'Cast-In-Place Structural Concrete' for installation and inspection of cast-in-place anchors.
 - 4. Section 06 1100: 'Wood Framing' for installation of drilled in anchors.

1.2 REFERENCES

- A. 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. American National Standards Institute / American Welding Society (Following are specifically referenced for Structural Steel testing):
 - a. ANSI/AWS D1.1/D1.1M:2015, 'Structural Welding Code - Steel'.
 - 3. ASTM International:
 - a. ASTM A307-14, 'Standard Specification for Carbon Steel Bolts and Studs, 60 000 psi Tensile Strength'.
 - b. ASTM A563-15, 'Standard Specification for Carbon and Alloy Steel Nuts'.
 - c. ASTM A706/A706M-16, 'Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement'.
 - d. ASTM F1554-15, 'Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength'.
 - e. 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'.
 - 4. International Code Council (IBC) (2015 or latest approved AHJ edition):
 - a. IBC Chapter 17, 'Structural Tests and Special Inspections'.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Scheduling:

1. Inspection shall be performed according IBC requirements.
2. Notify Testing Agency and Architect one week before installing anchors so inspection may be scheduled.

1.4 SUBMITTALS

- A. Action Submittals:
 1. Product Data:
 - a. Manufacturer's product literature for each item.
- B. Informational Submittals:
 1. Certificates:
 - a. Adhesive Anchors:
 - 1) Installer to provide current ACI/CRSI certification to Architect prior to installation of anchors.
 2. Test And Evaluation Reports:
 - a. Provide ESR for products used indicating conformance with current applicable ESR Acceptance Criteria.
 3. Manufacturer's Instructions:
 - a. Manufacturer's published installation recommendations for each item.
 4. Qualification Statements:
 - a. All concrete anchors except Adhesive Anchors:
 - 1) Installer to provide record of installer installation training showing dates and those trained for all installed products when required when by Architect.
- 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 inspection reports of all inspected anchors.

1.5 QUALITY ASSURANCE

- A. Qualifications:
 1. Manufacturer:
 - a. Having sufficient capacity to produce and deliver required materials without 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. Adhesive Anchors:
 - 1) Adhesive Anchors installed in horizontal to vertical overhead orientation to support sustained tension loads shall be installed by Certified Adhesive Anchor Installer (AAI) as certified through ACI/CRSI:
 - a) Refer to most current version of ACI 318 for certification requirements.
 - b) Proof of current certification shall be submitted to the Architect for approval prior to commencement of installation.
 - c. All other Concrete Anchors:
 - 1) Arrange for manufacturer's field representative to provide installation training for all products to be used, prior to commencement of work:
 - a) Provide installation training when required by Architect.
- B. Field 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 Inspection for post-installed concrete anchors:

- a. Owner will employ testing agency to perform inspection for post-installed concrete 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. Concrete Anchors:
 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 Contract Drawings.
 - b. Install hot-dipped or stainless steel anchor bolts to attach wood sill plates to foundation with **1/4 inch (6.4 mm)** by **3 inch (76 mm)** x **3 inch (76 mm)** minimum adjustable plate washers and standard cut washers between wood sill plates and nuts.
 - c. Nut: Conform to requirements of ASTM A563, Grade A, Hex.
 - d. 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:
 - a. Conform to requirements of ASTM A307, Grade A or ASTM F1554 Grade 36 unless indicated otherwise on Contract Drawings.
 3. Cast-In-Place Anchor Bolts:
 - a. J-Bolts:
 - 1) Non-headed type threaded **2 inches (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. Reinforcing Bars:
 - a. Composed of deformed carbon steel meeting requirements of ASTM A615/A615M, Grade 60.
 5. Adhesive Anchors:
 - a. Products shall have current ESR conforming to current ICC Acceptance Criteria AC308 for concrete.
 - b. Rod diameter and embedment length as indicated on Contract Drawings.
 - c. Type Two Acceptable Products:
 - 1) HIT-RE 500V3 with SafeSet Epoxy Adhesive by Hilti Fastening Systems, Tulsa, OK www.us.hilti.com.
 - 2) Pure 110+ by Powers Fasteners Inc., Brewster NY www.powers.com.
 - 3) SET-XP Epoxy by Simpson Strong-Tie Co., Pleasanton, CA www.simpsonanchors.com.
 - 4) Equal as approved by Architect before installation. See Section 01 6200.

6. Expansion Anchors:
 - a. Products shall have current ESR conforming to current ICC Acceptance Criteria AC193 for concrete.
 - b. Type Two Acceptable Products:
 - 1) KWIK Bolt TZ Expansion Anchor by Hilti Fastening Systems, Tulsa, OK www.us.hilti.com.
 - 2) Power-Stud +SD2 by Powers Fasteners Inc., Brewster NY www.powers.com.
 - 3) Strong-Bolt by Simpson Strong-Tie Co., Pleasanton, CA www.simpsonanchors.com.
 - 4) Equal as approved by Architect before installation. See Section 01 6200.
7. Screw Anchors:
 - a. Provide anchors with length identification markings conforming to ICC Acceptance Criteria AC 193 for concrete.
 - b. Type Two Acceptable Products:
 - 1) KWIK HUS-EZ by Hilti Fastening Systems, Tulsa, OK www.us.hilti.com.
 - 2) Wedge-Bolt+ by Powers Fasteners Inc., Brewster NY www.powers.com.
 - 3) Titen HD by Simpson Strong Tie Co, Pleasanton, CA www.simpsonanchors.com.
 - 4) Equals as approved by Architect through shop drawing submittal before installation. See Section 01 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:
 - 1) Exercise care in coring or drilling to avoid damaging existing reinforcing or embedded items.
 - 2) 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:
 - a. Unless otherwise specified, do not drill holes in concrete until:
 - 1) Concrete has minimum age of 21 days at time of anchor installation.
 - 2) Concrete has achieved full design strength for load achievement.

3.2 PREPARATION

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

3.3 INSTALLATION

- A. Post-Installed Anchors:
 1. General:
 - a. Drill holes with rotary impact hammer drills using carbide-tipped bits.
 - b. Unless otherwise shown on Drawings, drill holes perpendicular to concrete surface.
 - c. 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:

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

3.4 FIELD QUALITY CONTROL

- A. Field And Inspections:
1. Civil and structural field 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. Expansion 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. Inspections:
 - 1) Inspections shall include required verification and inspection of anchors as referenced in IBC Table 1704.4 and in accordance with most current version of ACI 318 or ACI 318M and applicable ASTM material standards that:
 - a) The correct rod/anchor is used; size and type.
 - b) The correct hole size is used and prepared per Manufacturer's instructions.
 - c) That climactic conditions, and concrete temperature, allow for the anchors' installation and use.
 - d) Proper hole cleaning equipment, per Manufacturer's instructions, is used.
 - e) Torque applied to anchors does not exceed Manufacturer's allowable limits.
 - f) Torque applied to anchors is per Manufacturer's instructions.
- B. Non-Conforming Work:
1. Contractor is to immediately notify Architect of incorrectly placed, misplaced or malfunctioning anchors and request instructions for corrective actions.

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 03 2100**REINFORCEMENT BARS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install concrete reinforcement bars as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 01 1200: 'Multiple Contract Summary' for Owner Furnished Testing and Inspecting Services.
 - 2. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
 - 3. Section 03 1113: 'Structural Cast-In-Place Concrete Forming'.
 - 4. Section 03 3111: 'Cast-In-Place Structural Concrete' for:
 - a. Reinforcement installed in concrete.
 - b. Pre-installation conference held jointly with other concrete related sections.

1.2 REFERENCES

- A. Association Publications:
 - 1. American Concrete Institute:
 - a. ACI 'Detailing Manual' (2004 Edition).
 - 2. Concrete Reinforcing Steel Institute (CRSI):
 - a. CRSI, 'Manual of Standard Practice' (2009 28th Edition).
- B. Reference Standards:
 - 1. American Concrete Institute:
 - a. ACI 117-10: 'Specifications for Tolerances for Concrete Construction and Materials and Commentary' (Reapproved 2015).
 - b. ACI 318-14, 'Building Code Requirements for Structural Concrete and Commentary'.
 - 2. ASTM International (Following are specifically referenced for reinforcement bars testing):
 - a. ASTM A615/A615M-16, 'Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement'.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conferences:
 - 1. Participate in pre-installation conference as specified in Section 03 3111.
 - 2. In addition to agenda items specified in Section 01 3100, and Section 03 3111, review following:
 - a. Installation scheduling and reinforcing placement.
 - b. Review Section 01 4523 for Testing and Inspection administrative requirements and responsibilities and Field Quality Control tests and inspections required of this section.
 - 1) Review requirements and frequency of testing and inspections.
- B. Scheduling:
 - 1. Notify Testing Agency and Architect as directed in Section 03 3053 and Section 03 3111.

1.4 SUBMITTALS

- A. Action Submittals:

1. Shop Drawings:
 - a. Reinforcing placement drawings.
- B. Informational Submittals:
 1. Certificates:
 - a. Mill certificates for mill tests for reinforcing in accordance with ASTM A615/A615M.
- 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 Inspection Reports of reinforcement bars.

1.5 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 1. Comply with provisions of following codes and standards except where more stringent requirements are shown or specified:
 - a. American Concrete Institute:
 - 1) ACI 318, 'Building Code Requirements for Structural Concrete and Commentary'.
 - b. Concrete Reinforcing Steel Institute:
 - 1) CRSI, 'Manual of Standard Practice'.
- B. Qualifications:
 1. Throughout progress of the work of this section, provide at least one (1) person who shall be thoroughly familiar with Construction Documents and other applicable specified requirements, completely trained and experienced in necessary skills, and who shall be present at site and shall direct all work performed under this Section:
 - a. In actual installation of the work of this Section, use adequate numbers of skilled workmen to ensure installation in strict accordance with approved design.
 - b. In acceptance or rejection of work performed under this Section, no allowance will be made for lack of skill on part of workmen.
- C. Testing And Inspection:
 1. Owner is responsible for Quality Assurance. Quality assurance performed by Owner will be used to validate Quality Control performed by Contractor.
 2. Owner will provide Testing and Inspection for inspection of reinforcement bars:
 - a. Owner will employ testing agencies to perform testing and inspection for inspection of reinforcement bars 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. Deliver bars separated by size and tagged with manufacturer's heat or test identification number.
 2. Reinforcement bars shall be free of heavy rust scales and flakes, or other coating at time of delivery and placing.
- B. Storage And Handling Requirements:
 1. Properly protect rebar on site after delivery.

PART 2 - PRODUCTS

2.1 MATERIAL

- A. Reinforcement Bars:
1. Bars shall have grade identification marks and conform to ASTM A615/A615M:
 - a. Grade 60 minimum, except dowels that are to be field bent, Grade 40 minimum.
 2. Bars shall be deformed type.
 3. Bars shall be free of heavy rust scales and flakes, or other bond-reducing coatings.

2.2 ACCESSORIES

- A. Bar Supports:
1. Concrete masonry units or bricks are not acceptable.
 2. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs which are plastic protected (CRSI, Class 1) or stainless steel protected (CRSI, Class 2).
 3. Type Two Acceptable Products:
 - a. Concrete 'dobies' or blocks wired to reinforcing.
 - b. Manufactured chairs with 4 sq inch (25.8 sq cm) bearing surface on sub-grade, or other feature to prevent chair from being pushed into sub-grade or damaging vapor retarder under slabs on grade.
 - c. Equals as approved by Architect before installation. See Section 01 6200.

2.3 FABRICATION

- A. Fabricate reinforcement bars according to the Concrete Reinforcing Steel Institute (CRSI) 'Manual of Standard Practice' and details on Contract Documents.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General:
1. Avoid cutting or puncturing vapor retarder during reinforcement placement and concrete operations.
 2. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete.
 3. Blowtorch shall not be used to facilitate field cutting or bending or any other reinforcing work.
 4. Reinforcement shall not be bent after partially embedded in hardened concrete.
- B. Placing Reinforcement:
1. Comply with Concrete Reinforcing Steel Institute CRSI 'Manual of Standard Practice' recommended practice for 'Placing Reinforcing Bars' for details and methods of reinforcement placement and supports. and as herein specified.
 2. Accurately position, support, and secure reinforcement against displacement by formwork, construction, or concrete placement operations:
 - a. Locate and support reinforcing by chairs, runners, bolsters, bar supports, spacers, or hangers, as required as recommended by 'ACI Detailing Manual, except slab on grade work.
 - b. Support bars in slabs on grade and footings with specified bar supports around perimeter and at 4-1/2 feet on center each way maximum to maintain specified concrete cover.
 - c. Install bar supports at bar intersections.
 3. Bend bars cold.

4. Dowel vertical reinforcement for formed concrete columns or walls out of footing or structure below with rebar of same size and spacing required above.
 5. Securely anchor and tie reinforcement bars and dowels before placing concrete. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- C. Splices:
1. Non-Concrete Structural System:
 - a. Avoid splices of reinforcement bars at points of maximum stress. Lap bars 60 bar diameters minimum unless dimensioned otherwise on Drawings. Run reinforcement bars continuous through cold joints.
 2. Concrete Structural System:
 - a. In beams, slabs, and walls, avoid splices of reinforcement bars at points of maximum stress.
 - b. Lap bars as follows:
 - 1) Compression Splices: 45 bar diameters minimum.
 - 2) Tension Splices: In accordance with ACI 318 Class B requirements.
 - 3) No splice shall be less than **20 inches (508 mm)**.
 - 4) For epoxy coated rebar, increase lap-splice lengths by 1.5 times those listed above.
 - c. In columns, splices in vertical bars are permitted only at floor levels or points of lateral support and shall consist of 45 bar diameter laps.
 - d. Run reinforcement bars continuous through cold joints.
- D. Tolerances:
1. Provide following minimum concrete cover for reinforcement as per ACI 318 or ACI 318M. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations:
 - a. Concrete cast against and permanently exposed to earth:
 - 1) Interior Slabs on Grade: **1 inches (25 mm)**, clear from top of slab at **4 inches (100 mm)** slabs, **2 inches (50 mm)** clear at **6 inches (150 mm)** slabs.
 - 2) Sections other than Slabs: **3 inches (75 mm)**.
 - b. Concrete Exposed to Earth or Weather:
 - 1) No. 6 and Larger Bars: **2 inches (50 mm)**.
 - 2) No. 5 and Smaller Bars, W31 and D31 Wire: **1-1/2 inches (38 mm)**.
 - c. Concrete not exposed to weather or in contact with ground:
 - 1) Slabs, walls, and joists:
 - a) No. 14 and No. 18 bars: **1-1/2 inches (38 mm)**.
 - b) No. 11 bars and smaller: **3/4 inches (19 mm)**.
 - 2) Beams and Columns:
 - a) Primary reinforcement, ties, stirrups and spirals: **1-1/2 inches (38 mm)**.

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. Reinforcement Bars:
 - a. Testing Agency shall provide inspection for Reinforcement Bars. See Section 03 3111 for Testing and Inspection requirements

END OF SECTION

SECTION 03 3111**CAST-IN-PLACE STRUCTURAL CONCRETE****PART 1 - GENERAL****1.1 SUMMARY****A. Includes But Not Limited To:**

1. Furnish and install concrete work as described in Contract Documents including:
 - a. Quality of concrete used on Project but furnished under other Sections.
 - b. Concrete mix information and use of admixtures.
 - c. Field Quality Control Testing and Inspection requirements for concrete.
 - d. Pre-installation conference held jointly with other concrete related sections.
 - e. Sealants and curing compounds used with concrete.
 - f. Compact aggregate base for miscellaneous cast-in-place concrete.
 - g. Miscellaneous cast-in-place concrete and equipment pads.

B. Products Installed But Not Furnished Under This Section:

1. Concrete accessories.
2. Inserts, bolts, boxes, templates, and fastening devices for other work, including those for bases only for Mechanical and Electrical.
3. Membrane Concrete Curing.

C. Related Requirements:

1. Section 01 1200: 'Multiple Contract Summary' for Owner Furnished Testing and Inspecting Services.
2. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
3. Section 03 1113: 'Structural Cast-In-Place Concrete Forming'.
4. Section 03 1511: 'Concrete Anchors and Inserts'.
5. Section 03 2100: 'Reinforcement Bars'.
6. Section 03 3923: 'Membrane Concrete Curing' for quality of curing materials used.
7. Section 05 1223: 'Structural Steel For Buildings'.
8. Section 07 9213: 'Elastomeric Joint Sealant' for quality of sealants.
9. Section 31 0501: 'Common Earthwork Requirements' for:
 - a. General procedures and requirements for earthwork.
 - b. Pre-installation conference held jointly with other common earthwork related sections.
10. Section 31 1123: 'Aggregate Base' for aggregate base under miscellaneous cast-in-place concrete and exterior slabs, under interior slabs-on-grade concrete.
11. Section 31 2213: 'Rough Grading' for rough grading and preparation of natural soil subgrades below fill and aggregate base materials.
12. Section 31 2216: 'Fine Grading' for grading of subgrade below aggregate base and topsoil.
13. Section 31 2323: 'Fill' for compaction procedures and tolerances.
14. Section 32 8423: 'Underground Sprinklers' for sleeves for underground irrigation system.
15. Divisions 22, 23, And 26: Mechanical and electrical devices including boxes, conduits, pipes, hangers, inserts, and other work to be embedded in concrete work before placing.
16. Furnishing of items to be embedded in concrete specified in Section involved.
17. Owner will provide concrete leveling compounds and patching compounds required for carpet installation.

1.2 REFERENCES**A. Association Publications:**

1. American Concrete Institute, Farmington Hills, MI www.concrete.org. Abstracts of ACI Periodicals and Publications.

- a. Certifications:
 - 1) ACI CP-1(16), *Technical Workbook for ACI Certification of Concrete Field Testing Technician-Grade 1*.
 - 2) ACI CP-10(10), *Craftsman Workbook for ACI Certification of Concrete Flatwork Technician/Finisher*.
 - 3) ACI CP-19(16), *Technical Workbook for ACI Certification of Concrete Strength Testing Technician*.
 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 twenty-four (24) hour period.
 3. Floor Flatness (F_F): Rate of change in elevation of floor over a **12 inches (305 mm)** section.
 4. Floor Levelness (F_L): Measures difference in elevation between two points which are **10 feet (3.05 m)** apart.
 5. 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 (12.9 kph)** or greater.
- B. Reference Standards:
1. American Association of State and Highway Transportation Officials:
 - a. AASHTO M 153-06 (2016), 'Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction'.
 2. American Concrete Institute
 - a. ACI 117-10 (R2015): 'Specifications for Tolerances for Concrete Construction and Materials and Commentary'.
 - b. ACI 305.1-14, 'Specification for Hot Weather Concreting'.
 - c. ACI 306.1-90 (R2002), 'Standard Specification for Cold Weather Concreting'.
 - d. ACI 318-14, 'Building Code Requirements for Structural Concrete' (ACI 318) and 'Commentary on Building Code Requirements for Structural Concrete' (ACI 318R).
 3. ASTM International:
 - a. ASTM C31/C31M-15, 'Standard Practice for Making and Curing Concrete Test Specimens in the Field'.
 - b. ASTM C33/C33M-16, 'Standard Specification for Concrete Aggregates'.
 - c. ASTM C39/C39M-15a, 'Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens'.
 - d. ASTM C94/C94M-16, 'Standard Specification for Ready-Mixed Concrete'.
 - e. ASTM C140/C140M-16, 'Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units'.
 - f. ASTM C143/C143M-15, 'Standard Test Method for Slump of Hydraulic-Cement Concrete'.
 - g. ASTM C150/C150M-16, 'Standard Specification for Portland Cement'.
 - h. ASTM C172/C172M-14a, 'Standard Practice for Sampling Freshly Mixed Concrete'.
 - i. ASTM C173/C173M-16, 'Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method'.
 - j. ASTM C192/C192M-16a, 'Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory'.
 - k. ASTM C231/C231M-14, 'Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method'.
 - l. ASTM C260/C260M-10a, 'Standard Specification for Air-Entraining Admixtures for Concrete'.
 - m. ASTM C330/C330M-14, 'Standard Specification for Lightweight Aggregates for Structural Concrete'.
 - n. ASTM C494/C494M-15a, 'Standard Specification for Chemical Admixtures for Concrete'.
 - o. ASTM C496/C496M-11, 'Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens'.
 - p. ASTM C567/C567M-14, 'Standard Test Method for Determining Density of Structural Lightweight Concrete'.
 - q. ASTM C595/C595M-16, 'Standard Specification for Blended Hydraulic Cements'.
 - r. ASTM C618-15, 'Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete'.
 - s. ASTM C1077-16, 'Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation'.
 - t. ASTM C1157/C1157M-11, 'Standard Performance Specification for Hydraulic Cement'.

- u. ASTM D1751-04(2013), 'Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)'.
 - v. ASTM E329-14a: 'Standard Specification for Agencies Engaged in Construction Inspection and/or Testing'.
 - w. ASTM E1155-14, 'Standard Test Method for Determining F_F Floor Flatness and F_L Floor Levelness Numbers'.
4. International Code Council (IBC) (2015 or latest approved edition):
- a. IBC Chapter 17, 'Special Inspections And Tests'.
 - 1) Section 1704, 'Special Inspections And Tests, Contractor Responsibility And Structural Observations'.
 - 2) Section 1705, 'Required Special Inspection And Tests'.
 - a) Section 1705.2, 'Steel Construction'.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference:
- 1. Participate in MANDATORY pre-installation conference as specified in Section 01 3100 and held jointly with following sections:
 - a. Section 03 1113: 'Structural Cast-In-Place Concrete Forming'.
 - b. Section 03 2100: 'Reinforcement Bars'.
 - c. Section 26 0526: 'Grounding And Bonding For Electrical Systems'.
 - 2. Schedule pre-installation conference prior to placing of footings, installation of foundation forms and reinforcing steel, and installation of anchors, dowels, inserts, and block outs in foundation walls and slabs.
 - 3. In addition to agenda items specified in Section 01 3100, review following:
 - a. Set up concrete placement pour card system and verify that all relevant trades have signed off prior to concrete placement.
 - b. Obtaining trade sign-offs on each pour card will be responsibility of General Contactor's foreman or whoever is in charge of ordering concrete.
 - c. Pour cards will be turned in to Quality Assurance representative after the work has been completed so that they can be reviewed and filed.
 - d. Review installation scheduling, coordination, placement of building concrete, and placement of items installed in and under concrete.
 - e. Review installation scheduling, coordination and placement of site concrete and of items installed in concrete.
 - f. Review 'Verification of Conditions' requirements.
 - g. Review requirements for preparation of subgrade and aggregate base requirements.
 - h. Review formwork requirements.
 - i. Review approved mix design requirements, mix designs and use of admixtures.
 - j. Review reinforcing bar submittals.
 - k. Review installation schedule and placement of reinforcing bars.
 - l. Review placement, finishing, and curing of concrete, including cold and hot weather requirements.
 - m. Review joint layout plan for control and expansion joints, fillers for sidewalks, curbs, and gutters:
 - 1) Review jointing requirements.
 - n. Review smooth rubbed concrete finish procedures and requirements (applied immediately after removing concrete formwork while concrete is 'green').
 - o. Review concrete slab tolerances and corrective measures if tolerances not met.
 - p. Review safety issues.
 - q. 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 concrete.

1.4 SUBMITTALS

- A. Action Submittals:
1. Joint layout plan for control and expansion joints for sidewalks, curbs, and gutters for written approval before starting work on this Section.
 2. Shop Drawings:
 - a. Show dimensioned locations of anchor bolts for hold-down anchors and columns.
 - b. Show reinforcement and all necessary bending diagrams and reinforcing steel list, and construction joint locations.
 - c. Provide bar schedules and bending details.
 - d. Reinforced concrete walls shall be shown in scale elevation (scale at least one quarter inch to one foot). Details shall be in accordance with ACI rules.
 - e. Show all formwork for concrete surfaces which are to remain exposed in the finished work.
- B. Informational Submittals:
1. Certificates:
 - a. Installers:
 - 1) Certification for National Ready Mixed Concrete Association (NRMCA).
 - 2) Certification for ACI-certified Flatwork Finishers and Technicians.
 2. Design Data:
 - a. Mix Design:
 - 1) Furnish proposed mix design to Architect for review prior to commencement of Work.
 - a) Include density (unit weight) and void content determined per ASTM C1688/C1688M for fresh mixed properties and per ASTM C140/C140M for hardened concrete properties.
 - b) Mix design shall show proposed admixture, amount, usage instructions, and justification for proposed use.
 - b. Ready-Mix Supplier:
 - 1) Require mix plant to furnish delivery ticket for each batch of concrete. Keep delivery tickets at job-site for use of Owner or his representatives. Tickets shall show following:
 - a) Name of ready-mix batch plant.
 - b) Serial number of ticket.
 - c) Date and truck number.
 - d) Name of Contractor.
 - e) Name and location of Project.
 - f) Specific class or designation of concrete conforming to that used in Contract Documents.
 - g) Amount of concrete.
 - h) Amount and type of cement.
 - i) Total water content allowed by mix design.
 - j) Amount of water added at plant.
 - k) Sizes and weights of sand and aggregate.
 - l) Time loaded.
 - m) Type, name, manufacturer, and amount of admixtures used.
 - n) Design Data.
 - 2) Provide certificates with supporting testing reports verifying compliance with Contract Document requirements and that materials provided are from single source for following:
 - a) Cement.
 - b) Aggregate.
 - c) Fly Ash.
 3. Source Quality Control Submittals:
 - a. Concrete mix designs:
 - 1) Mix Type B:
 - a) Unexposed interior concrete slabs on grade.
 - b) 3500 psi (24.13 MPa) minimum at twenty-eight (28) days.
 - c) Water / Cementitious Material: 0.45 maximum by weight.
 - 2) Air Entrainment: Six (6) percent, plus or minus 1-1/2 percent for exterior concrete and foundation walls exposed to freeze/thaw cycles.

- 3) Do not add water any time during mixing cycle above amount required to meet specified water / cement ratio. No reduction in amount of cementitious material is allowed.
 - b. Slump:
 - 1) 4 inch (100 mm) slump maximum before addition of high range water reducer.
 - 2) 8 inch (200 mm) slump maximum with use of high range water reducer.
 - 3) Slump not required for Mix Type G.
 - c. Admixtures:
 - 1) Mix design shall show proposed admixture, amount, usage instructions, and justification for proposed use. Do not use any admixture without Architect's written approval.
 - 2) Fly ash: Amount of specified Class F (or Class C where Class F is not available) fly ash not to exceed twenty-five (25) percent of weight of cementations materials may used.
 - 3) Chemical: Specified accelerator or retarder may be used if necessary to meet environmental conditions.
 - 4) Chemical: Special additives to promote rapid drying concrete may be used in interior concrete slabs on grade if necessary to meet construction schedules.
- C. Closeout Submittals:
1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Record Documentation:
 - 1) Pour Reports:
 - a) Provide report that records following information:
 - b) Date and time of start of pour, Date and time of end of pour, and Date and time of end of finishing procedures.
 - c) Temperature at start of pour, Temperature at end of Pour, and Maximum temperature during performance of finishing procedures.
 - d) Wind speed at start of pour, Wind speed at end of pour, and Maximum wind speed during performance of finishing procedures.
 - e) Humidity at start of pour, Humidity at end of pour, and High and low humidity during performance of finishing procedures.
 - f) Cloud cover at start of pour, Cloud cover at end of pour, and High and low cloud cover during performance of finishing procedures.
 - g) Screeding method and equipment used.
 - h) Saw cut method and equipment used.
 - 2) Testing and Inspection Reports:
 - a) Testing Agency Testing and Inspecting Reports of concrete.

1.5 QUALITY ASSURANCE

- A. Qualifications: Requirements of Section 01 4301 applies, but is not limited to following:
1. Installers and Installation Supervisor:
 - a. ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
 2. Ready-Mix Supplier:
 - a. Comply with ASTM C94/C94M requirements and be certified according to NRMCA's 'Certification of Ready Mixed Concrete Production Facilities'.
 3. Testing Agencies:
 - a. Independent agency qualified according to ASTM C1077 and ASTM E329.
 - 1) Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technicians, Grade I according to ACI CP-1 or equivalent certification program.
 - 2) Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be ACI-certified Concrete Laboratory Testing Technician - Grade II.
- 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 on concrete:

- a. Owner will employ testing agencies to perform testing and inspection on concrete as specified in Field Quality Control in Part 3 of this specification:
 - 1) Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform the Work in strict accordance with requirements of Contract Documents and perform contractor testing and inspection.
 - 2) See Section 01 1200: 'Multiple Contract Summary'.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
 1. Expansion Joint Filler Material:
 - a. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Storage And Handling Requirements:
 1. Expansion Joint Filler Material:
 - a. Store materials in a clean, dry area in accordance with manufacturer's instructions.
 - b. Protect materials during handling and application to prevent damage.

PART 2 - PRODUCTS

2.1 SYSTEM

- A. Manufacturers:
 1. Manufacturer Contact List:
 - a. Aridus Admixture by US Concrete, Euless, TX www.us-concrete.com/aridus/.
 - b. BASF (Construction Chemicals Division), Cleveland, OH www.master-builders-solutions.basf.us/en-us.
 - c. Bonsal American, Charlotte, NC www.bonsal.com.
 - d. Concure Systems Admixture by Concure Systems, Phoenix, AZ www.ConcureSystems.com.
 - e. Dayton Superior Specialty Chemicals, Kansas City, KS www.daytonsuperiorchemical.com.
 - f. Euclid Chemical Company, Cleveland, OH www.euclidchemical.com.
 - g. Fritz-Pak Concrete Admixtures, Dallas, TX www.fritzpak.com.
 - h. GCP Applied Technologies, Cambridge, MA www.gcpat.com/construction/en-us.
 - i. L & M Construction Chemicals, Omaha, NE www.lmcc.com.
 - j. Larsen Weldcrete by Larsen Products Corp, Rockville, MD www.larsenproducts.com.
 - k. Sika Corporation, Lyndhurst, NJ www.sikaconstruction.com and Sika Canada, Pointe Claire, QC www.sika.ca.
 - l. Unitex, Kansas City, MO www.unitex-chemicals.com.
 - m. U S Mix Products Co, Denver, CO www.usspec.com.
 - n. W R Meadows, Hampshire, IL www.wrmeadows.com.
- B. Performance:
 1. Design Criteria: Conform to requirements of ASTM C94/C94M unless specified otherwise:
 2. Capacities:
 - a. For testing purposes, following concrete strengths are required:
 - 1) At 7 days: 70 percent minimum of 28 day strengths.
 - 2) At 28 days: 100 percent minimum of 28 day strengths.
- C. Materials:
 1. Hydraulic Cement: Meet requirements of ASTM C150/C150M, Type Type II
 - a. Meet requirements of ASTM C595/C595M, Type IP (MS)
 - b. Meet requirements of ASTM C1157/C1157M, Type Type MS
 2. Aggregates:
 - a. General:

- 1) Submit a letter on quarry's letterhead that certifies all aggregate for concrete complies with the requirements of this section. Material certificates which are submitted shall be signed by both the materials producer and the contractor, certifying that materials comply with or exceed requirements specified herein to the Architect, Civil and Structural Engineering Consultant and the Independent Testing Laboratory for review and approval.
- 2) Aggregates for all concrete shall come from a quarry that is DOT approved and meets or exceeds durability Class I aggregate. The quarry shall submit a letter to Engineer that certifies that all aggregate complies with DOT requirements for durability. Aggregate not meeting DOT durability requirements shall not be used.
- b. Coarse:
 - 1) Meet requirements of ASTM C33/C33M or nonconforming aggregate that by test or actual service produces concrete of required strength and conforms to local governing codes.
 - 2) Aggregate shall be uniformly graded by weight.
- c. Fine:
 - 1) Meet requirements of ASTM C33/C33M.
 - 2) Aggregate shall be uniformly graded by weight.
3. Water: Clear, apparently clean, and potable.
4. Admixtures And Miscellaneous:
 - a. Fly Ash:
 - 1) Meet requirements of ASTM C618, Class F (or Class C where Class F is not available) and with loss on ignition (LOI) of three (3) percent maximum.
 - b. Chemical:
 - 1) No admixture shall contain calcium chloride nor shall calcium chloride be used as an admixture. All chemical admixtures used shall be from same manufacturer and compatible with each other.
 - 2) Air Entraining Admixture:
 - a) Meet requirements of ASTM C260/C260M.
 - b) Type Two Acceptable Products:
 - (1) Equal as approved by Architect before use. See Section 01 6200.
 - 3) Water Reducing Admixture:
 - a) Meet requirements of ASTM C494/C494M, Type A and containing not more than 0.05 percent chloride ions.
 - b) Type Two Acceptable Products:
 - (1) Equal as approved by Architect before use. See Section 01 6200.
 - 4) Water Reducing, Retarding Admixture:
 - a) Meet requirements of ASTM C494/C494M, Type D and contain not more than 0.05 percent chloride ions.
 - b) Type Two Acceptable Products:
 - (1) Equal as approved by Architect before use. See Section 01 6200.
 - 5) High Range Water Reducing Admixture (Superplasticizer):
 - a) Meet requirements of ASTM C494/C494M, Type F or G and containing not more than 0.05 percent chloride ions.
 - b) Type Two Acceptable Products:
 - (1) Equal as approved by Architect before use. See Section 01 6200.
 - 6) Non-Chloride, Non-Corrosive Accelerating Admixture:
 - a) Meet requirements of ASTM C494/C494M, Type C or E and containing not more than 0.05 percent chloride ions.
 - b) Type Two Acceptable Products:
 - (1) Equal as approved by Architect before use. See Section 01 6200.
 - 7) Corrosion Inhibiting Admixture:
 - a) Liquid admixture to inhibit corrosion of steel reinforcement in concrete by introducing proper amount of anodic inhibitor. Admixture shall contain thirty (30) percent calcium nitrite solution and shall be used where called for in specifications or on drawings.
 - b) Type Two Acceptable Products:
 - (1) Eucon CIA by Euclid.
 - (2) DCI or DCI-S by GCP Applied Technologies.
 - (3) Equal as approved by Architect before use. See Section 01 6200.

- 8) Alkali-Silica Reactivity Inhibiting Admixture:
 - a) Specially formulated lithium nitrate admixture for prevention of alkali-silica reactivity (ASR) in concrete. Admixture must have test data indicating conformance to ASTM C1293.
 - b) Type Two Acceptable Products:
 - (1) Eucon Integral ARC by Euclid.
 - (2) RASIR by W R Grace.
 - (3) Equal as approved by Architect before use. See Section 01 6200.
- 9) Viscosity Modifying Admixture (VMA):
 - a) Liquid admixture used to optimize viscosity of Self-Consolidating Concrete (SCC). Subject to compliance with requirements, provide following at dosage rates per manufacturer's recommendation.
 - b) Type Two Acceptable Products:
 - (1) Equal as approved by Architect before use. See Section 01 6200.
- 10) Shrinkage Reducing Admixture (SRA):
 - a) Liquid admixture specifically designed to reduce drying shrinkage and potential for cracking.
 - b) Type Two Acceptable Products:
 - (1) Equal as approved by Architect before use. See Section 01 6200.
- 11) Rapid Drying Admixture in Interior Concrete Slabs on Grade:
 - a) Admixture specifically designed to promote rapid drying of concrete.
 - b) Type Two Acceptable Products:
 - (1) Equal as approved by Architect before use. See Section 01 6200.

2.2 ACCESSORIES

- A. Formwork:
 1. Meet requirements specified in Section 03 1113:
- B. Bonding Agents:
 1. Type Two Acceptable Products:
 - a. Acrylic Additive by Bonsal American.
 - b. Day Chem Ad Bond (J-40) by Dayton Superior.
 - c. Flex-Con by Euclid Chemical Co.
 - d. Larsen Weldcrete by Larsen Products Corp.
 - e. Everbond by L & M Construction Chemicals.
 - f. MasterEmaco A 660 (formally Acryl 60) by BASF.
 - g. U S Spec Multicoat by U S Mix Products.
 - h. Intralok by W R Meadows.
 - i. Equal as approved by Architect before use. See Section 01 6200.
- C. Expansion Joint Filler:
 1. Expansion Joint Filler Material:
 - a. Design Criteria:
 - 1) Resilient, flexible, non-extruding, expansion-contraction joint filler meeting requirements of ASTM D1751.
 - 2) **1/2 inch (12.7 mm)** thick.
 - 3) Resilience:
 - a) When compressed to half of original thickness, recover to minimum of seventy (70) percent of original thickness.
 - b. Type Two Acceptable Products:
 - 1) Fiber Expansion Joint by W R Meadows, Hampshire, IL www.wrmeadows.com.
 - 2) Equal as approved by Architect before installation. See Section 01 6200.
- D. Finishing Material (Exposed Vertical Faces of Foundation and Retaining Walls):
 1. Finishing Material available in multiple concrete shades to closely match concrete surface.
 2. Type Two Acceptable Products:
 - a. Mixture of 1 part cement (using same cement as used in concrete foundations), 1 part sand with 95 percent passing #50 sieve.

- b. RapidSet WunderFixx by CTS Cement Manufacturing Corporation, Cypress, CA
www.rapidset.com.
- c. Equal as approved by Architect before installation. See Section 01 6200.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification Of Conditions:
 1. Concrete Forms:
 - a. Verify dimensions and spot elevations for locations of forms for concrete footings, stem walls, building slabs, curbs, gutters, walkways, and drainage systems are correct before concrete is placed.
 - 1) Notify Architect of incorrect dimensions or spot elevations in writing.
 - 2) Do not place concrete until corrections are made and verified.

3.2 PREPARATION

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

- 3) Avoid cement over 140 deg F (60 deg C).
- 4) Use cold mixing water or ice.
- 5) Use fog spray or evaporation retardant to lessen rapid evaporation from concrete surface.
- 6) See ACI 305.1 'Specification for Hot Weather Concreting' for additional requirements.

B. Surface Preparation:

1. Earthwork Preparation:
 - a. Aggregate base and subgrade:
 - 1) Prepare aggregate base as specified in Section 31 1123.
 - 2) Prepare natural soil subgrade as specified in Section 31 2213.
 - 3) Prepare fill subgrade as specified in Section 31 2323.
2. Inserts, bolts, boxes, templates, pipes, conduits, and other accessories required by Divisions 22, 23, and 26 shall be installed and inspected before placing concrete.
3. Install inserts, bolts, boxes, templates, pipes, conduits, and other accessories furnished under other Sections to be installed as part of work of this Section:
 - a. Tie anchor bolts for hold-down anchors and columns securely to reinforcing steel.

C. Removal:

1. Remove water and debris from space to be placed:

3.3 INSTALLATION

A. Placing Concrete:

1. General:
 - a. Place as soon after mixing as possible.
 - b. Deposit as nearly as possible in final position.
 - c. No concrete shall be deposited in water.
 - d. Placing of concrete shall be continuous until panel or section is complete.
 - e. Compact concrete in forms by vibrating and other means where required.
 - 1) Thoroughly consolidate concrete around reinforcing bars (Consolidation not required in concrete around reinforcing bars with Mix Type G).
 - 2) Use and type of vibrators shall conform to ACI 309.
 - f. Form vertical surfaces full depth. Do not allow concrete to flow out from under forms in any degree into landscaped areas.
 - g. Consolidate concrete thoroughly.
 - h. Do not embed aluminum in concrete.
 - i. Do not use contaminated, deteriorated, or re-tempered concrete.
 - j. Avoid accumulation of hardened concrete.
 - k. Dusting with cement not permitted.
2. Footings:
 - a. Bear 12 inches (300 mm) minimum into undisturbed earth or on mechanically compacted engineered fill. Step footings at ratio of 1-1/2 horizontal to One vertical unless detailed otherwise. Exterior wall footing shall bear 2'-6" minimum below finish grades.
 - b. Level top of finish footing and leave rough.
 - c. Where joints are required, bulkhead, key horizontally, and dowel with two No. 5 reinforcing bars, 48 inches (1 200 mm) long.
3. Foundation Walls: Leave steel projecting where required for floor tie.
4. Exterior Slabs:
 - a. For continuous placing and where shown on Drawings, saw cut one inch (25 mm) deep control joints before shrinkage occurs (2 inches at 6 inch slabs) (50 mm at 150 mm slabs).
5. Miscellaneous Concrete Elements:
 - a. Mow Strips and Aprons:
 - 1) Aggregate base not necessary under mow strips and aprons.
 - 2) Form and cast mow strips in place.
 - 3) Set top of mow strip above finish grade as follows:
 - a) Sodded Areas: 2 inches (50 mm) below.
 - b) Seeded Areas: One inch (25 mm) below.
 - c) Ground Cover Areas: 2 inches (50 mm) below.

- d) Trees and Shrub Areas (not individual trees): 4 inches (100 mm) below.
- 4) Compact topsoil underneath mow strips and aprons to density of undisturbed earth.
- b. Pipe Bollards:
 - 1) Install plumb and fill with concrete.
- c. Sidewalks, Exterior Stairs, And Landings:
 - 1) Slope with cross slope of 1/8 to 1/4 inch per ft (3 to 6 mm per 300 mm) (one to two percent) in direction of intended drainage.
 - 2) Slope away from building 1/8 to 1/4 inch per ft (3 to 6 mm per 300 mm) (one to two percent) minimum.
 - 3) Concrete walks shall be screeded to bring surface to grades and lines as indicated. Surface shall be floated with wood float with no coarse aggregate showing and then given broom finish before concrete sets.
- 6. Joints:
 - a. Control Joints (Contraction Joints):
 - 1) Form control joints with early-entry, dry-cut saws as soon as final trowel operations are complete and joints can be cut without raveling.
 - 2) Depth of control joints shall be approximately one quarter of concrete slab thickness, but not less than one inch (25 mm).
 - 3) Control joints to be hand tooled in sidewalks, curbs and gutters, mow strips, and aprons.
 - 4) Table One:

Concrete Control Joint On-Center Spacing (+/-)		
Sidewalks	4 feet to 6 feet	1.2 meters to 1.8 meters
Curbs and Gutters	10 feet	3.0 meters
Mow Strips	3 feet to 5 feet	0.90 meters to 1.50 meters
Flat Drainage Structures	10 feet	3 meters
Retaining Walls w/guardrails	Align with posts	
Retaining Walls w/chain link fencing	Align with posts	

- b. Expansion Joints:
 - 1) Expansion joints in Concrete Paving are specified in Section 32 1313.
 - 2) Install so top of expansion joint material is 1/4 inch (6 mm) below finished surface of concrete.
 - 3) No expansion joint required between curbs and sidewalks parallel to curb.
 - 4) Provide expansion joints at ends of exterior site concrete elements that are perpendicular to and terminate at curbs, building foundations or other concrete elements (i.e. sidewalks, mow strips, aprons).
 - 5) Provide expansion joints between sidewalks that are parallel, and adjacent, to storage building or main building.
 - 6) Provide expansion joints around perimeter of concrete slab on grade at mechanical enclosure, around perimeter of slab on grade at dumpster enclosure and at top and bottom of exterior stairs.
 - 7) Table Two:

Concrete Expansion Joint (Isolation) On-Center Spacing (+/-)		
Sidewalks, Curbs and Gutters	40 feet to 100 feet	12 meters to 30 meters
Mow Strips and Aprons	20 feet to 40 feet	6 meters to 12 meters
Flat Drainage Structures	50 feet	15 meters
Retaining Walls w/guardrails	36 feet	11 meters
Retaining Walls w/chain link fencing	50 feet	15 meters

- 8) Seal expansion joints as specified in Section 07 9213 for following areas:
 - a) Between entryway slabs and building foundations.
 - b) Between sidewalks and building foundations.
 - c) Within curbs and gutters.

- d) Within flat drainage structures and at joints between flat drainage structures and other concrete elements.
 - 9) Expansion joints are not required to be sealed for following areas:
 - a) Within aprons and where apron abuts sidewalks.
 - b) Within mow strips and where mow strip abuts building foundation and sidewalks.
 - c) Within sidewalks.
 7. Bonding Fresh And Hardened Concrete:
 - a. Re-tighten forms.
 - b. Roughen surfaces.
 - c. Clean off foreign matter and laitance.
 - d. Wet but do not saturate.
 - e. Slush with neat cement grout or apply bonding agent.
 - f. Proceed with placing new concrete.
 8. Anchor Bolts:
 - a. Place anchor bolts not tied to reinforcing steel immediately following leveling of concrete. Reconsolidate concrete around bolt immediately after placing bolt.
 - b. Do not disturb bolts during finishing process.
- B. Finishing:
1. Interior Concrete Flatwork:
 - a. Screed Concrete.
 - b. Float Finish:
 - 1) Float as soon after screeding as possible.
 - 2) Consolidate surface with power-driven floats with exception of areas inaccessible to power-driven floats, which may be hand-floated.
 - 3) Re-straighten, cutting down high spots and filling low spots.
 - 4) Repeat float passes and re-straightening until surface has uniform, smooth, granular texture.
 - c. Rough:
 - 1) Top of stairs to receive setting bed for ceramic or paver tile.
 - 2) Top of building slab to receive setting bed for ceramic or paver tile.
 - d. Trowel Finish:
 - 1) Steel trowel slab after concrete has set enough to avoid bringing water and fines to surface.
 - 2) Perform troweling with power-driven trowels with exception of areas inaccessible to power-driven trowels, which may be hand-troweled.
 - 3) Continue troweling passes and re-straightening with **10 foot (3 meter)** highway straightedge until surface is free of trowel marks and uniform in texture and appearance.
 - 4) Apply burnished, burned-out trowel finish.
 2. Exterior Concrete Flatwork:
 - a. Curb, Gutter, Sidewalks, Mow Strips, Flat Drainage Structures, Stairs, And Miscellaneous:
 - 1) After completion of final floating, performed immediately after screeding and when excess moisture or surface sheen has disappeared, complete surface finishing, as follows:
 - a) Provide fine hair finish where grades are less than 6 percent **1-1/4 inch (32 mm)**.
 - b) Provide rough hair finish where grades exceed 6 percent **1-1/4 inch (32 mm)**.
 - c) Broom finish, by drawing broom across concrete surface, perpendicular to line of traffic. Repeat operation if required to provide fine line texture acceptable to Architect. At curb and gutter, apply broom finish longitudinal to curb and gutter flowline.
 - d) On inclined slab surfaces, provide coarse, non-slip finish by scoring surface with stiff-bristled broom, perpendicular to line of traffic. At curb and gutter, apply broom finish longitudinal to curb and gutter flowline.
 - e) Do not remove forms for twenty-four (24) hours after concrete has been placed. After form removal, clean ends of joints and point-up any minor honeycombed areas. Remove and replace areas or sections with major defects, as directed by Architect.
 - f) Round edges exposed to public view to **1/2 inch (13 mm)** radius, including edges formed by expansion joints.

- g) Remove edger marks.
- 3. Vertical Surfaces (Exposed To View Vertical Surfaces, Exposed Retaining Walls, Exposed Foundation Walls, Concrete Piers, and etc.):
 - a. General:
 - 1) Finishing Material to fill and smooth interior and exterior concrete surface defects such as spalls, gouges, cracks, dents, chips, bug holes, stone pockets, honeycombs, voids and other defective areas.
 - 2) Chamfer lines shall be finished.
 - b. Surface Preparation:
 - 1) Formwork shall be stripped from concrete while concrete is still 'green'.
 - 2) Concrete surface to be finished immediately after formwork has been removed.
 - a) Immediately after removing forms, remove joints, marks, bellies, projections, loose materials and other irregularities, and cut back metal ties from surfaces to be exposed.
 - b) Repair defective areas and voids or stone pockets with Finishing Material and smooth to even surface matching surrounding undamaged area.
 - c. Smooth Rubbed Finish:
 - 1) Thoroughly wet with water, apply Finishing Material in thin layer, rub in circular motion to smooth uniform finish.
 - 2) Entire surface shall be protected from rapid drying for not less than three (3) days.
 - 3) Surfaces shall be cleaned of drip marks and discolorations.
 - 4) Concrete surface shall be left with clean, neat, uniform finish, free from form markings and shall be uniform in color and texture.

C. Curing:

- 1. Membrane Concrete Curing:
 - a. As specified in Section 09 3923 'Membrane Concrete Curing'.
 - b. Follow Manufacturer's written instructions for preparation, application rates, placement, and cleanup:
 - 1) Apply as soon as troweling on interior concrete is complete.
 - 2) Apply as soon as brooming or finishing of exterior concrete is complete.
 - 3) Spraying application is required.
 - 4) Do not dilute or thin product.
 - 5) Do not apply when temperature of concrete is less than 40 deg F (4.4 deg C).
 - 6) Apply uniformly without puddles or ponding.
 - 7) Do not apply before bleed water has dissipated.
 - 8) Do not apply over standing water.

D. Tolerances:

- 1. General:
 - a. Tolerances shall conform to requirements of ACI 117 or CSA A23.1/A23.2, except where specified differently:
 - 1) Floor test surfaces shall be measured and reported within seventy two (72) hours after completion of slab concrete finishing operations and before removal of any supporting shores to eliminate any curling effect F-numbers.
 - b. Maximum Variation Tolerances:
 - 1) Table Three:

Maximum Variation Tolerances		
Thickness, standard	plus 3/8 inch, minus 1/4 inch	plus 9.5 mm, minus 3 mm
Thickness, footings	minus 0 inch	minus 0 mm
Plan, 0 - 20 feet	1/2 inch	12.7 mm
Plan, 40 feet or greater	3/4 inch	19 mm
Plan, footings	plus 1/2 inch	plus 12.7 mm
Eccentricity, footings	2 inch maximum standard, 1/2 inch at masonry	50 mm maximum standard, 12.7 mm at masonry
Openings, size	minus 1/4 inch, plus one inch	minus 6 mm, plus 25.4 mm
Openings, location	plus / minus 1/2 inch at center	plus / minus 12.7 mm at center

Plumb	1/2 inch maximum	12.7 mm maximum
Consecutive Steps, treads	1/4 inch	6 mm
Consecutive Steps, risers	1/8 inch	3 mm
Flight of Stairs, treads	1/4 inch in total run	6 mm in total run
Flight of Stairs, risers	1/8 inch in total height	3 mm in total height

2. Local Flatness / Levelness of Interior Slabs:
 - a. Carpet and Tile Areas:
 - 1) Specified Overall Value of F_F25 / F_L20 and Minimum Local Value of F_F15 / F_L13 when tested in accordance with ASTM E1155.
 - 2) Specified Overall Value of F_F30 / F_L20 and Minimum Local Value of F_F18 / F_L13 when tested in accordance with ASTM E1155 in ceramic, resilient or vinyl tiled areas.
 - 3) Used on building slabs to be covered by carpet and tile as shown on Contract Drawings. Verify and coordinate with Finish Schedule.
 - 4) Remedy For Out-of-Tolerance Building Slabs:
 - a) Sections of building slabs which do not meet specified tolerances but are within ten (10) percent of specified tolerances, may be corrected by grinding or filling, at Owner's option.
 - b) Remove and replace sections of slabs measuring outside specified correctable tolerances.
 - c) Carpet areas: If floor leveling compounds or concrete patching compounds are required to bring floor into specified tolerances, they will be provided by Owner in conjunction with carpet installation and back-charged to Contractor.

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. Reinforcement Bars and Bolts:
 - a. Testing Agency shall provide inspections will include following:
 - 1) Bolts:
 - a) Inspection of bolts to be installed in concrete prior to and during placement of concrete.
 - b) Periodic inspection of anchors installed in hardened concrete.
 - 2) Reinforcement Bars:
 - a) Periodic inspection of reinforcement bars and placement prior to concrete placement to verify grade, size, cover, spacing, and position of reinforcing.
 - b) Inspect that all reinforcement bars are be positively identified as to heat number and mill analysis.
 - c) Confirm surface of reinforcing bars is free of form release oil or other deleterious substances.
 3. Concrete:
 - a. Testing Agency shall provide testing and inspection for concrete as per ASTM C1077.
 - b. Testing and inspections, if performed, will include following:
 - 1) Periodic inspection verifying use of required design mix.
 - 2) Inspection of reinforcing bars and anchor bolts before placement of concrete for proper installation.
 - 3) Inspection at time fresh concrete is sampled to fabricate specimens for strength tests, perform slump and air content tests, and determine temperature of concrete.
 - 4) Inspection of concrete placement for proper application techniques.
 - a) Steel tools are not to be used on exterior concrete.
 - 5) Periodic inspection for maintenance of specified curing temperature and techniques:

- a) Steel tools are not to be used on exterior concrete. Bull floating and finish floating is to be performed with magnesium or wood floats.
- 6) Periodic inspect of formwork for shape, location and dimensions of concrete member being formed:
 - a) Certified Inspector shall inspect forms for general location, configuration, camber, shoring, sealing of form joints, correct forming material, concrete accessories, and form tie locations.
- 7) Periodic inspection of concrete finishing operations for proper finishing techniques.
- 8) Periodic inspection for placement of specified curing compounds.
- c. Testing Agency will sample and test during placement of concrete as directed by Architect and may include following:
 - 1) Sampling Fresh Concrete: ASTM C172/C172M, except modified for slump to comply with ASTM C94/C94M:
 - a) Slump: ASTM C143/C143M, test each time set of compressive specimens are made.
 - b) Air Content: ASTM C173/C173M, volumetric method for lightweight or normal weight concrete: ASTM C231/C231M, pressure method for normal weight concrete each time set of compression test specimens are made.
 - c) Concrete Temperature: Test each time set of compressive specimens are made.
 - d) Unit Weight: ASTM C567/C567M, test each time set of compressive specimens are made.
 - 2) Concrete floor flatness and floor levelness of interior slabs as per ASTM E1155.
 - 3) Concrete moisture and alkalinity testing. See Section 09 0503 Flooring Substrate Preparation.
- d. Compression Test Specimen: ASTM C31/C31M, one (1) set of four (4) standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.
- e. Compressive Strength Tests: ASTM C39/C39M:
 - 1) Obtain one (1) composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd (4 cu m), but less than 50 cu. yd (38 cu m), plus one (1) set for each additional 50 cu. yd (38 cu m) or fraction thereof.
 - 2) One (1) specimen tested at seven (7) days, two (2) specimens tested at twenty-eight (28) days, and one (1) specimen retained in reserve for later testing if required.
 - 3) If strength of field-cured cylinders is less than eighty-five (85) percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing in-place concrete.
 - 4) Strength level of concrete will be considered satisfactory if averages of sets of three (3) consecutive strength test results equal or exceed specified compressive strength, and no individual strength test result falls below specified compressive strength by more than 500 psi (3.45 MPa).
- f. Samples:
 - 1) Fresh Concrete: ASTM C172/C172M except modified for slump to comply with ASTM C94/C94M.
 - a) Slump: ASTM C143/C43M, test each time set of compressive specimens are made.
 - b) Air Content: ASTM C173/C173M, volumetric method for lightweight or normal weight concrete: ASTM C231/C231M, pressure method for normal weight.
 - c) Concrete Temperature: Test each time set of compressive specimens are made.
 - d) Unit Weight: ASTM C567/C567M, test each time set of compressive specimens are made.

B. Non-Conforming Work: Non-conforming work as covered in the General Conditions applies, but is not limited to the following:

1. Correct any work found defective or not complying with contract document requirements at no additional cost to the Owner.

3.5 CLEANING

A. General:

1. Curing:
 - a. Clean tools, equipment as directed by Manufacturer's instructions.

3.6 PROTECTION

- A. Concrete:
 1. Protect concrete that has not received its initial set from precipitation to avoid excess water in mix and unsatisfactory surface finish.
 2. Do not allow materials resulting from construction activities, which will affect concrete or application of finish floor systems adversely, to come in contact with interior concrete slabs.
 3. Protect interior concrete floors from stains, paint, mortar and other construction activities.
- B. Curing:
 1. Restrict foot or vehicle traffic as curing membrane dries as recommended by Manufacturer.

END OF SECTION

SECTION 03 3923**MEMBRANE CONCRETE CURING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
 - 1. Quality of membrane concrete curing as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 03 3111: 'Cast-In-Place Structural Concrete' for application of membrane concrete curing.

1.2 REFERENCES

- A. Definitions:
 - 1. Curing: Process by which hydraulic-cement concrete matures and develops hardened properties, over time, as result of continued hydration of cement in presence of sufficient water and heat. Also used to describe action taken to maintain moisture and temperature conditions in freshly placed concrete.
- B. Reference Standards:
 - 1. American Association of State and Highway Transportation Officials:
 - a. AASHTO M 148-05, 'Standard Specification for Liquid Membrane-Forming Compounds for Curing'.
 - 2. ASTM International:
 - a. ASTM C309-11, 'Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete'.

1.3 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Manufacturer's product data.
 - b. Material Safety Data Sheets (MSDS).
- B. Informational Submittals:
 - 1. Manufacturer Instructions:
 - a. Printed installation instructions.

1.4 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Comply with applicable VOC standards and other local requirements.

1.5 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. Follow Manufacturer's written instructions for handling and storage of product:
 - a. Store in unopened containers in clean, dry area between **35 deg F (2 deg C)** and **110 deg F (43 deg C)** (Keep from freezing) or as directed by Manufacturer's instruction.
2. Shelf Life: Do not use curing compound that is over one (1) year from manufacturer date.

1.6 FIELD CONDITIONS

A. Ambient Conditions:

1. Do not apply curing compound when temperature of concrete is less than **40 deg F (4.4 deg C)**.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Membrane Concrete Curing:

1. Description:
 - a. Clear water-based, ready-to use, dissipating membrane curing agent that cures freshly placed concrete, forming effective barrier against moisture loss from concrete surface.
2. Design Criteria:
 - a. VOC-compliant compound.
 - b. Meet requirements of ASTM C309 and AASHTO M 148, Type 1 or 1-D, Class B.
 - c. Interior concrete: containing no mineral spirits, naptha, or other components detrimental to finish flooring installation.
 - d. Maintain ninety-five (95) percent of mix water present in concrete mass after application.
 - e. Gradually dissipate after twenty-eight (28) days without leaving stain or discoloring concrete surface.
3. Horizontal and Vertical Cast-In-Place Structural Concrete:
 - a. Type One Acceptable Products.
 - 1) Exterior and Interior Concrete:
 - a) Clear Cure J7WB by Dayton Superior Corporation, Miamisburg, OH www.daytonsuperior.com.
 - b) Clear Water Resin by Right Point, Dekalb, IL www.rightpointe.com.
 - c) L&M Cure R by L&M Construction Chemicals, Inc. Omaha, NE www.lmcc.com.
 - d) VOCOMP 20 (exterior concrete only, do not use when a concrete sealer will be applied in areas of freeze/thaw and deicer salts) by W.R. Meadows, Inc. Hampshire, IL www.wrmeadows.com.
 - e) 1100-Clear by W. R. Meadows, Inc. Hampshire, IL www.wrmeadows.com.
 - b. Equal product meeting design criteria requirements as approved by Architect/Owner's Representative before BID. See Section 01 6200.

PART 3 - EXECUTION: Not Used

END OF SECTION

SECTION 03 6213**NON-METALLIC NON-SHRINK GROUTING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install structural grout as described in Contract Documents.
 - a. For grout base for structural columns.
 - b. For grout base for machine bases.
 - c. For securing anchor bolts and hardware in concrete.
 - d. For securing anchor bolts and hardware in masonry.
- B. Related Requirements:
 - 1. Section 04 0516: 'Masonry Grouting'.

1.2 REFERENCES

- A. Association Publications:
 - 1. American Concrete Institute:
 - a. ACI 305R-10, 'Guide to Hot Weather Concreting'.
 - b. ACI 306R-10, 'Guide to Cold Weather Concreting'.
 - c. ACI 351.1R-12, 'Grouting Between Foundations and Bases for Support of Equipment and Machinery'.
- B. Reference Standards:
 - 1. ASTM International:
 - a. ASTM C1107/C1107M-14a, 'Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink).'
 - 2. United States Army Corps of Engineers (USACE):
 - a. CRD C-621-93, 'Handbook for Concrete and Cement Standard Specification for Packaged, Dry, Hydraulic-Cement Grout (Nonshrink'.

1.3 SUBMITTALS

- A. Action Submittals
 - 1. Product Data:
 - a. Manufacturer's data sheets on each product to be used, including:
 - 1) Preparation instructions and recommendations.
 - 2) Storage and handling requirements and recommendations.
 - 3) Manufacturer's printed installation instructions for each product.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Delivery And Acceptance Requirements:
 - 1. Materials shall be delivered in original, unopened packages with labels intact clearly identifying product name and manufacturer until time of use.
- B. Storage And Handling Requirements:
 - 1. Follow Manufacturer's recommendations including but not limited to following:
 - a. Store in clean, dry location.
 - b. Keep containers sealed until ready for use.

- c. Store materials at room temperature before use.
2. Protect materials during handling and placement to prevent damage or contamination.
 - a. Protect materials from freezing or overheating.
3. Shelf Life: One (1) year minimum in original, unopened containers.

1.5 FIELD CONDITIONS

- A. Ambient Conditions:
 1. General:
 - a. Do not place grout over frozen concrete.
 2. Maintain environmental conditions and protect Work during and after installation to comply with referenced standards and Manufacturer's printed recommendations:
 - a. Do not install products under environmental conditions outside Manufacturer's recommendations.
 3. Follow ACI requirements for cold and hot weather concreting or Manufacturer's written instructions, whichever is more stringent:
 - a. Cold Weather Limitations:
 - 1) Follow requirements of ACI 306R for cold weather concreting.
 - b. Hot Weather Limitations:
 - 1) Follow requirements of ACI 305R for hot weather concreting.
 - c. ACI 305R-10, 'Guide to Hot Weather Concreting'.
 - d. ACI 306R-10, 'Guide to Cold Weather Concreting'.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Design Criteria:
 1. Description:
 - a. Commercial non-shrink, non-metallic grout.
 2. Meet following requirements:
 - a. ASTM C1107/C1107M, Type B or Type C.
 - b. Corps and Engineers CRD C-621.
 - c. Compressive strength of **6000 psi (41 MPa)** minimum.
- B. Type Two Acceptable Products:
 1. Masterflow 928 by BASF Systems, Shakopee, MN or BASF Canada, Mississauga, ON www.buildingsystems.basf.com.
 2. ProSpec F77 by Bonsal American, Inc., Charlotte, NC www.bonsal.com.
 3. Advantage 1107 Grout by Dayton Superior Corporation, Oregon, IL www.daytonsuperiorchemical.com.
 4. NS Grout by Euclid Chemical Company, Cleveland, OH www.euclidchemical.com.
 5. Five Star Grout by Five Star Products Inc, Fairfield, CT www.fivestarprouducts.com.
 6. Duragrout by L&M Construction Chemicals Inc., Omaha, NE www.lmcc.com.
 7. Planigrout 712 by MAPEI Corporation, Deerfield Beach, FL www.mapei.US or Mapei Inc., Laval, QC www.mapei.com/CA.
 8. SikaGrout 212 by Sika Corporation, Lyndhurst, NJ www.usa.sika.com or Sika Canada, Inc. Pointe-Claire, QC www.can.sika.com.
 9. MP Grout by US Mix Products Company, Denver, CO www.usspec.com.
 10. Sealtight CG-86 Grout by W R Meadows, Hampshire, IL www.meadows.com.
 11. Equal as approved by Architect before installation. See Section 01 6200.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Surface Preparation:
 - 1. Prepare concrete surfaces in accordance with Manufacturer's written instructions:
 - 2. Remove all loose materials.
 - 3. Clean surface of any substance that could interfere with bond on material including dirt, paint, tar, asphalt, wax, oil, grease, latex compounds, form release agents, laitance, loose toppings, foreign substances and any other residues.
 - 4. Saturate area to be grouted with water in accordance with Manufacturer's written instructions.

3.3 APPLICATION

- A. General:
 - 1. Follow Manufacturer's recommended thickness.
- B. Mixing:
 - 1. Mix grout in accordance with Manufacturer's written instructions.
 - 2. Add mix water in amount in accordance with Manufacturer's written instructions to provide required placing consistency.
 - 3. Do not add water in amount that will cause bleeding or segregation of mixed grout.
 - 4. Do not add any sand, cement, admixtures, or fluidifiers to grout.
- C. Placement:
 - 1. Place grout in accordance with Manufacturer's written instruction including but not limited to the following:
 - a. Proper curing is required.
 - b. Use cold weather or hot weather grouting procedures in accordance with Manufacturer's written instructions, as temperature dictates:
 - 1) Do not use at temperatures that may cause premature freezing.
 - 2) Do not allow to freeze until **4000 psi (27.6 MPa)** is attained.
 - c. Employ cold weather or hot weather grouting practices as temperatures dictates.
 - 2. Completely eliminate air pockets and provide full contact between grout and item being grouted. Do not exceed Manufacturer's recommended thickness.
- D. Curing:
 - 1. Cure grout in accordance with Manufacturer's written instructions or ACI curing practices.
 - 2. Wet cure grout until forms are removed.
 - 3. Seal grout surfaces after forms are removed as recommended by Manufacturer.
- E. Keep grout surfaces wet after curing compound has dried for as long as recommended by Manufacture.

3.4 FIELD QUALITY CONTROL

- A. Field Inspections:

1. Verify product has been installed as per Contract Documents and Manufacturer's written instructions.
- B. Non-Conforming Work: Non-conforming work as covered in the General Conditions applies, but is not limited to the following:
 1. Correct any work found defective or not complying with Contract Document requirements at no additional cost to the Owner.

3.5 CLEANING

- A. Use clean water.
- B. Clean tools and equipment with water before material hardens.

3.6 PROTECTION

- A. Follow Manufacturer's recommendation for protection when applying material.
- B. Protect placed grout from freezing until minimum strength of **4000 psi (27.58 MPa)** is reached.
- C. Protect placed grout from damage during construction.

END OF SECTION

SECTION 03 6300**EPOXY GROUTING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited to:
1. Furnish and install epoxy grouting as described in Contract Documents.

1.2 REFERENCES

- A. Reference Standards:
1. American Society For Testing And Materials:
 - a. ASTM D 638-00, 'Standard Test Method for Tensile Properties of Plastics.'

PART 2 - PRODUCTS**2.1 MATERIALS**

- A. Epoxy Grout:
1. Type One Acceptable Productsto be used in Concrete Applications:
 - a. "HIT RE 500" by Hilti Corporation
 - b. "SET-XP" by Simpson Strong Tie
 - c. Equal as approved by Architect before bidding. See Section 01 6200.
 2. Acceptable Products to be used in Masonry Applications:
 - a. "HIT HY 150 MAX" or "HIT HY 70" by Hilti Corporation (In grouted cells)
 - b. "HIT HY 70" by Hilti Corporation (In un-reinforced masonry cells w/screen tubes)
 - c. "SET-EPOXY-TIE" by Simpson Strong Tie
 - d. "Power-Fast" by Powers Fasteners
 - e. Equal as approved by Architect before bidding. See Section 01 6200.

PART 3 - EXECUTION**3.1 PREPARATION**

- A. All drilled holes for anchor rods 1" in diameter and smaller shall be 1/8" larger than the anchor rod being installed. All drilled holes for anchor rods greater than 1" in diameter shall be 1/4" larger than the bar or anchor rod being installed.
- B. After drilling the proper size hole, clean the walls and bottom of the drilled hole of all dust and debris using a nylon brush in conjunction with oil free compressed air. The hole shall be free of dust, dirt, debris and standing water.
- C. Follow all manufacturers' recommendations for epoxy installation.

END OF SECTION

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DIVISION 05: METALS

05 4000 COLD-FORMED METAL FRAMING

05 4010 COLD-FORMED LOAD-BEARING METAL FRAMING

END OF TABLE OF CONTENTS

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SECTION 05 4010**COLD-FORMED LOAD-BEARING METAL FRAMING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install load-bearing metal framing and blocking as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 09 2216: 'Non-Structural Metal Framing'.
 - 2. Section 09 2900: 'Gypsum Board'.

1.2 REFERENCES

- A. Association Publications:
 - 1. American Iron and Steel Institute (AISI):
 - a. Cold-Formed Steel Design Manual, (2013 Edition) www.steelframing.org.
 - 2. Architectural Testing Inc. (ATI):
 - a. ATI Evaluation Service, Code Compliance Research Report, www.architecturaltesting.com.
 - 3. International Code Council (ICC):
 - a. ICC-ES Evaluation Reports, www.icc-es.org.
 - 4. Steel Framing Industry Association (SFIA):
 - a. SFIA 'Technical Guide for Cold-Formed Steel Framing Products', www.sfia.net.
 - 5. Steel Stud Manufacturers Association (SSMA):
 - a. 2015 IBC - SSMA 'Product Technical Guide'.
- B. Reference Standards:
 - 1. American Iron and Steel Institute (AISI):
 - a. AISI S100-12, 'North American Specification For The Design Of Cold-Formed Steel Structural Members'.
 - b. AISI S110-07-S1-09 (2012), 'Standard For Seismic Design Of Cold-Formed Steel Structural Systems – Special Bolted Moment Frames'.
 - c. AISI S200-12, 'North American Standard For Cold-Formed Steel Framing – General Provisions'.
 - d. AISI S201-12, 'North American Standard For Cold-Formed Steel Framing – Product Data'.
 - e. AISI S210-07 (2012), 'North American Standard For Cold-Formed Steel Framing – Floor and Roof System Design'.
 - f. AISI S211-07 W/SI-12 (2012), 'North American Specification For Cold-Formed Steel Framing – Wall Stud Design'.
 - g. AISI S212-07 (2012), 'North American Specification For Cold-Formed Steel Framing – Header Design'.
 - h. AISI S213-07/S1-09 (2009), 'North American Standard For Cold-Formed Steel Framing – Lateral Design'.
 - i. AISI S214-12, 'North American Standard For Cold-Formed Steel Framing – Truss Design'.
 - 2. American Welding Society:
 - a. AWS D1.3/D1.3M:2008, 'Structural Welding Code - Sheet Steel'.
 - 3. 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 A780/A780M-09(2015), 'Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings'.
 - c. ASTM A924/A924M-17, 'Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.'

- d. ASTM A1003/A1003M-15, 'Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members'.
 - e. ASTM C955-17, 'Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases.'
 - f. ASTM C1007-11a (2015), 'Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories'.
 - g. ASTM C1513-13, 'Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections'.
 - h. ASTM E119-16a, 'Standard Test Methods for Fire Tests of Building Construction and Materials'.
4. Canadian Standards Association (CSA Group):
 - a. CSA S136-12, 'North American Specification for the Design of Cold-Formed Steel Structural Members'.
 5. International Building Code (IBC): (2015 or latest approved version).

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conferences:
 1. Schedule pre-installation conference after submittals have been reviewed and returned by Architect, but before beginning metal framing work:
 2. In addition to agenda items specified in Section 01 3100, review following:
 - a. Review project requirements, substrate conditions, and manufacturer's installation instructions.
 - b. Review welding requirements if welding is required for project.

1.4 SUBMITTALS

- A. Action Submittals:
 1. Product Data:
 - a. Provide technical product data and installation instructions.
 2. Shop Drawings:
 - a. Placing, fabrication, blocking, and erection drawings before commencing work including:
 - 1) Locations of framing members, wall framing sections and opening elevations.
 - 2) Sizes and spacing of framing members.
 - 3) Methods of fastening framing members to each other and to supporting systems.
 - 4) Methods of anchorage.
 - 5) Details of vertical deflection connections to structures.
 - 6) Locations and spacing of lateral bracing and structural bracing systems.
 - 7) Accessory products required for complete installation.
 - 8) Show special components and installations not fully dimensioned or detailed in Manufacturer's Product data.
- B. Informational Submittals:
 1. Certificates:
 - a. Manufacturers certification that product comply with referenced codes and standards, and in accordance with AISI S100.
 - b. Mill certificates or data indicating steel sheet complies with requirements, including base-steel thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
 2. Test And Evaluation Reports:
 - a. ATI, ICC or other Approved Testing Agency (active member) Evaluation Report.
 3. Manufacturers' Instructions:
 - a. Provide recommendations for each component of system.
 4. Source Quality Control Submittals:
 - a. Structural Calculations:

- 1) Submit structural calculations prepared by Manufacturer or Engineer of Record for approval including:
 - a) Description of design criteria.
 - b) Engineering analysis depicting stress and deflection (stiffness) requirements for each framing application.
 - c) Selection of framing components, accessories and welded connection requirements.
 - d) Verification of attachments to structure and adjacent framing components.
5. Qualification Statement:
 - a. Installer:
 - 1) Provide Qualification documentation if requested by Architect or Owner.

1.5 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 1. Comply with AISI specifications and standards.
 2. Fire Characteristics:
 - a. For only projects required by code to be fire-rated construction:
 - 1) Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E119 by, and displaying classification label from testing and inspecting agency acceptable to authorities having jurisdiction (AHJ).
- B. Qualifications:
 1. Manufacturer Qualifications:
 - a. Manufacturer Qualifications: Member in good standing of the Steel Framing Industry Association (SFIA).
 2. Installer Qualifications:
 - a. Provide effective, full time quality control over all fabrication and erection complying with pertinent codes and regulations of government agencies having jurisdiction.
 - b. Minimum two (2) years satisfactorily completed projects of comparable quality, similar size, and complexity in past three (3) years before bidding.
 - c. Upon request, submit documentation.
 3. Testing Agency Qualifications:
 - a. Meet requirements as specified in Section 01 4301 'Quality Assurance – Qualifications'.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Storage And Handling Requirements:
 1. Protect and store cold-formed steel framing from corrosion, moisture staining, deformation, adverse weather, and other damage in accordance with ASTM C1007.
 - a. Remove damaged materials from job site immediately.

PART 2 - PRODUCTS

2.1 ASSEMBLIES

- A. Manufacturers:
 1. Type One Acceptable Manufacturers:
 - a. Any member in good standing of Steel Framing Industry Association (SFIA) or Steel Stud Manufacturer's Association (SSMA).
 - b. Equal as approved by Architect before bidding. See Section 01 6200.
- B. Design Criteria:
 1. Fabricate framing members and accessories in accordance with ASTM C955 from metal meeting requirements of ASTM A653/A653M and/or ASTM A1003/A1003M.

- a. All structural members in gauges 22, 20 and 18 shall be SQ Grade 33 Grade 33, i.e., with $F_y=33$ Ksi.
 - b. All members in gauges of 16, 14 and 12 shall be SQ Grade 50, i.e., with $F_y=50$ Ksi.
 - c. Tracks in all gauges shall be SQ Grade 33, i.e., with $F_y=33$ Ksi., SQ (Structural Quality) - Grade 50 Class 2 minimum.
 - d. All studs, joists, tracks and other framing materials shall be made with steel having G-60 galvanized coating meeting ASTM A653/A653M, ASTM A924/A924M, and ASTM C955.
- C. Materials:
1. Wall Framing:
 - a. Studs: C-shaped steel studs, punched, and with stiffened **1-5/8 inch (41.3 mm)** flanges. Metal thickness and section properties as shown on Drawings.
 - b. Tracks: U-shaped steel track, unpunched and with straight, **1-1/4 inch (32 mm)** wide flanges. Metal thickness to match studs.
 2. Welding:
 - a. Welding is permitted on 18 gauge or heavier material only:
 - 1) Specify welding configuration and size on Structural Calculation submittal.
 - 2) Qualify welding operators in accordance with Section 6.0 of AWS D1.3.
 - 3) Touch up all welds with zinc-rich paint in compliance with ASTM A780/A780M.
 3. Fabrication:
 - a. Framing components shall be cut squarely or at desired angle for a proper square or angular fit. Components shall be held in position with adequate means until properly fastened.

2.2 ACCESSORIES

- A. Framing Accessories:
1. Provide accessories of Manufacturer's standard thickness and configuration, unless indicated otherwise.
 2. Accessories include, but are not limited to, supplementary framing, bracing, bridging and solid blocking, web stiffeners, end clips, gusset plates, girts, joist hangers and end closures, hole reinforcing plates, and backer plates, all as needed to provide complete metal framing system.
- B. Vertical Deflection Clips: Clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web and capable of resisting forces imposed by the wall system:
- C. Slotted Deflection Track: Deep-leg, U-shaped steel track; punched with vertical slots in both legs. Studs should be positively attached to deep-leg track using vertical slots while allowing free vertical movement. Legs designed to support horizontal and lateral loads and transfer them to the primary structure, as follows:
1. Standard Leg: **2-1/2 inch (63.5 mm)**.
 2. Standard Vertical Slot in Leg: **1-1/2 inches (38.1 mm)** or **2-1/2 inch (63.5 mm)**.
 3. Minimum Yield Strength and Thickness:
 - a. 33 ksi: **0.0329 inch (0.84 mm)** and **0.0428 inch (1.09 mm)**.
 - b. 50 ksi: **0.0538 inch (1.37 mm)** and **0.0677 inch (1.72 mm)**.
- D. Headers and Jambs - Heavy-Duty Stud: Used to form header beams and jambs, columns or posts, of web depths indicated, unpunched, with stiffened flanges.
- E. Fasteners:
1. Corrosion resistant coated, self-drilling, self-threading steel drill screws complying with ASTM C1513.

PART 3 - EXECUTION

3.1 EXAMINATION:

- A. Verification Of Conditions:
1. Prior to installation, inspect previous work of all other trades:
 - a. Verify that all work is complete and accurate to point where this installation may properly proceed in strict accordance with framing shop drawings.
 - b. Notify Architect in writing if conditions are not acceptable to install metal stud framing.

3.2 INSTALLATION

- A. Interface With Other Work:
1. Coordinate with other Sections to provide blocking necessary for their work.
 2. Coordinate with other Sections for location of blocking required for installation of equipment and building specialties.
- B. General:
1. Install metal framing in accordance with ASTM C1007, Manufacturer's printed recommendations, and Contract Document requirements, whichever is most stringent on an item-by-item basis.
 2. Notify Architect of conflicts in these requirements.
- C. Erection Tolerances:
1. 1/4 inch (6 mm) in 20 feet (500 mm), non-cumulative in length of wall.
 2. 1/8 inch (3 mm) in 10 feet (250 mm) with 1/4 inch (6 mm) maximum in height of wall.
 3. Distances between parallel walls shall be 1/4 inch (6 mm) maximum along length and height of wall.
 4. Space individual framing members plus or minus 1/8 inch (3 mm) maximum from required location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
- D. Wall Framing:
1. Securely anchor tracks to supporting structures.
 2. Provide complete uniform and level bearing support for bottom track.
 3. Securely anchor abutting pieces of track to common structural element or butt weld or splice.
 4. Securely attach studs to flanges or webs of both upper and lower tracks, and plumb and align.
 5. Install jack studs at door heads and elsewhere as required to furnish structural support and securely attach to supporting members.
 6. Provide temporary bracing until erection is completed.
 7. Install wall stud bridging in manner to provide resistance to both minor axis bending and rotation. Space bridging rows equally not to exceed 48 inch (1 200 mm).
 8. Furnish and install insulation equal to that specified in Division 07 in doubled jamb studs and doubled header members that will not be accessible to insulation installer.
 9. Wrap multiple, adjacent framing members with duct tape or otherwise secure to eliminate 'chattering.'
 10. Use grommets at framing penetrations where unsecured items pass through.

3.3 REPAIR

- A. Galvanizing Repairs:
1. Prepare and repair damaged galvanizing coatings on fabricated and installed cold-formed steel framing as specified in Section 05 0503.

3.4 PROTECTION

- A. Protect installed products until completion of project.

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 1636 WOOD PANEL PRODUCT SHEATHING

06 2000 FINISH CARPENTRY

06 2001 COMMON FINISH CARPENTRY REQUIREMENTS
06 2024 DOOR, FRAME, AND FINISH HARDWARE INSTALLATION
06 2210 MISCELLANEOUS WOOD TRIM

06 4000 ARCHITECTURAL WOODWORK

06 4001 COMMON ARCHITECTURAL WOODWORK REQUIREMENTS
06 4005 PLASTIC LAMINATE
06 4116 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS
06 4512 ARCHITECTURAL WOODWORK WOOD TRIM

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. 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
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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.

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

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. Related Requirements:
 - 1. Sections under 06 0500 Heading: Wood Treatment.
 - 2. Sections under 06 4000 Heading: 'Architectural Woodwork' for wall blocking requirements.

1.2 REFERENCES

- A. Reference Standards:
 - 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 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
 - 1. Protect lumber and plywood 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 plywood on level racks and keep free of ground to avoid warping.
 - 2. Stack to insure proper ventilation and drainage.

PART 2 - PRODUCTS**2.1 MATERIAL**

- A. Dimension Lumber:
 - 1. Meet requirements of PS 20 and National Grading Rules for softwood dimension lumber.
 - 2. 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.
 - 3. 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'.
 - 4. Preservative Treated Plates / Sills:
 - a. **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)
 - b. **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. Lumber Ledgers:
 - 1. No. 1 Douglas Fir, Larch, or Southern Pine.

- C. Blocking:
 - 1. Sound lumber without splits, warps, wane, loose knots, or knots larger than **1/2 inch (13 mm)**.
- D. Furring Strips:
 - 1. Utility or better.

PART 3 - EXECUTION

3.1 ERECTION

- A. General:
 - 1. Use preservative treated wood for wood members in contact with concrete or masonry.
- B. Masonry Wall Plates:
 - 1. Anchor **2x6 (50 mm by 150 mm)** and **2x8 (50 mm by 200 mm)** 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.
- C. Accessory / Equipment Mounting And Standing & Running Trim Blocking (nailers):
 - 1. Furnish and install blocking in wood framing required for hardware, specialties, equipment, accessories, and mechanical and electrical items, etc.
 - 2. Attach blocking not installed with clips with two fasteners in each end of each piece of blocking.
- D. Furring Strips
 - 1. On Wood or Steel: Nail or screw as required to secure firmly.
 - 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 1636**WOOD PANEL PRODUCT SHEATHING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install wood panel product sheathing required for walls, roofs, and floors as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 01 0000: 'General Requirements':
 - 2. Section 06 1100: 'Wood Framing' for:
 - a. Pre-installation conference held jointly with Section 06 1636.

1.2 REFERENCES

- A. Association Publications:
 - 1. National Institute of Standards and Technology (NIST), U. S. Department of Commerce:
 - a. Voluntary Product Standard DOC PS 1-09. 'Structural Plywood'.
 - b. Voluntary Product Standard DOC PS 2-04. 'Performance Standard for Wood-Based Structural-Use Panels'.
 - 2. The Engineered Wood Association (APA), Tacoma, WA www.apawood.org.
 - a. Performance Rated Panels, 'Product Guide' (for products bearing the APA trademark) December 2011.
 - b. Voluntary Product Standard:
 - 1) PS 1-09. 'Structural Plywood'.
 - 2) PS 2-04. 'Performance Standard for Wood-Based Structural-Use Panels'.
 - c. PRP-108 'Performance Standards and Policies for Structural-Use Panels'.
 - 3. TECO, Cottage Grove, WI www.tecotested.com.
 - a. TECO PRP-133: ('Fire Rated Assemblies – OSB substitution for plywood in UL fire-rated assemblies that specify plywood).
- B. Reference Standards:
 - 1. International Code Council (IBC) (2015 or latest AHJ approved edition):
 - a. IBC Chapter 17, 'Special Inspections And Tests'.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference:
 - 1. Participate in pre-installation conference as specified in Section 06 1100.
 - 2. In addition to agenda items specified in Section 01 3100 and Section 06 1100, review following:
 - a. Review Section 01 4523 for Testing and Inspection administrative requirements and responsibilities and Field Quality Control inspection required of this section.
- B. Scheduling:
 - 1. Notify Testing Agency and Architect twenty-four (24) hours minimum before placing sheathing.

1.4 SUBMITTALS

- A. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:

- a. Record Documentation:
 - 1) Testing and Inspection Reports:
 - a) Testing Agency Inspection Reports of sheathing.

1.5 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Performance:
 - 1. Design Criteria:
 - a. Meet requirements of PS 1, PS 2, or PRP-133 (TECO). Except where plywood is specifically indicated on Contract Drawings, oriented strand board (OSB) is acceptable.
- B. Sheathing:
 - 1. Sheathing:
 - a. Sheathing shall bear grade stamp from American Plywood Association (APA) or equal grading organization.
 - b. Sheathing shall not exceed 18 percent moisture content when fabricated or more than 19 percent when installed in Project.
 - c. Sheathing 23/32 inch (18.3 mm) thick and thicker used for single-layer subflooring shall be tongue and groove.
 - d. Sheathing used for same purpose shall be of same thickness. In all cases, thickness specified is minimum required regardless of span rating.
 - e. Minimum span ratings for given thicknesses shall be as follows:

Thickness	Span Rating
3/8 inch	24 / 0
7/16 inch nominal	24 / 16
15/32 inch actual	32 / 16
1/2 inch nominal	32 / 16
19/32 inch actual	40 / 20
5/8 inch nominal	40 / 20
23/32 inch actual	48 / 24
3/4 inch nominal	48 / 24

2.2 ACCESSORIES

- A. Nails:
 - 1. As indicated on Contract Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General:
 - 1. Top of nail heads shall be flush with sheathing surface.
 - 2. Use of edge clips to provide spacing between sheathing panels is acceptable.
- B. Roof Sheathing:
 - 1. Placing:
 - a. Lay face grain at right angles to supports. Provide blocking for support if framing turns at roof overhang.
 - b. Provide **1/8 inch (3 mm)** space between sheets at end and side joints.
 - c. Stagger panel end joints.
 - d. Sheathing shall be continuous of two spans minimum.
 - 2. Edge Bearing and Blocking:
 - a. As indicated on Contract Drawings.
 - 3. Nail Spacing:
 - a. As indicated on Contract Drawings.
 - b. Place nails at least **3/8 inch (9.5 mm)** in from edge.
 - 4. Thickness:
 - a. As indicated on Contract Drawings.
 - 5. Do not install any piece of roof sheathing with shortest dimension of less than **24 inches (600 mm)** unless support is provided under all edges.

3.2 FIELD QUALITY CONTROL

- A. Field Inspections:
 - 1. Sheathing:
 - a. General:
 - 1) Owner is responsible for Quality Assurance. Quality assurance performed by Owner will be used to validate Quality Control performed by Contractor.
 - 2) Quality Control is sole responsibility of Contractor as specified in Section 01 4523 'Testing And Inspection Services'.
 - b. For walls and roof areas where nail spacing is **4 inches (100 mm)** and less on center, Inspector shall verify wood panel sheathing, grade, thickness and nominal size of framing members, adjoining panel edges, nail size and spacing, bolting and other fastening of other components.

3.3 PROTECTION

- A. Protect roof sheathing from moisture until roofing is installed.

END OF SECTION

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SECTION 06 2001**COMMON FINISH CARPENTRY REQUIREMENTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install sealants required for items installed under this Section, as described in Contract Documents.

- B. Products Installed But Not Furnished Under This Section:
 - 1. Architectural Woodwork.
 - 2. Chair Rails.
 - 3. Pass-through Window and Trim (Family Services only).
 - 4. Selected Building Specialties.
 - 5. Selected Equipment.
 - 6. Miscellaneous as specified elsewhere.

- C. Related Requirements:
 - 1. Section 06 1100: 'Wood Framing' for furring and blocking.
 - 2. Section 06 2210: 'Miscellaneous Wood Trim'.
 - 3. Sections under 06 4000 Heading: Furnishing of Architectural Woodwork.
 - a. Section 06 4001: 'Common Architectural Woodwork Requirements':
 - 1) Approved Fabricators.
 - 2) Quality of wood materials to be used in Finish Carpentry.
 - b. Section 06 4005: 'Plastic Laminate' for countertops.
 - c. Section 06 4116: 'Plastic Laminated-Faced Architectural Cabinets'.
 - d. Section 06 4512: 'Architectural Woodwork Wood Trim'.
 - 4. Section 06 6001: 'Miscellaneous Plastic Fabrications' for quality of Window Stools.
 - 5. Section 07 9213: 'Elastomeric Joint Sealants' for quality of sealants, submittal and installation requirements.
 - 6. Section 08 5619: 'Pass Windows' for pass-through window.
 - 7. 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.
 - 8. Sections in Division 10: Furnishing of Specialties.
 - 9. Sections in Division 11: Furnishing of Equipment.

1.2 REFERENCES

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

- B. Definitions:
 - 1. Grade: Unless otherwise noted, this term means Grade rules for Economy, Custom, and/or Premium Grade:
 - a. Economy Grade: The lowest acceptable grade in both material and workmanship requirements, and is for work where price outweighs quality considerations.
 - b. Custom Grade: Typically specified for and adequately covers most high-quality architectural woodwork, providing a well-defined degree of control over a project's quality of materials, workmanship, or installation.
 - c. Premium Grade: The highest Grade available in both material and workmanship where the highest level of quality, materials, workmanship, and installation is required.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Bommer Industries, Landrum, SC www.bommer.com.
 - b. Ives, Indianapolis, IN www.iveshardware.com.
 - c. Stanley, New Britain, CT www.stanleyhardware.com or Oakville, ON (800) 441-1759.
- 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.

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

END OF SECTION

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

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

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference.
 - 1. Participate in pre-installation conference.
 - 2. In addition to agenda items specified in Section 01 3100, review following:
 - a. Schedule conference after hardware has been delivered to site and organized into hardware groups by door, but before installation of hardware.
 - b. Check for appropriate blocking and for correct hardware models and fasteners for substrates.
 - c. Review submittals and set of Manufacturer's installation, adjustment, and maintenance instructions submitted under Section 08 7101.
 - d. Review use of crowbar or other prying devices are not permitted to be used to set door frame into wall opening.

1.3 SUBMITTALS

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

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
 - 1. Wood Doors:
 - a. Do not have doors delivered to building site until after plaster, cement, and taping compound are dry.

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

PART 2 - PRODUCTS: Not Used

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Hollow Metal Frames:
 1. Site Tolerances:
 - a. Squareness: **1/16 inch (1.6 mm)** from top edge to opposite top edge.
 - b. Plumbness: **1/16 inch (1.6 mm)** from top of jamb to bottom of jamb.
 - c. Alignment: **1/16 inch (1.6 mm)** from plane of left side face of jamb to right side face of jamb.
 - d. Twist: **1/16 inch (1.6 mm)** across throat of jamb plane measured across each face to plane of opposite jamb throat.
 - e. Finished Clearance Between Door And Frame:
 - 1) **1/16 inch (1.6 mm)** at head and hinge jamb plus **1/16 inch (1.6 mm)** maximum
 - 2) **1/8 inch (3 mm)** at strike jamb plus or minus **1/16 inch (1.6 mm)** maximum.
 - 3) **1/2 inch (12.7 mm)** to top of finished floor surface or **1/4 inch (6 mm)** to top of threshold, plus or minus **1/16 inch (1.6 mm)** maximum.
 2. Set frame in location and level head.
 - a. Use of crowbar or other prying device to set door frame into wall opening will damage door frames and are not permitted to be used.
 3. Equalize with adjustable floor anchor.
 4. Set spreaders and fasten jambs to floor and wall.
 - a. Wood spreaders shall be square, fabricated from lumber one inch minimum thick, be same length as door opening at header, and same depth as frame.
 - b. Cut notches for frame stops.
 - c. Do not remove spreaders until frames are permanently anchored in wall.
 - d. Use one spreader at base of frame and another at strike level.
 - e. Do not use temporary spreaders welded to base of jambs during installation of frame.
 5. Fill gap between frame and framing with urethane foam or tightly-packed fiberglass insulation. If urethane foam is used, foam interior of frames before installing frame. Trim excess before installation of frame.
 6. Caulking:
 - a. Caulk around both sides of frames of doors receiving acoustical seals with specified sealant.
 - b. 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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SECTION 06 2210**MISCELLANEOUS WOOD TRIM****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install wood trim not specified elsewhere as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 06 1100: 'Wood Framing' for wall blocking required for Wood Trim.
 - 2. Section 06 2001: 'Common Finish Carpentry Requirements':
 - a. Installation of Wood Trim.
 - 3. Section 06 4001: 'Common Architectural Woodwork Requirements':
 - a. Approved Fabricators.
 - b. General standards for materials and fabrication of Architectural Woodwork.
 - 4. Section 06 4512: 'Architectural Woodwork Wood Trim'.
 - 5. Section 09 9324: 'Interior Clear-Finished Hardwood'.

1.2 REFERENCES

- A. Association Publications:
 - 1. Architectural Woodwork Institute / Architectural Woodwork Manufacturers Association of Canada / Woodwork Institute, 46179 Westlake Drive, Suite 120, Potomac Falls, VA www.awinet.org.
 - a. Architectural Woodwork Standards (AWS), 2nd Edition, 2014.
- B. Definitions:
 - 1. Grade: Unless otherwise noted, this term means Grade rules for Economy, Custom, and/or Premium Grade:
 - a. Custom Grade: Typically specified for and adequately covers most high-quality architectural woodwork, providing a well-defined degree of control over a project's quality of materials, workmanship, or installation.
 - 2. Plain-Sawn: A hardwood figure developed by sawing a log lengthwise at a tangent to the annual growth rings. It appears as U-shaped or straight markings in the board's face.

1.3 SUBMITTALS

- A. Action Submittals:
 - 1. Samples:
 - a. Interior Hardwood for Transparent Finish:
 - 1) Before performing work of this Section, prepare Control Sample, to match sample available from Owner, to be used as finishing standard for interior clear finished hardwood as specified in Section 09 9324.
 - 2) Design Criteria:
 - a) Provide **8 inch by 10 inch (200 mm by 255 mm)** sample of Red Oak to match Owner provided stain color selected for Project.
 - b) Control Sample will be used as performance standard for evaluating finish provided.
- B. Informational Submittals:
 - 1. Source Quality Control Submittals:
 - a. Samples:
 - 1) Interior Hardwood for Transparent Finish:

- a) Owner will provide Control Sample for finish.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Design Criteria:
 - 1. General:
 - a. Meet requirements of Section 06 4001 for general standards for materials and fabrication of Architectural Woodwork.
 - 2. Clear Finished Hardwood:
 - a. Match materials specified in Section 06 4512.
 - b. Match finish specified in Section 06 4512 and match Owner selected sample as specified in Section 09 9324.

2.2 SOURCE QUALITY CONTROL

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

PART 3 - EXECUTION: Not Used

END OF SECTION

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

- A. Includes But Not Limited To:
 - 1. General standards for materials and fabrication of Architectural Woodwork and for hardware associated with Architectural Woodwork.
- B. Related Requirements:
 - 1. Section 06 1100: 'Wood Framing' for furring and blocking.
 - 2. Section 06 2001: 'Common Finish Carpentry Requirements' for Installation.
 - 3. Section 06 2210: 'Miscellaneous Wood Trim'.
 - 4. Section 06 4005: 'Plastic Laminate'.
 - 5. Section 06 4116: 'Plastic-Laminated-Faced Architectural Cabinets'.
 - 6. Section 06 4512: 'Architectural Woodwork Wood Trim'.
 - 7. Section 09 9324: 'Interior Clear-Finished Hardwood' for filling of nail holes and finishing.

1.2 REFERENCES

- A. Association Publications:
 - 1. Architectural Woodwork Institute / Architectural Woodwork Manufacturers Association of Canada / Woodwork Institute, 46179 Westlake Drive, Suite 120, Potomac Falls, VA www.awinet.org.
 - a. Architectural Woodwork Standards (AWS), 2nd Edition, 2014.
- B. Definitions:
 - 1. Grade: Unless otherwise noted, this term means Grade rules for Economy, Custom, and/or Premium Grade:
 - a. Custom Grade: Typically specified for and adequately covers most high-quality architectural woodwork, providing a well-defined degree of control over a project's quality of materials, workmanship, or installation.

1.3 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Manufacturer's literature for specialty items and hardware not manufactured by Architectural Woodwork fabricator.
 - 2. Shop Drawings:
 - a. Fabricator:
 - 1) Provide shop drawings for cabinet and casework that are included for project showing details, casework locations and layout in compliance with Contract Drawings.
- B. Informational Submittals:
 - 1. Qualification Statement:
 - a. Fabricator:
 - 1) Provide Qualification documentations as requested.

1.4 QUALITY ASSURANCE

- A. Qualifications: Requirements of Section 01 4301 applies, but not limited to following:

1. Fabricator:
 - a. Fabricator Firm specializing in performing work of this section.
 - 1) Firm experience in supplying products indicated for this Project.
 - 2) Firm with sufficient production capacity to produce required units.
 - 3) Firm will comply with specifications and Contract Documents for this Project.
 - 4) Minimum five (5) years experience in Woodwork installations.
 - 5) Minimum five (5) satisfactorily completed installations in past three (3) years of projects similar in size, scope, and installation procedures required for this project before bidding.
 - b. Upon request by Architect or Owner, submit documentation.

1.5 DELIVERY, HANDLING, AND STORAGE

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

PART 2 - PRODUCTS

2.1 FABRICATORS

- A. Approved Fabricators. See Section 01 4301:
 1. Meet Quality Assurance Fabricator Qualifications as specified in Part 1 of this specification.

2.2 ASSEMBLIES

- A. Design Criteria:
 1. General:
 - a. AWS Custom Grade is minimum acceptable standard, except where explicitly specified otherwise, for materials, construction, and installation of architectural woodwork.
 2. Materials:
 - a. Lumber:
 - 1) Grade:
 - a) No defects in boards smaller than 600 sq in (3 871 sq cm).
 - b) One defect per additional 150 sq inches (968 sq cm) in larger boards.
 - c) Select pieces for uniformity of grain and color on exposed faces and edges.
 - d) No mineral grains accepted.
 - 2) Allowable Defects:
 - a) Tight knots not exceeding 1/8 inch (3 mm) in diameter. No loose knots permitted.
 - b) Patches (dutchmen) not apparent after finishing when viewed beyond 18 inches (450 mm).
 - c) Checks or splits not exceeding 1/32 inch by 3 inches (1 mm by 75 mm) and not visible after finishing when viewed beyond 18 inches (450 mm).
 - d) Stains, pitch pockets, streaks, worm holes, and other defects not mentioned are not permitted.
 - e) Normal grain variations, such as cats eye, bird's eye, burl, curl, and cross grain are not considered defects.
 - 3) Use maximum lengths possible, but not required to exceed 10 feet (3 meters) without joints. No joints shall occur closer than 72 inches (1 800 mm) in straight runs

- exceeding 18 feet (3 600 mm). Runs between 18 feet (3 600 mm) and 10 feet (3 meters) may have no more than one joint. No joints shall occur within 72 inches (1 800 mm) of outside corners nor within 18 inches (450 mm) of inside corners.
- 4) Moisture content shall be six (6) percent maximum at fabrication. No opening of joints due to shrinkage is acceptable.

B. Fabrication:

1. Follow Architectural Woodwork Standards (AWS) for fabrication of Architectural Woodwork.
2. Tolerances:
 - a. No planer marks (KCPI) allowed. Sand wood members and surfaces with 100 grit or finer.
 - b. Maximum Gap: None allowed.
 - c. Flushness Variation: 0.015 inch (0.4 mm) maximum.
 - d. Sanding Cross Scratches: 1/4 inch (6 mm) maximum.
 - e. Plug screw holes. Screw locations not to be visible beyond 18 inches (450 mm).
3. Fabricate work in accordance with measurements taken on job site.
4. 'Ease' sharp corners and edges of exposed members to promote finishing and protect users from splinters. Radius of 'easing' shall be uniform throughout Project and between 1/32 and 1/16 of an inch (0.8 and 1.6 of a millimeter).
5. Fabricate so veneer grain is vertical.
6. Joints:
 - a. Use lumber pieces with similar grain pattern when joining end to end.
 - b. Compatibility of grain and color from lumber to panel products is required.
7. Install hardware in accordance with Manufacturer's directions. Leave operating hardware operating smoothly and quietly.
8. Remove or repair damaged surface of or defects in exposed finished surfaces of architectural woodwork to match adjacent similar undamaged surface.

PART 3 - EXECUTION: Not Used

END OF SECTION

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

- A. Products Furnished But Not Installed Under This Section:
 - 1. Wall-hung counters.
 - 2. Countertops for custom casework.

- B. Related Requirements:
 - 1. Section 06 2001: 'Common Finish Carpentry Requirements':
 - a. Installation of countertops for custom casework.
 - 2. Section 06 4001: 'Common Architectural Woodwork Requirements':
 - a. Approved Fabricators.
 - b. General standards for materials and fabrication of Architectural Woodwork.

1.2 REFERENCES

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

- B. Definitions:
 - 1. Flame Spread: The propagation of flame over a surface.
 - a. Flame Spread Index: The numerical value assigned to a material tested in accordance with ASTM E84 or UL 723.
 - 2. Grade: Unless otherwise noted, this term means Grade rules for Economy, Custom, and/or Premium Grade.
 - a. Premium Grade: Highest Grade available in both material and workmanship where highest level of quality, materials, workmanship, and installation is required.
 - 3. High-Pressure Decorative Laminate (HPDL): Laminated thermosetting decorative sheets intended for decorative purposes. Also known as Plastic Laminate.
 - 4. Smoke-Developed Index: The numerical value assigned to a material tested in accordance with ASTM E84 or UL 723.

- C. Reference Standards:
 - 1. ASTM International:
 - a. ASTM E84-16, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
 - b. ASTM E162-15a, 'Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source'.
 - 2. Kitchen Cabinet Manufacturers Association:
 - a. ASTM/KCMA A161.1-2012, 'Performance And Construction Standards For Kitchen And Vanity Cabinets'.
 - 3. National Electrical Manufacturer's Association / American National Standards Institute:
 - a. ANSI/NEMA LD-3-2005, 'High Pressure Decorative Laminates'.
 - 4. Underwriters Laboratories, Inc.:
 - a. UL 723: 'Standard for Safety Test for Surface Burning Characteristics of Building Materials'; (10th Edition).

1.3 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Color selections.
 - b. Manufacturer's technical data sheet.
- B. Informational Submittals:
 - 1. Certificates:
 - a. Provide Manufacturer's certification of compliance to ANSI/NEMA LD 3.
 - 2. Test And Evaluation Reports:
 - a. Test reports: Certified test reports showing compliance with specified performance characteristics and physical properties for Quality Assurance if requested by Owner or Architect.
- C. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Record Documentation:
 - 1) Manufacturers documentation:
 - a) Manufacturer's literature for plastic laminate.
 - b) Color selections.

1.4 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Fire-Test-Response Characteristics: Provide plastic laminate with surface burning characteristics as determined by testing identical products by qualified testing agency.
 - a. Surface-Burning Characteristics:
 - 1) Plastic Laminate shall have Class A flame spread rating in accordance with ASTM E84 or UL 723 Type 1.
 - a) Class A (Flame spread index 0-25; Smoke-developed index 0-450).
 - b) Flash point: None.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Fabricators:
 - 1. Approved Fabricators. See Section 06 4001 for Approved Fabricators.
- B. Manufacturers:
 - 1. Type Two Acceptable Manufacturers:
 - a. Nevamar, Odenton, MD www.nevamar.com.
 - b. Equal as approved by Architect before bidding. See Section 01 6200.
- C. Plastic Laminates:
 - 1. Design Criteria:
 - a. Countertops:
 - 1) Post-formed front edge and backsplash, except where detailed otherwise, with plastic laminate meeting requirements of ANSI/NEMA LD 3: PF 42.
 - a) Vertical Applications: GP 28.
 - b) Horizontal (other than countertops): GP 38.
 - 2) No raised lip on front edge.
 - b. Balancing Material: BK 20.
 - c. AWS Quality Grade: Premium.
 - 2. Assemblies:

- a. Countertops shall meet requirements of KCMA A161.1.
- b. Adhesives for other than post-formed types shall be spray grade, high heat resistant, neoprene contact adhesive.
3. Category Four Approved Colors. See Section 01 6200 for definition of Categories:
 - a. MR7002 Wild Oats by Nevamar.

PART 3 - EXECUTION: Not Used

END OF SECTION

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SECTION 06 4116**PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
 - 1. Custom casework:
- B. Related Requirements:
 - 1. Section 06 1100: Furring and blocking.
 - 2. Section 06 2001: 'Common Finish Carpentry Requirements':
 - a. Installation of countertops for custom casework.
 - 3. Section 06 4001: 'Common Architectural Woodwork Requirements':
 - a. Approved Fabricators.
 - b. General standards for materials and fabrication of Architectural Woodwork.
 - 4. Section 06 4005: 'Plastic Laminate' for countertops.

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.
 - 2. Hardwood Plywood & Veneer Association (HPVA), Reston, VA www.hpva@hpva.org.
 - 3. The Engineered Wood Association (APA), Tacoma, WA www.apawood.org.
- B. Definitions:
 - 1. Adhesive, Type I (fully waterproof): Forms a bond that will retain practically all of its strength when occasionally subjected to a thorough wetting and drying; bond shall be of such quality that specimens will withstand shear and the two-cycle boil test specified in ANSI/HPVA HP (latest edition).
 - 2. Adhesive, Type II (water-resistant): Forms a bond that will retain practically all of its strength when occasionally subjected to a thorough wetting and drying; bond shall be of such quality that specimens will withstand the three-cycle cold soak test specified in ANSI/HPVA HP.
 - 3. Core: The material (typically, veneer, lumber, particleboard, medium-density fiberboard, or a combination of these) on which an exposed surface material (typically, veneer or high-pressure decorative laminate HPDL) is applied.
 - 4. Core, Solid: The innermost layer or section in flush door construction. Typical constructions are as follows:
 - a. Core, Mineral: A fire-resistant core material generally used in wood doors requiring fire ratings of 3/4 hours or more.
 - b. Particleboard - A solid core of wood or other lignocellulose particles bonded together with a suitable binder, cured under heat, and pressed into a rigid panel in a flat-platen press.
 - 5. Edge Banding: Method of concealing plies or inner cores of plywood or particleboard when edges are exposed.
 - 6. Exposed Surfaces: Surfaces normally visible after installation.
 - 7. Face: The better side of any panel in which the outer plies are of different veneer grades; also, either side of a panel in which there is no difference in veneer grade of the outer plies.
 - 8. 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.

9. High-Pressure Decorative Laminate (HPDL): Laminated thermosetting decorative sheets intended for decorative purposes. Sheets consist essentially of layers of fibrous sheet material, such as paper, impregnated with thermosetting condensation resin and consolidation under heat and pressure. Top layers have decorative color or printed design. Exposed surface has attractive exposed surface that is durable and resistant to damage from abrasion and mild alkalies, acids, and solvents. Also, known as Plastic Laminate.
10. Medium Density Fiberboard (MDF): Generic name for a panel or core manufactured from lignocellulosic fibers combined with synthetic resin or other suitable binder and bonded together under heat and pressure in hot press by process in which added binder creates entire bond.
11. Melamine: Resin-impregnated paper used in decorative composite panel products.
12. Panel Product: Panels manufactured with differences in core materials, adhesives or binders which affect characteristics of the panels. These include wood veneers and many prefinished wood panels and decorative overlays with aesthetic and performance characteristics.

C. Reference Standards:

1. American National Standards Institute / Hardwood Plywood & Veneer Association:
 - a. ANSI/HPVA HP-1-2009, 'Standard for Hardwood and Decorative Plywood'.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

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

1.4 SUBMITTALS

A. Action Submittals:

1. Product Data:
 - a. Manufacturer's literature or cut sheets for hardware.
2. Shop Drawings:
 - a. Confirm compliance with Contract Document requirements as to configuration and dimensions of custom casework.
 - b. Include plan and elevation views, materials used, standing and running trim profiles, assembly methods, joint details, fastening methods, accessories, and hardware.

1.5 DELIVERY, HANDLING, AND STORAGE

A. Delivery And Acceptance Requirements:

1. Assemble architectural woodwork at Architectural Woodwork Fabricator's plant and deliver ready for erection insofar as possible.
2. Protect architectural woodwork from moisture and damage while in transit to job site.
3. Report damaged materials received within two (2) days from delivery at project site.

B. Storage And Handling Requirements:

1. Unload and store in place where it will be protected from moisture and damage and convenient to use.

1.6 WARRANTY

A. Manufacturer Warranty:

1. Fabricator's written guarantee that all Goods and Services will be free from defects in materials and workmanship for warranted period from date of substantial completion.

PART 2 - PRODUCTS**2.1 ASSEMBLIES****A. Manufacturers:**

1. Manufacturer Contact List:
 - a. Accuride, Santa Fe Springs, CA www accuride.com.
 - b. Blum Inc, Stanley, NC www blum.com.
 - c. CompX National, Mauldin, SC www nclnet.com.
 - d. Formica, Cincinnati, OH www formica.com.
 - e. Grass America Inc, Kernerville, NC www grassusa.com.
 - f. Hafele America Co., Archdale, NC hafele.com.
 - g. Ives, Indianapolis, IN www iveshardware.com.
 - h. Knap & Vogt, Grand Rapids, MI www knapeandvogt.com.
 - i. Nevamar, Odenton, MD www nevamar.com.
 - j. Olympus Lock Co, Seattle, WA www olympus-lock.com.
 - k. Salice America Inc, Charlotte, NC (800) 222-9652 or (704) 841-7810
www saliceamerica.com.
 - l. Stanley, New Britain, CT www stanleyhardware.com.

B. Components:

1. Design Criteria:
 - a. General:
 - 1) Except as noted otherwise, fabricate the work of this section to AWS 'Custom Grade'.
2. Panel Product:
 - a. Glues (adhesives) used in manufacture and fabrication of panel products shall be Type I or II.
 - b. Moisture content shall be same as specified for lumber.
 - c. Cores:
 - 1) Cabinet Doors: Medium density fiberboard (MDF) with minimum density of **48 lbs per cu ft (769 kg per cu meter)**.
 - 2) All Other: Industrial grade particle board with minimum density of **45 lbs per cu ft (721 kg per cu meter)**.
 - d. Facings And Colors:
 - 1) Plastic Laminate:
 - a) Approved Colors:
 - (1) S6031 Fossil Gray by Nevamar.
 - 2) Melamine or Kortron: White.
 - e. Edgings:
 - 1) Shelves And Exposed Panel Product Edges:
 - a) Hot-glued, 2 mm thick minimum, PVC edge-banding.
 - b) Wood-grained or solid color to match cabinet, except color matching Melamine or Kortron surface at shelf edges.
 - 2) Semi-Exposed Panel Product Edges:
 - a) Hot-glued, **0.018 inch (0.46 mm)** thick minimum, PVC edge-banding, wood grained or solid color to match cabinet.

C. Fabrication:

1. Construction:
 - a. Cabinet Body:
 - 1) Use AWS Flush Overlay construction on cabinet bodies.
 - 2) If used, install Rail System adjustable shelf supports recessed.
 - b. Drawers:
 - 1) Fabricate with separate, screw-attached drawer front.
 - 2) Joints shall be dowel and pressure glued, or lock shoulder, glued, and pin nailed.
 - 3) Set bottoms into sides, backs, and subfront with **1/4 inch (6 mm)** deep groove with **3/8 inch (9.5 mm)** minimum standing shoulder.

- 4) Every drawer shall have specified drawer guides and pull installed. Install drawer guides with 'Euroscrews', and pulls with through-bolts passing through both front and sub-front.
- c. Cabinet Doors:
 - 1) Full height, panel product cabinet doors may be fabricated in two pieces and joined on back with metal backplate. Backplate shall match interior door surface color.
 - 2) Hinges: Install hinges using plastic insertion dowels for hinges and 'Euroscrews' for baseplates.
 - 3) Every cabinet door shall have specified pull installed.
2. Cabinet Component Thickness And Material:
 - a. Use plastic laminate facing on panel product, except on following surfaces, where Kortron or Melamine shall be used.
 - 1) Cabinet interiors and shelving faces behind cabinet doors in all rooms.
 - 2) Cabinet interiors and shelving faces always open to view.
 - 3) Cabinet exteriors permanently concealed.
 - 4) Drawer sides, backs, bottoms, and subfronts.
 - b. Ends, Divisions, Bottoms, Tops: **3/4 inch (19 mm)** thick panel product.
 - c. Rails: **3/4 inch (19 mm)** thick panel product.
 - d. Shelves:
 - 1) Panel product.
 - 2) Thickness:
 - a) **30 Inch (750 mm)** Span And Less: **3/4 inch (19 mm)** thick.
 - b) Spans Over **30 Inches (750 mm)** To **42 Inches (1 050 mm)**: **One inch (25 mm)** thick.
 - c) Spans Over 42 Inches: **One inch (25 mm)** thick and provide Hafele or equal center supports.
 - e. Backs: **1/4 inch (6 mm)** thick panel product.
 - f. Doors: **3/4 inch (19 mm)** thick panel product.
 - g. Drawer Sides, Backs, And Subfronts: **1/2 inch (12.7 mm)** thick minimum panel product.
 - h. Drawer Bottoms: **1/4 inch (6 mm)** thick panel product.
 - i. Separate Drawer Front: **3/4 inch (19 mm)** panel product.
3. Install plastic grommets in cable access holes in countertops.

2.2 ACCESSORIES

- A. Cabinet And Drawer Hardware:
 1. Cabinet And Drawer Pulls:
 - a. Satin Chromium Plated brass / bronze core bow handles, **4 inches (100 mm)** long minimum.
 - b. Type Two Acceptable Products:
 - 1) 4484 by Stanley.
 - 2) Equal as approved by Architect before installation. See Section 01 6200.
 2. Cabinet And Drawer Locks:
 - a. Pin tumbler type suitable for location. Key individually, except key cabinets and drawers within an Office alike.
 - b. Type Two Acceptable Manufacturers:
 - 1) Comp X National Lock.
 - 2) Olympus Lock.
 - 3) Equal as approved by Architect before installation. See Section 01 6200.
 3. Cabinet Adjustable Shelf Supports:
 - a. Either of following systems are acceptable, at Fabricator's option:
 - 1) 32mm System: Casework Fabricator's standard.
 - 2) Traditional System:
 - 3) Class Two Quality Standards: 255 and 256 by Knap & Vogt.
 4. Cabinet Hinges:
 - a. Description:
 - 1) Cup Hinge (Concealed Hinge or European style).
 - 2) Steel, nickel-plated, full overlay, self closing with dowel, Mod 17.
 - b. Design Criteria:
 - 1) Doors **48 inches (1 200 mm)** High or Less:

- a) Two (2) hinges.
 - b) Hinge Opening: 165 degree minimum.
 - 2) Doors over 48 inches (1 200 mm) High:
 - a) Four (4) hinges.
 - b) Hinge Opening: 165 degree minimum.
 - c. Basis of Design: Model 329.03.558 with Model 329.73.510 mounting plate by Hafele:
 - 1) Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories:
 - a) Blum.
 - b) Grass America.
 - c) Hafele.
 - d) Knape & Vogt.
 - e) Salice.
5. Cabinet Inactive Leaf Catches:
- a. Class Two Quality Standards:
 - 1) Full-Height Doors: Two Surface Bolts No 043 - 2 inch (50 mm) by Ives.
 - 2) All Other Doors: Elbow Catch No 2 by Ives.
6. Drawer Guides:
- a. Keyboard / Pencil Drawers:
 - 1) Steel ball bearings, 45 lb (20 kg) load rating minimum.
 - 2) 3/4 extension, top mounting.
 - 3) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) Series 2006 by Accuride.
 - b) Article 422.14.345 by Haffele.
 - c) Series KV8200 by Knape & Vogt.
 - b. Standard Drawers:
 - 1) Full extension, steel ball bearings, 100 lb (45 kg) load rating.
 - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) Series 3832-Classic by Accuride.
 - b) Article 422.04.552 by Haffele.
 - c) Series KV8400 by Knape & Vogt.
- B. Cabinet Door Bumpers:
1. Description:
 - a. Polyurethane bumper to protect gypsum board from cabinet handle damage where cabinet handles hit gypsum wallboard surface.
 2. Design Criteria:
 - a. Clear.
 - b. Peel adhesion.
 - c. Size: 3/8 inch (9.5 mm diameter x 1/8 inch (3 mm) thick.
 3. Type Two Acceptable Products:
 - a. WS-34 Cylindrical Soft Durometer Cabinet Bumper by Anybumper, Amite, LA www.Anybumper.com.
 - b. Equal as approved by Architect before installation. See Section 01 6200.
- C. Pass-Through Window Track Assembly:
1. Aluminum track with nylon or ball bearing steel rollers. Bottom track is not to extend above surface of counter when installed.
 2. Type One Acceptable Products:
 - a. Standard Installation Ezy-Roll Aluminum Track Number P1092 ANOD by Knape and Vogt, which includes:
 - 1) 1085 vinyl glides: Four (4) each.
 - 2) 1093 upper channel: One (1) each.
 - 3) 1095 shoe: Two (2) each.
 - 4) 1097 rollers: Four (4) each.
 - 5) 1099 lower track: One (1) each.
 - b. Equal as approved by Architect before bidding. See Section 01 6200.
- D. Sliding Window Lock:
1. Provide with 4 keys.

2. Class Two Quality Standard: Number 965 NP Ratchet Lock by Knape & Vogt.

PART 3 - EXECUTION: Not Used

END OF SECTION

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

- A. Products Furnished But Not Installed Under This Section:
 - 1. Chair rails.
 - 2. Hardwood trim at ceiling.
 - 3. Pass-through window wood trim (Family Services only).

- B. Related Requirements:
 - 1. Section 06 1100: 'Wood Framing' for wall blocking required for Wood Trim.
 - 2. Section 06 2001: 'Common Finish Carpentry Requirements':
 - a. Installation of Wood Trim.
 - 3. Section 06 2210: Remaining Wood Trim.
 - 4. Section 06 4001: 'Common Architectural Woodwork Requirements':
 - a. Approved Fabricators.
 - b. General standards for materials and fabrication of Architectural Woodwork.
 - 5. Section 08 1429: Interior Flush Wood Doors.
 - 6. Section 08 5619: 'Pass Windows' (Family Services only).
 - 7. Section 09 9324: 'Interior Clear-Finished Hardwood'.

1.2 REFERENCES

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

- B. Definitions:
 - 1. Grade: Unless otherwise noted, this term means Grade rules for Economy, Custom, and/or Premium Grade.
 - a. Custom Grade: Typically specified for and adequately covers most high-quality architectural woodwork, providing a well-defined degree of control over a project's quality of materials, workmanship, or installation.
 - 2. Plain-Sawn: A hardwood figure developed by sawing a log lengthwise at a tangent to the annual growth rings. It appears as U-shaped or straight markings in the board's face.
 - 3. Running Trim: Generally combined in the term "standing and running trim" and refers to random, longer length trims delivered to the jobsite (e.g., baseboard, chair rail, crown molding).

1.3 SUBMITTALS

- A. Action Submittals:
 - 1. Shop Drawings:
 - a. Include materials used, standing and running trim profiles, joint details, and hardware.
 - 2. Samples:
 - a. Interior Hardwood for Transparent Finish:
 - 1) Before performing work of this Section, prepare Control Sample, to match sample available from Owner, to be used as finishing standard for interior clear finished hardwood as specified in Section 09 9324.
 - 2) Design Criteria:

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

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Manufacturers:
1. Approved Fabricators. See Section 06 4001 for Approved Fabricators.
- B. Performance / Design Criteria: Conform to requirements of Section 06 4001 'Common Architectural Woodwork Requirements'.
1. Glue: Waterproof and of best quality.
 2. Factory-finish to match Owner selected sample as specified in Section 09 9324.
- C. Architectural Woodwork Wood Trim:
1. Interior Hardwood For Transparent Finish:
 - a. Design Criteria:
 - 1) Solid wood shall be plain sawn Red Oak.
 - 2) Finish to match Owner selected sample as specified in Section 09 9324.
 - 3) Color:
 - a) Owner will provide sample of existing wood stain from project to match.
- D. Shelves:
1. Conform to applicable requirements of Sections 06 4001 and 06 4116.
 2. Use **3/4 inch (19 mm)** Kortron or Melamine faced Panel Product with hot glued 3 mm thick PVC edge banding with eased edges. Apply banding on exposed edges with **one inch (25 mm)** return onto unexposed edges. Edge banding color to match Panel Product.

2.2 SOURCE QUALITY CONTROL

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

PART 3 - EXECUTION Not Used

END OF SECTION

DIVISION 07: THERMAL AND MOISTURE PROTECTION

07 2000 THERMAL PROTECTION

07 2116 BLANKET INSULATION

07 5000 MEMBRANE ROOFING

07 5113 BUILT-UP ASPHALT ROOFING

07 6000 FLASHING AND SHEET METAL

07 6210 GALVANIZED STEEL FLASHING AND TRIM

07 9000 JOINT PROTECTION

07 9213 ELASTOMERIC JOINT SEALANTS

07 9219 ACOUSTICAL 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 unfaced thermal batt insulation in metal framing and acoustic batt insulation 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 C665-12, '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. Unfaced Insulation: Meet requirements of ASTM C665, Type I.
 - b. Order insulation by 'R' factor rather than 'U' factor, rating, or thickness, either **16 or 24 inches (400 or 600 mm)** wide according to framing spacing.
 - c. 'R' Factor Required:
 - 1) Acoustically Insulated Ceilings:
 - a) Enclosed Spaces: Fill framed cavity with batt of appropriate thickness.

- b) Unenclosed Spaces: R19.
2) Wood or Metal Wall Stud Framing:

R11	3-1/2 inches deep	89 mm deep
R19	5-1/2 inches deep	140 mm deep

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General:
1. Leave no gaps in insulation envelope.
 2. 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.

END OF SECTION

SECTION 07 5113**BUILT-UP ASPHALT ROOFING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install modifications to existing built-up roofing system as described in Contract Documents.
- B. Products Installed But Not Furnished Under This Section:
 - 1. Flashing at equipment curbs.
 - 2. Flashing for plumbing and electrical protrusions.
- C. Related Requirements:
 - 1. Section 06 1100: 'Wood Framing' for wood pads and curbs for roof-mounted equipment.
 - 2. Section 06 2001: 'Common Finish Carpentry Requirements' for installation of wood nailers, curbs and blocking if required.
 - 3. Section 07 6210: 'Galvanized Steel Flashing And Trim' for sheet metal work.

1.2 REFERENCES

- A. Reference Standards:
 - 1. ASTM International:
 - a. ASTM C1177/C1177M-13, 'Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing'.
 - b. ASTM D41/D41M-14, 'Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing'.
 - c. ASTM D140/D140M-09, 'Standard Practice for Sampling Bituminous Materials'.
 - d. ASTM D312/D312M-15, 'Standard Specification for Asphalt Used in Roofing'.
 - e. ASTM D1227-13, 'Standard Specification Specification for Emulsified Asphalt Used as a Protective Coating for Roofing'.
 - f. ASTM D1863/D1863M-05(2011), 'Standard Specification for Mineral Aggregate Used on Built-Up Roofs'.
 - g. ASTM D2178/D2178M-14, 'Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing'.
 - h. ASTM D2626/D2626M-04(2012), 'Standard Specification for Asphalt-Saturated and Coated Organic Felt Base Sheet Used in Roofing'.
 - i. ASTM D2822/D2822M-05(2011), 'Standard Specification for Asphalt Roof Cement'.
 - j. ASTM D2824/D2824M-13, 'Standard Specification for Aluminum-Pigmented Asphalt Roof Coatings, Nonfibered, Asbestos Fibered, and Fibered without Asbestos'.
 - k. ASTM D4601/D4601M-04(2012), 'Standard Specification for Asphalt-Coated Glass Fiber Base Sheet Used in Roofing'.
 - l. ASTM D4897/D4897M-01(2009), 'Standard Specification for Asphalt-Coated Glass-Fiber Venting Base Sheet Used in Roofing'.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference:
 - 1. Participate in mandatory pre-installation conference:
 - a. Schedule pre-installation conference after installation of roof deck but before application of any roofing system component.
 - b. Roofing Installer's Foreman and those responsible for installation of roofing to be in attendance. Include Roofing Manufacturer's Representative if available.

- 2. In addition to agenda items specified in Section 01 3100, review following:
 - a. Review any items affecting issuance of roofing system warranty.
 - b. Review Special Procedure Submittal for Warranty Information to be given to Manufacturer before Manufacture will issue Roof Warranty by Installer.
 - c. Review Cleaning and Disposal requirements.
 - d. Review safety issues.
 - e. Review final inspection.

1.4 SUBMITTALS

A. Action Submittals:

- 1. Product Data:
 - a. Manufacturer's literature or cut sheet for each component of system.
- 2. Samples:
 - a. Roofing Materials:
 - 1) Installer to provide samples to testing agency of each product used.
 - 2) During course of work, Architect or Owner's Representative may secure additional samples according to ASTM D140/D140M of materials being used from containers at job site and submit them to an independent laboratory for comparison to specified material.
 - 3) Should test results prove that material is not functionally equal to specified material:
 - a) Roofing Installer shall pay for all testing.
 - b) Roofing installed and found not to comply with specifications shall be removed and replaced at no change to Owner.

B. Informational Submittals:

- 1. Test And Evaluation Reports:
 - a. Provide testing reports that products provided meet requirements of this specification.
 - b. Closeout Report:
 - 1) Provide Closing following information:
 - a)
- 2. Special Procedure Submittals:
 - a. Installer to fill out Attachment for Warranty Information to be given to Manufacturer before Manufacture will issue Roof Warranty.
- 3. Special Procedure Submittals:
 - a. Contact Owner's Representative (FM Group or Project Manager) for following information:
 - 1) Installer to include following mandatory information to be added to 'Roofing Manufacturer System Warranty' submitted with Closing Documents.
 - a) Name of Owner (name of FM Group) _____
 - b) Mailing Address (FM office address) _____
 - c) Building Property ID (unique 7 digit identifier) _____
 - d) Project site address: _____
 - e) Roof Completion Date _____
 - f) Any addition data required from Manufacturer.
 - 2) Installer to include following mandatory information to be added to 'Roof Installer Workmanship Warranty' submitted with Closing Documents:
 - a) Name of Owner (name of FM Group) _____
 - b) Mailing Address (FM office address) _____
 - c) Building Property ID (unique 7 digit identifier) _____
 - d) Project site address: _____
 - e) Roof Completion Date _____
 - f) Any addition data required from Manufacturer.
- 4. Qualification Statement:
 - a. Installer:
 - 1) Provide Qualification documentation as specified in Quality Assurance in Part 1 of this specification.

C. Closeout Submittals:

- 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:

- a. Operations and Maintenance Data:
 - 1) Provide maintenance and emergency repair documentation.
- b. Warranty Documentation:
 - 1) Final, executed copy of 'Roofing Manufacturer System Warranty' including wind speed coverage and required Owner mandatory information.
 - 2) Final, executed copy of 'Roof Installer Workmanship Warranty' including required Owner mandatory information.
 - 3) Verify mandatory information as specified in Special Procedure Submittal has been included in Final Warranty.
- c. Record Documentation:
 - 1) Manufacturers Documentation:
 - a) Manufacturer's literature.
 - b) Roof Inspection progress reports.
 - c) Job progress photos.
 - d) Inspection Report completed by Roofing Manufacturer

1.5 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 1. Building Codes:
 - a. Roof system will meet requirements of all federal, state, and local codes having jurisdiction.
- B. Qualifications:
 1. Installers:
 - a. Requirements of Section 01 4301 applies but not limited to the following:
 - 1) Provide documentation.
 - a) Approved and authorized by Roofing Manufacturer to install Manufacturer's product and eligible to receive Manufacturer's warranty before bid.
 - b) Minimum ten (10) years experience in hot multi-ply roofing.
 - c) Minimum ten (10) satisfactorily completed installations of comparable quality, scope, similar size, and complexity and three (3) projects in past two (2) years before bidding:
 - (1) List of roofing installations performed by certified installer, and their addresses.
 - d) Current license for the city, county, and state where project is located and license for specific type of roofing work to be performed.
 - e) Roofing Installer's foreman shall be skilled in his trade and qualified to lay out and supervise the Work.
 - f) Flashing installation shall be performed by personnel trained and authorized by Roofing Manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
 1. Make no deliveries to job site until installation is about to commence, or until approved storage area is provided.
 2. Deliver products to job site in Manufacturer's original unopened containers or wrappings with labels intact and legible bearing all seals and approvals.
 3. Deliver materials in sufficient quantities to allow continuity of work.
 4. Coordinate delivery with Architect.
- B. Storage And Handling Requirements:
 1. Follow Manufacturer's instructions and precautions for storage and protection of materials.
 2. Storage:
 - a. Store materials on clean, raised platforms or pallets with weather-protective covering. Do not stack pallets. Discard rolled material that are flattened, creased, or otherwise damaged.
 - b. Store rolled goods on end.
 - c. Provide continuous protection of materials against wetting and moisture absorption.

- 1) Insulation:
 - a) Remove plastic packaging shrouds.
 - 2) Felt material:
 - a) Slit top of plastic shrink wrap only.
 - 3) Cover top and sides of all stored material with tarpaulin (not polyethylene). Secure cover.
 - d. Remove wet materials from site.
 - e. Situate equipment and materials so as to preclude danger, disturbance, or interference to public safety and traffic, and to not constitute fire hazard.
3. Handling:
- a. Handle rolled goods so as to prevent damage to edge or ends.
 - b. Select and operate material handling equipment so as not to damage existing construction or applied roofing. Do not operate or situate material handling equipment in locations that will hinder smooth flow of vehicular or pedestrian traffic.

1.7 WARRANTY

- A. Manufacturer Warranty:
1. Manufacturer's written 20-year NDL warranty.
- B. Roof Installer Workmanship Warranty:
1. Installer's written 2-year warranty, countersigned by Contractor as joint warrantor. Warranty shall cover workmanship and materials and repairs or replacement of work at no cost to Owner. Blistering, buckling, and poor workmanship shall be considered defects subject to correction under this guarantee.

PART 2 - PRODUCTS

2.1 SYSTEM

- A. Manufacturers:
1. Category Four Approved System Manufacturers. See Section 01 6200 for definition of Categories.
 - a. CertainTeed Roofing Products, Valley Forge, PA www.certainteed.com.
 - b. Consolidated Fiber Glass Products Co Inc, Bakersfield, CA www.conglas.com.
 - c. GAF Corp, Wayne, NJ www.gaf.com.
 - d. G-P Gypsum Corporation, Atlanta, GA www.gp.com/gypsum.
 - e. Johns Manville, Denver, CO www.jm.com.
 - f. Tamko, Joplin, MO www.tamko.com.
 - g. U S Intec Div BMCA, Wayne, NJ www.usintec.com.
- B. Performance:
1. Design Criteria: System shall have UL Class B rating minimum.
- C. Materials:
1. Insulation:
 - a. FM or UL approved.
 - b. Bottom Layer:
 - 1) **5/8 inch (16 mm)** thick minimum Dens-Deck Fireguard Roof Board by G-P Gypsum.
 - c. Middle Layer:
 - 1) **1/4 inch (6 mm)** per foot tapered extruded polystyrene, polyisocyanurate, or expanded polystyrene roofing system with five year aged `R' value of insulation of value to match existing as required.
 - d. Top Layer:
 - 1) **5/8"** thick minimum Dens-Deck Roof Board by G-P Gypsum.
 2. Approved Materials including quantity per **100 sq ft (9.3 sq meters)** of roof area:
 - a. Asphalt Primer: Meet requirements of ASTM D41/D41M: **8 lbs. (3.6 kg)**.

- b. Asphalt:
 - 1) High melt point shall meet requirements of ASTM D312/D312M, type as shown.
 - a) Asphalt used shall be labeled as follows:
 - b) Identification.
 - c) Manufacturer and Type.
 - d) Finish blowing temperature. **Degrees F. (Degrees C).**
 - e) Equiviscous temperature. **Degrees F. (Degrees C).**
 - f) Flash point. **Degrees F. (Degrees C).**
 - g) Asphalt mopping between insulation Type III: **30 lbs. (13.6 kg).**
 - h) For asphalt to receive glass fiber base sheet Type III: **30 lbs. (13.6 kg).**
 - i) Mopping between plies, 3 courses of **25 lbs (11.3 kg)** each Type III: **75 lbs. (34 kg).**
 - j) Flood coat, Type I or III: **60 lbs. (27.2 kg).**
- c. Membranes:
 - 1) Base Sheet: No. 40, **25 lbs (11.3 kg)** Nominal, fiber glass meeting requirements of ASTM D4601/D4601M, Type II: **40 lbs. (18.1 kg).**
 - 2) Roof Plies: Meet requirements of ASTM D2178/D2178M, Type VI, 3 layers (Weight is nominal): **30 lbs. (13.6 kg).**
- d. Cap Sheet: SBS Modified FR Cap Sheet with granules, **142 mil (3.6 mm)** thick minimum: **96 lbs. (43.5 kg).**
- e. Aggregate:
 - 1) Meet requirements of ASTM D1863/D1863M, **3/8 inch (9.5 mm)** nominal.
 - a) Gravel: **500 lbs. (226.8 kg).**
 - or
 - b) Slag: **400 lbs. (181.4 kg).**

2.2 ACCESSORIES

- A. Primer: Meet requirements of ASTM D41/D41M.
- B. Asphalt Base Emulsion: Meet requirements of ASTM D1227, Type I or II.
- C. Flashing Felt: Aggregate coated, reinforced, modified bitumen.
- D. Cant Strips: Fiber.
- E. Asphalt Roof Cement: Meet requirements of ASTM D2822/D2822M.
- F. Nails:
 - 1. Roofing Nails: One inch head or washer, ring shank.
 - 2. Concrete or Masonry Nails: Case hardened.
- G. Tin Discs: **24 ga (0.64 mm), one inch (25 mm)** minimum diameter.
- H. Mechanical fasteners for insulation to steel deck: Factory Mutual approved.
- I. Coating: Aluminum-pigmented asphalt roof coating meeting requirements of ASTM D2824/D2824M.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification Of Conditions:
 - 1. Examine decks for adequacy before commencing work. Requirements shall include:
 - a. Designed slope.
 - b. Location of roof drains.

- c. Smoothness.
 - d. Moisture conditions.
 - e. Other condition incompatible with good roofing practice.
2. Notify Architect in writing of conditions that would limit guarantee on part of Manufacturer or applicator.

3.2 INSTALLATION

A. Interface With Other Work:

1. Coordinate with installers who's work penetrates roof deck or requires men and equipment to traverse roof deck.

B. General Requirements:

1. Install roofing materials only in dry weather.
2. Provide sufficient work force to meet completion requirements specified:
 - a. Roofing foreman shall be skilled in his trade and qualified to lay out and supervise the work.
 - b. Foreman shall be present at times while work is in progress.
3. Kettles used for heating bitumen shall be equipped with accurate and clearly visible thermometers:
 - a. Temperature at mop shall be equiviscous temperature plus or minus 25 deg F (minus 4 deg C).
 - b. Temperature shall never reach flash point or be maintained at or above finish blowing temperature for more than four (4) hours.
4. Do not allow felt machines, high-boys, mop-buckets, tractors, trailers, graveling equipment, etc, having hard wheels on roof membrane. Soft rubber or inflatable tires will be acceptable.
5. Do not use drum type felt machines.
6. Glaze-coat glass felts, if required by Felt Manufacturer, and all organic felts in areas where gravel surfacing is not completed by end of each working day. Do not leave felts exposed to weather overnight.
 - a. Install temporary two-ply cut-offs at termination of each day's work and seal so roof is completely watertight. Remove cut-offs when roofing application is resumed.
 - b. Seal flashings at the end of each days work so they are watertight.
 - c. Glaze coats of bitumen used for protection of work in place shall not decrease amount of bitumen specified for installation of work.

C. Installation Over Metal Deck:

1. Install leveling layer or fireguard layer, if required.
2. Mechanically attach bottom layer of insulation with specified fasteners in accordance with I-90 requirements:
 - a. Mop in top layer of insulation staggering joints from first layer in flood coat of hot asphalt.
 - b. Lay insulation boards with edges in moderate contact without forcing.
 - c. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.
 - d. Apply no more insulation than can be sealed with membrane in same day.
3. Install specified cant strips on top of insulation in asphalt.
4. Solid mop glass felt base sheet to insulation.
5. Lay roofing plies shingle fashion, starting at low points and drains, and working up slopes to high point of roof. Solid mop each of three felts to base sheet with 25 lbs (11.3 kg) of asphalt per layer per square.
 - a. Lap 24-3/4 inches (619 mm) on sides and 4 inches (100 mm) on ends.
 - b. Roll and broom plies of felt thoroughly into hot, tacky bitumen full felt width. Roofing having voids is subject to rejection.
 - c. Turn up layers, mop to cant strip, and trim 2 inches (50 mm) above cant strip on vertical surfaces. Use appropriate starter and termination strips.
6. Cut out and repair fishmouths, wrinkles, buckles or tears in felt plies with an additional ply over top:
 - a. After installing membrane plies, flood coat roof surface by pouring asphalt from pouring cans.
 - b. While asphalt is hot, embed specified aggregate at specified rate.

- c. Sweep up excess gravel for **48 inch (1 200 mm)** wide area wherever higher roof drains onto lower roof, and apply asphalt flood coat and another application of gravel.
 7. Valleys, waterways, or other areas where water stands shall receive double-graveling as specified for areas where one roof drains onto another:
 - a. Spread excess piles of surfacing materials around roof area so finished roof is clean and smooth.
 8. Prevent bitumen, felt, or other debris from entering roof drains or conductors:
 - a. Bear cost of cleaning drains found to be clogged from this debris.
 9. No phase-construction shall be allowed, e.g., applying one dry sheet and later applying ply sheets, etc.
- D. Projection Flashings:
 1. Install projection flashings for vent pipes, electrical pipes, and stacks. Flashings shall have **4 inch (100 mm)** minimum wide flange.
 - a. Install projection flashings on top of last ply of roofing membrane in a solid **1/8 inch (3 mm)** thick bed of flashing cement. Securely fasten flanges.
 - b. Install two plies of No. 15 felt in hot asphalt over flange and feather onto roof membrane **3 inches (75 mm)** and **6 inches (150 mm)** respectively beyond outer edge of flange.
- E. Base Flashing System:
 1. Solidly prime concrete or masonry surfaces with an asphalt primer.
 2. Install base flashings at vertical intersections of roof deck and walls, column stubs, platforms, canted gravel stop details, etc.
 3. Extend plies and asphalt moppings up vertical surfaces, and trim **2 inches (50 mm)** above top of cant strip.
 4. Install 2 plies modified bitumen flashing sheet, top layer granular coated, extending from reglet to **4 inches (100 mm)** minimum from base of cant onto roof.
 5. Nail with **1-1/2 inch (38 mm)** masonry nails through flat tin discs along upper edge **8 inch (200 mm)** on centers maximum into mortar joints or wall.
 6. End laps shall be **4 inches (100 mm)** minimum and staggered not less than **24 inches (600 mm)**.

3.3 CLEANING

- A. Remove from job site debris resulting from or incidental to this work. Clean or repair bitumen spills and damage to Owner's satisfaction.

END OF SECTION

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SECTION 07 6210**GALVANIZED STEEL FLASHING AND TRIM****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install miscellaneous flashing, counterflashing, and hold-down clips as described in Contract Documents and not specified to be of other material.
- B. Products Furnished But Not Installed Under This Section:
 - 1. Gravel stops, copings, scuppers, and miscellaneous sheet metal specialties not specified to be of other materials.
- C. Related Requirements:
 - 1. Section 06 1100: 'Wood Framing' for wood base.
 - 2. Sections under 07 3000 heading: 'Steep Slope Roofing' for installation of gravel stops, copings, scuppers, and miscellaneous roofing related flashing.
 - 3. Sections under 07 5000 heading: 'Membrane Roofing' for installation of gravel stops, copings, scuppers, and miscellaneous roofing related flashing.
 - 4. Section 07 9213: 'Elastomeric Joint Sealant'.

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 A792/A792M-10(2015), 'Standard Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process'.
 - 2. Federal Specifications:
 - a. TT-S-00230C(2) Sealing Compound, Elastomeric Type, Single Component, (For Caulking, Sealing, and Glazing in Buildings and Other Structures).

PART 2 - PRODUCTS**2.1 SYSTEM**

- A. Manufacturers:
 - 1. Type Two Acceptable Manufacturers Of Metal:
 - a. CMG – Coated Metals Group, Denver, CO www.cmgmetals.com.
 - b. Drexel Metals, LLC, Ivyland, PA www.drexmet.com.
 - c. Fabral, Lancaster, PA www.fabral.com.
 - d. Firestone Metal Products, Anoka, MN www.unaclad.com.
 - e. MBCI, Houston, TX www.mbc.com.
 - f. Metal Sales Manufacturing Corp, Sellersburg, IN www.mtlsales.com.
 - g. O'Neal Flat Rolled Metals (member of O'Neal Industries), Brighton, CO www.ofrmetals.com.
 - h. Petersen Aluminum Corp, Elk Grove, IL www.pac-clad.com.
 - i. Ryerson, Chicago, IL www.ryerson.com.
 - j. Equal as approved by Architect before installation. See Section 01 6200.
- B. Materials:

1. Sheet Metal:
 - a. Galvanized iron or steel meeting requirements of ASTM A653/A653M, G 90 or Galvalume steel meeting requirements of ASTM A792/A792M AZ50, 50 ksi.
 - 1) 22 ga (0.792 mm) for hold-down clips.
 - 2) 24 ga (0.635 mm) for all other.
- C. Fabrication:
 1. Form accurately to details.
 2. Profiles, bends, and intersections shall be even and true to line.
 3. Fold exposed edges 1/2 inch (12.7 mm) to provide stiffness.
- D. Finish:
 1. Exposed to view:
 - a. Provide face coating of polyvinylidene Fluoride (PVF₂) Resin-base finish (Kynar 500 or Hylar 5000) containing seventy (70) percent minimum PVF₂ in resin portion of formula. Thermo-cured two coat system consisting of corrosion inhibiting epoxy primer and top coat factory applied over properly pre-treated metal.
 - b. Reverse side coating shall be thermo-cured system consisting of corrosion inhibiting epoxy primer applied over properly pre-treated metal.
 2. Color as selected by Architect from Manufacturer's standard colors.

2.2 ACCESSORIES

- A. Sealants: Rubber base type conforming to Fed Spec TT-S-00230C.
- B. Fasteners:
 1. Of strength and type consistent with function.
 2. Nails: Hot-dipped galvanized.
 3. Screws, Bolts, And Accessory Fasteners: Galvanized or other acceptable corrosion resistant treatment.

PART 3 - EXECUTION

3.1 INSTALLATION

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

3.2 CLEANING

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

END OF SECTION

SECTION 07 9213**ELASTOMERIC JOINT SEALANTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install sealants not specified to be furnished and installed under other Sections.
 - 2. Quality of sealants to be used on Project not specified elsewhere, including submittal, material, and installation requirements.
- B. Related Requirements:
 - 1. 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.

1.5 QUALITY ASSURANCE

A. Qualifications:

- 1. Manufacturer: Company specializing in manufacturing products specified in this section with minimum ten (10) years documented experience.
- 2. Applicator Qualifications:
 - a. Company specializing in performing work of this section.

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

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Acceptance Requirements:
1. Deliver and keep in original containers until ready for use.
 2. Inspect for damage or deteriorated materials.
- B. Storage and Handling Requirements:
1. Handle, store, and apply materials in compliance with applicable regulations and material safety data sheets (MSDS).
 2. Handle to prevent inclusion of foreign matter, damage by water, or breakage.
 3. Store in a cool dry location, but never under 40 deg F (4 deg C) or subjected to sustained temperatures exceeding 90 deg F (32 deg C) or as per Manufacturer's written recommendations.
 4. Do not use sealants that have exceeded shelf life of product.

1.7 FIELD CONDITIONS

- A. Ambient Conditions:
1. Do not install sealant during inclement weather or when such conditions are expected. Allow wet surfaces to dry.
 2. Follow Manufacturer's temperature recommendations for installing sealants.

1.8 WARRANTY

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

PART 2 - PRODUCTS

2.1 SYSTEMS

- A. Manufacturers:
1. Manufacturer Contact List:
 - a. Dow Corning Corp., Midland, MI www.dowcorning.com.
 - b. Franklin International, Inc. Columbus, OH www.titebond.com.
 - c. GE Sealants & Adhesives (see Momentive Performance Materials Inc.).

- d. Laticrete International Inc., Bethany, CT www.laticrete.com.
- e. Momentive Performance Materials Inc. (formally GE Sealants & Adhesives), Huntersville, NC www.ge.com/silicones.
- f. Sherwin-Williams, Cleveland, OH www.sherwin-williams.com.
- g. Sika Corporation, Lyndhurst, NJ www.sikaconstruction.com or Sika Canada Inc, Pointe Claire, QC www.sika.ca.
- h. Tremco, Beachwood, OH www.tremcosealants.com or Tremco Ltd, Toronto, ON (800) 363-3213.

B. Materials:**1. Design Criteria:**

- a. Compliance: Meet or exceed requirements of these standards:
 - 1) ASTM C920: Elastomeric joint sealant performance standard.
 - 2) ASTM D5893/D5893M: Silicone Joint Sealant for Concrete Pavements.
- b. Comply with Manufacturer's ambient condition requirements.
- c. Sealants must meet Manufacturer's shelf-life requirements.
- d. Sealants must adhere to and be compatible with specified substrates.
- e. Sealants shall be stable when exposed to UV, joint movements, and environment prevailing at project location.
- f. Primers (Concrete, stone, masonry, and other nonporous surfaces typically do not require a primer. Aluminum and other nonporous surfaces except glass require use of a primer. Installer Option to use Adhesion Test to determine if primer is required or use primer called out in related sections):
 - 1) Adhesion Test:
 - a) Apply silicone sealant to small area and perform adhesion test to determine if primer is required to achieve adequate adhesion. If necessary, apply primer at rate and in accordance with Manufacturer's instructions. See 'Field Quality Control' in Part 3 of this specification for Adhesive Test.
 - 2) If Primer required, shall not stain and shall be compatible with substrates.
 - 3) Allow primer to dry before applying sealant.

2. Sealants At Exterior Building Elements:**a. Description:**

- 1) Weathersealing expansion, contraction, perimeter, and other movement joints which may include all or part of the following for project:
 - a) Aluminum entrance perimeters and thresholds.
 - b) Door frames.
 - c) Joints and cracks around windows.
 - d) Masonry.
 - e) Parapet caps.
 - f) Wall penetrations.
 - g) Other joints necessary to seal off building from outside air and moisture.

b. Design Criteria:

- 1) Meet following standards for Sealant:
 - a) ASTM C920: Type S, Grade NS, Class 50 Use NT, M, G, A.
- 2) Limitations:
 - a) Do not use below-grade applications.
 - b) Do not use on surfaces that are continuously immersed or in contact with water.
 - c) Do not use on wet, damp, frozen or contaminated surfaces.
 - d) Do not use on building materials that bleed oils, plasticizers or solvents, green or partially vulcanized rubber gaskets or tapes.
- 3) Color:
 - a) Architect to select from Manufacturer's standard colors.
 - b) Match building elements instead of window (do not use white that shows dirt easily).

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

- 1) Dow Corning:
 - a) Primer: 1200 Prime Coat.
 - b) Sealant: 791 Silicone Weatherproofing Sealant.
- 2) Momentive Performance Materials (formerly, GE Sealants & Adhesives):
 - a) Primer: SS4044 Primer.

- b) Sealant: GE SCS2000 SilPruf Silicone Sealant & Adhesive.
 - 3) Tremco:
 - a) Primer:
 - (1) Metal surface: No. 20 primer.
 - (2) Porous surfaces: No. 23 primer.
 - b) Sealant: Spectrum 1 Silicone Sealant.
- 3. Sealants At Exterior Sheet Metal And Miscellaneous:
 - a. Description:
 - 1) Weathersealing expansion, contraction, perimeter, and other movement joints which may include all or part of the following for project:
 - a) Flashings.
 - b) Gutters.
 - c) Penetrations in soffits and fascias.
 - d) Roof vents and flues.
 - e) Lightning protection components.
 - b. Design Criteria:
 - 1) Meet following standards for Sealant:
 - a) ASTM C920: Type S Grade NS, Class 25 (min) Use NT, M, G, A and O.
 - 2) Limitations:
 - a) Do not use below-grade applications.
 - b) Do not use on surfaces that are continuously immersed or in contact with water.
 - c) Do not use on wet, damp, frozen or contaminated surfaces.
 - d) Do not use on building materials that bleed oils, plasticizers or solvents, green or partially vulcanized rubber gaskets or tapes.
 - c. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Dow Corning: 790 Silicone Building Sealant.
 - 2) Momentive Performance Materials (formerly, GE Sealants & Adhesives): GE SCS2350 Silicone Elastomeric Sealant.
 - 3) Tremco: Tremsil 600 Silicone Sealant.
- 4. 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.
- 5. 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. Surfaces shall be clean, dry, free of dust, oil, grease, dew, frost or incompatible sealers, paints or coatings that may interfere with adhesion. Prepare substrates in accordance with Manufacturer's instructions:

- a. Porous surfaces: Clean by mechanical methods to expose sound surface free of contamination and laitance followed by blasting with oil-free compressed air.
 - b. Nonporous surfaces: Use two-cloth solvent wipe in accordance with ASTM C1193. Allow solvent to evaporate prior to sealant application.
 - c. High-pressure water cleaning: Exercise care that water does not enter through failed joints.
 - d. Primers:
 - 1) Primers enhance adhesion ability.
 - 2) Use of primers is not a substitution for poor joint preparation.
 - 3) Primers should be used always in horizontal application where there is ponding water.
2. Field test joints in inconspicuous location.
 - a. Verify joint preparation and primer required to obtain optimum adhesion of sealants to joint substrate.
 - b. When test indicates sealant adhesion failure, modify joint preparation primer, or both and retest until joint passes sealant adhesion test.
 3. Masking: Apply masking tape as required to protect adjacent surfaces and to ensure straight bead line and facilitate cleaning.
- B. Joints:
1. Prepare joints in accordance with ASTM C1193.
 - a. Clean joint surfaces of contaminants capable of affecting sealant bond to joint surface using Manufacturer's recommended instructions for joint preparation methods.
 - b. Remove dirt, dust, oils, wax, paints, and contamination capable of affecting primer and sealant bond.
 - c. Clean concrete joint surfaces to remove curing agents and form release agents.
- C. Protection:
1. Protect elements surrounding the Work of this section from damage or disfiguration.

3.3 APPLICATION

- A. General:
1. Apply silicone sealant in accordance with Manufacturer's instructions.
 2. Do not use damaged or deteriorated materials.
 3. Install primer and sealants in accordance with ASTM C1193 and Manufacturer's instructions.
 4. Apply primer where required for sealant adhesion.
 5. Install sealants immediately after joint preparation.
 6. Do not use silicone sealant as per the following:
 - a. Apply caulking/sealant at temperatures below 40 deg F (4 deg C).
 - b. Below-grade applications.
 - c. Brass and copper surfaces.
 - d. Materials bleeding oils, plasticizers, and solvents.
 - e. Structural glazing and adhesive.
 - f. Surfaces to be immersed in water for prolonged time.
- B. Joint Backing:
1. Install joint backing to maintain sealant joint ratios recommended by Manufacturer.
 2. Install without gaps, twisting, stretching, or puncturing backing material. Use gage to ensure uniform depth to achieve correct profile, coverage, and performance.
 3. Rod for open joints shall be at least 1-1/2 times width of open joint and of thickness to give solid backing. Backing shall fill up joint so depth of sealant bite is no more than 3/8 inch (9.5 mm) deep.
- C. Bond Breaker:
1. Install bond breaker where joint backing is not used or where backing is not feasible.
 - a. Apply bond-breaker tape in shallow joints as recommended by Sealant Manufacturer.
- D. Sealant:

1. Apply sealant with hand-caulking gun with nozzle of proper size to fit joints. Use sufficient pressure to insure full contact to both sides of joint to full depth of joint. Apply sealants in vertical joints from bottom to top.
 2. Fill joint opening to full and proper configuration.
 3. Apply in continuous operation.
 4. Tool joints immediately after application of sealant if required to achieve full bedding to substrate or to achieve smooth sealant surface. Tool joints in opposite direction from application direction, i.e., in vertical joints, from the top down. Do not 'wet tool' sealants.
 5. Depth of sealant bite shall be **1/4 inch (6 mm)** minimum and **1/2 inch (12.7 mm)** maximum, but never more than one half or less than one fourth joint width.
- E. Caulk gaps between painted or coated substrates and unfinished or pre-finished substrates. Caulk gaps larger than **3/16 inch (5 mm)** between painted or coated substrates.

3.4 TOLERANCES

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

3.5 FIELD QUALITY CONTROL

- A. Adhesion Test (Installer Option to use adhesion test to determine if primer is required).
1. Perform adhesion tests in accordance with Manufacturer's instructions and ASTM C1193, Method A, Field-Applied Sealant joint Hand-Pull Tab:
 - a. Perform five (5) tests for first **1,000 linear feet (300 meters)** of applied silicone sealant and one (1) test for each **1,000 linear feet (300 meters)** seal thereafter or perform one (1) test per floor per building elevation minimum.
 - b. For sealants applied between dissimilar materials, test both sides of joints.
 2. Sealants failing adhesion test shall be removed, substrates cleaned, sealants re-installed, and re-testing performed.
 3. Maintain test log and submit report to Architect indicating tests, locations, dates, results, and remedial actions.

3.6 CLEANING

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

END OF SECTION

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

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

1.2 REFERENCES

- A. Definitions:
 - 1. Sealant. Sealants are generally used in applications where elastic properties are needed while adhesives are generally used in applications where bonding strength and rigidity are needed. With technology advancements both sealants and adhesives can be used interchangeably depending on the applications performance requirements.
 - 2. Sealant Types and Classes:
 - a. Federal Specifications:
 - 1) Type I: Self-leveling, pour grade.
 - 2) Type II: Non-sag, gun grade.
 - 3) Type NS: Non-sag, gun grade.
 - 4) Class A: +25 percent, -25 percent expansion – contraction.
 - b. ASTM Specifications:
 - 1) Type S: Single-component sealant.
 - 2) Type M: Multi-component sealant.
 - 3) Grade P: Pourable or self-leveling sealant for joints on horizontal surfaces.
 - 4) Grade NS: Non-sag or gunnable sealant for joints in vertical surfaces.
 - 5) Class 25: Sealant that, when tested for adhesion or cohesion under cyclic movement shall withstand increase and decrease of at least 25 percent of joint width as measured at time of application.
 - 6) Class 12: Sealant that, when tested for adhesion and cohesion under cyclic movement shall withstand increase and decrease of at least 12 percent of joint width as measured at time of application.
 - 7) T: Sealant designed for use in joints in pedestrian and vehicular traffic areas such as walkways, plazas, decks and parking garages.
 - 8) NT: Sealant designed for use in joints in non-traffic areas.
 - 9) M: Sealant will remain adhered to mortar.
 - 10) G: Sealant will remain adhered to glass.
 - 11) A: Sealant will remain adhered to aluminum.
 - 12) O: Sealant will remain adhered to substrates other than glass, aluminum, mortar.
- B. Reference Standards:
 - 1. ASTM International:
 - a. ASTM C834-17, 'Standard Specification for Latex Sealants'.
 - b. ASTM C919-12(2017), 'Standard Practice for Use of Sealants in Acoustical Applications'.
 - c. ASTM C1193-16, 'Standard Guide for Use of Joint Sealants'.
 - d. ASTM E84-16, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
 - e. ASTM E90-09(2016), 'Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements'

2. Underwriters Laboratories, Inc.:
 - a. UL 723: 'Standard for Safety Test for Surface Burning Characteristics of Building Materials; Tenth Edition 2008.'

1.3 SUBMITTALS

- A. Action Submittals:
 1. Product Data:
 - a. Manufacturer's literature for each Product.
- B. Informational Submittals:
 1. Certificates:
 - a. Manufacturer's Certificate:
 - 1) Certify products are suitable for intended use and products meet or exceed specified requirements.
 - 2) Certificate from Manufacturer indicating date of manufacture.
 2. Manufacturers' Instructions:
 - a. Manufacturer's installation recommendations for each Product.

1.4 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 1. Surface-Burning Characteristics:
 - a. Class A flame spread rating in accordance with ASTM E84 or UL 723 Type 1.
 - 1) Class A (Flame spread index 0-25; Smoke-developed index 0-450).

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
 1. Deliver and keep in original containers until ready for use.
 2. Inspect for damage or deteriorated materials.
- B. Storage And Handling Requirements:
 1. Handle to prevent inclusion of foreign matter, damage by water, or breakage.
 2. Store in cool, dry location, and at temperatures never under 40 deg F (4 deg C) nor exceeding 80 deg F (26.7 C).

1.6 FIELD CONDITIONS

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Sealants:
 1. Design Criteria:
 - a. Meet requirements of ASTM C834.
 - b. Meet Class A flame spread rating.
 2. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a. OSI Pro-Series SC-175 Draft & Acoustical Sound Sealant by OSI Sealants Inc, Mentor, OH www.osisealants.com.

- b. QuietZone Acoustic Caulk by Owens Corning, Toledo, OH www.owenscorning.com.
- c. Acoustical Sealant by Tremco, Beachwood, OH www.tremcosealants.com or Toronto, ON (800) 363-3213.
- d. Acoustical Sound Sealant by Titebond.
- e. Acoustical Sealant by U S Gypsum, Chicago, IL www.usg.com.

2.2 ACCESSORIES

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

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification Of Conditions:
 - 1. Examine substrate surfaces and joint openings are ready to receive Work.
 - 2. Sealants provided shall meet Manufacturer's shelf-life requirements.
 - 3. Notify Architect of unsuitable conditions in writing.
 - a. Do not proceed until unsatisfactory conditions are corrected.
 - 4. Commencement of Work by installer is considered acceptance of substrate.

3.2 PREPARATION

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

3.3 INSTALLATION

- A. General:
 - 1. Do not use damaged or deteriorated materials.
 - 2. Install primer and sealants in accordance with ASTM C1193 and Manufacturer's instructions where required for sealant adhesion.

3. Install sealants immediately after joint preparation.
 4. Do not apply caulking/sealant at temperatures below 40 deg F (4 deg C).
- B. Joint Backing:
1. Rod for open joints shall be at least 1-1/2 times width of open joint and of thickness to give solid backing. Backing shall fill up joint so depth of sealant bite is no more than 3/8 inch (9.5 mm) deep.
 2. Apply bond-breaker tape in shallow joints as recommended by Sealant Manufacturer.
- C. Install at perimeter joints and mechanical and electrical penetrations in sound insulated rooms. Apply sealant with hand-caulking gun with nozzle of proper size to fit joints. Use sufficient pressure to insure full contact to both sides of joint to full depth of joint.
- D. Tool joints immediately after application of sealant if required to achieve full bedding to substrate or to achieve smooth sealant surface.
- E. Depth of sealant bite shall be 1/4 inch (6 mm) minimum and 1/2 inch (12.7 mm) maximum, but never more than one half or less than one fourth joint width.

3.4 FIELD QUALITY CONTROL

- A. Inspection:
1. Examine sealant joints to verify compliance with Contract Document requirements.
- B. Non-Conforming Work. Non-conforming work as covered in the General Conditions applies, but is not limited to the following:
1. Sealant material found to be contaminated or damaged or inadequate preparation of substrate results in deficiencies in joint sealant adhesion is considered defective or not complying with Contract Document requirements.
 2. Correct any work found defective or not-complying with Contract Document requirements at no additional cost to Owner.

3.5 CLEANING

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

END OF SECTION

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 4000 ENTRANCES, STOREFRONTS, AND CURTAIN WALLS

08 4113 ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

08 5000 WINDOWS

08 5619 PASS WINDOWS

08 7000 HARDWARE

08 7101 COMMON FINISH HARDWARE REQUIREMENTS
08 7102 HANGING DEVICES
08 7103 SECURING DEVICES
08 7104 OPERATING TRIM
08 7106 CLOSING DEVICES
08 7107 PROTECTIVE PLATES AND TRIM
08 7108 STOPS AND HOLDERS
08 7109 ACCESSORIES

08 8000 GLAZING

08 8100 GLASS GLAZING

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. 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.
 - e. F109 Entrance Lock: Turn/push button locking: Pushing and turning button disengages outside lever, requiring using of key until button is manually unlocked. Push-button locking: Pushing button disengages outside lever until unlocked by key or by turning inside lever. Disengages outside spindle from latch when locked.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Delivery And Acceptance Requirements:

1. Materials shall be delivered in original, unopened packages with labels intact.

PART 2 - HARDWARE GROUPS**2.1 STOREFRONT ENTRY DOORS**

A. Single Doors:

1. **Group ST1:**
 - a. 1 set: Pivots.
 - b. 1 set: Weatherstrip.
 - c. 1 each: Closer.
 - d. 1 each: Exit Device with dogging capability and locking cylinder.
 - e. 1 each: Pull.
 - f. 1 each: Stop.
 - g. 1 each: Sweepstrip.
 - h. 1 each: Threshold.

2.2 INTERIOR DOORS

A. Single Interior Doors:

1. **Group 20:**
 - a. 1 set: Smoke Gaskets.
 - b. 3 each: Hinges.
 - c. 1 each: Latchset Function F75.
 - d. 1 each: Stop.
2. **Group 22:**
 - a. 1 set: Smoke Gaskets.
 - b. 3 each: Hinges.
 - c. 1 each: Lockset Function F86.
 - d. 1 each: Stop.
3. **Group 22A:**
 - a. 1 set: Smoke Gaskets.
 - b. 3 each: Hinges.
 - c. 1 each: Lockset Function F86.
 - d. 1 each: Stop.
 - e. 1 each: Threshold.
4. **Group 24:**
 - a. 1 set: Smoke Gaskets.
 - b. 3 each: Hinges.
 - c. 1 each: Lockset Function F81.
 - d. 1 each: Stop.
5. **Group 26:**
 - a. 1 set: Smoke Gaskets.
 - b. 1 each: Acoustic Seal.
 - c. 3 each: Hinges.
 - d. 1 each: Lockset Function F81.
 - e. 1 each: Stop.
 - f. 1 each: Threshold.
6. **Group 28:**
 - a. 1 set: Smoke Gaskets.
 - b. 1 each: Closer.
 - c. 3 each: Hinges.
 - d. 1 each: Kick Plate.
 - e. 1 each: Pull.
 - f. 1 each: Push.
 - g. 1 each: Stop.
 - h. 1 each: Threshold (where occurs)
7. **Group 30B:**
 - a. 1 set: Smoke Gaskets.
 - b. 1 each: Closer.
 - c. 1 each: Exit Device.
 - d. 1 each: Lockset Function F81.
 - e. 3 each: Hinges.
 - f. 1 each: Kick Plate.
 - g. 1 each: Stop.
8. **Group 32:**
 - a. 1 set: Smoke Gaskets.
 - b. 1 each: Closer.
 - c. 3 each: Hinges.
 - d. 1 each: Lockset, Function F76.
 - e. 1 each: Stop.
 - f. 1 each: Threshold

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 05 1223: 'Structural Steel For Buildings' for channel frames.
 - 2. Section 06 2024: 'Door, Frame, And Finish Hardware Installation' for installation.
 - 3. Section 06 4116: Plastic-Laminate-Faced Architectural Cabinets' for pass-through window and hardware.
 - 4. Section 08 4113: 'Aluminum-Framed Entrances And Storefronts' for aluminum entry frames.

1.2 REFERENCES

- A. Reference Standards:
 - 1. American Architectural Manufacturers Association / Window & Door Manufacturers Association / Canadian Standards Association:
 - a. AAMA/WDMA/CSA 101/I.S.2/A440-11, 'North American Fenestration Standard/Specification for windows, doors, and skylights'.
 - 2. ASTM International:
 - a. ASTM A568/A568M-13a, 'Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for.
 - b. ASTM A653/A653M-13, '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 A250.8-2003(R2008), '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 One Approved VMR 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.

- B. Manufacturers:
 - 1. Category One 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 / Canadian Standards Association:
 - a. AAMA/WDMA/CSA 101/I.S.2/A440-11, 'North American Fenestration Standard/Specification for windows, doors, and skylights'.
2. ASTM International:
 - a. ASTM C1036-16, 'Standard Specification for Flat Glass'.
 - b. ASTM C1048-12, 'Standard Specification for Heat-Treated Flat Glass—Kind HS, Kind FT Coated and Uncoated Glass'.
3. Hardwood, Plywood, and Veneer Association:
 - a. HPVA HP-1-2009 'Standard for Hardwood and Decorative Plywood'.
4. National Particleboard Association / Composite Panel Association:
 - a. NPA A208.1-2009, 'Particleboard'.

1.3 SUBMITTALS

- A. Action Submittals:
 1. Shop Drawings:
 - a. Schedule showing type of door at each location. Included shall be size, veneer, core type, fire rating, hardware prep, openings, blocking, etc.
 - b. Indicate factory finish color and type.
 2. Samples:
 - a. Interior Hardwood for Transparent Finish:
 - 1) Approval subject to Annual Review:
 - a) Prepare sample to match Control Sample available from Owner to be used as finishing standard for interior clear finished hardwood as specified in Section 09 9324.
 - b) Approval of sample by Owner will establish performance standard of stain to be used until next annual review.
 - 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 by Owner.
- B. Informational Submittals:
 1. Source Quality Control Submittals:
 - a. Samples:
 - 1) Interior Hardwood for Transparent Finish:
 - a) Owner will provide Control Sample 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 One Approved VMR 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.

B. Manufacturers:

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

C. Wood Doors:

1. Type: AWS PC-5ME or FD-5ME.
2. Grade: AWS Premium, except face veneer.
3. Fully Type I Construction: Adhere all glue lines with Type I adhesive, including veneer lay-up.
4. Face Veneer:
 - a. Plain sliced Red Oak meeting requirements of AWS Grade A, **1/50 inch (0.5 mm)** thick minimum immediately before finishing.
 - b. Face veneers shall be running book matched.
5. Core:
 - a. Fully bonded to stiles and rails and sanded as a unit before applying veneers.
 - b. Non-Rated:
 - 1) 32 lb density meeting requirements of ANSI A208.1 Mat Formed Wood Particle Board, Grade 1-L-1 minimum.
 - 2) Stiles:

- a) **1-3/8 inches (35 mm)** deep minimum before fitting.
 - b) Stile face to be hardwood matching face veneer material, thickness manufacturer's standard.
 - 3) Rails:
 - a) **1-1/8 inches (28 mm)**.
 - b) Manufacturer's option.
- 6. Factory Glazing (non-fire-rated openings):
 - a. Glazing: Tempered glazing meeting requirements of ASTM C1048, Kind FT, Condition A, Type I, Class I, Quality q3. Thickness **1/4 inch (6 mm)**.
 - b. Lite Kit:
 - 1) Design Criteria:
 - a) Pre-finished wood or wood veneer frames.
 - 2) Dimensions:
 - a) Doors shown on Door Schedule are to have **6 inch (150 mm)** wide by **33 inches (850 mm)** high cutout opening) security view window with bottom of opening located **42 inches (1 000 mm)** above finish floor and side located **6 inches (150 mm)** from strike edge of door.
 - 3) Category Four Approved Product. See Section 01 6200 for definitions of Categories:
 - a) Profile M6G by Graham.
 - b) Profile W6 by Marshfield.
 - c) Profile VT1 by VT Industries.
- D. Fabrication:
 - 1. Doors shall be factory-machined. Coordinate with Section 08 1213 and Sections under 08 7000.
- E. Finishes:
 - 1. Factory Finishing:
 - a. Applied by Door Manufacturer before leaving factory.
 - b. Performance / Design Criteria:
 - 1) Finish factory-finish to match Owner selected sample as specified in Section 09 9324.
 - 2) Color:
 - a) Owner will provide stain sample from project for custom match.
 - c. Finish: AWS Finish System TR-6 Catalyzed Polyurethane Premium Grade for unfilled, open-grain woods.

2.2 SOURCE QUALITY CONTROL

- A. Inspections:
 - 1. Verification of Performance:
 - a. Doors shall have following information permanently affixed on top of door:
 - 1) Manufacturer:
 - 2) Door designation or model.
 - 3) Veneer species.
 - 4) Factory finish.
 - 2. Clear Finished Hardwood:
 - a. Color matches Owner provided sample specified in Section 09 9324.

PART 3 - EXECUTION: Not Used

END OF SECTION

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

- A. Includes But Not Limited To:
 - 1. Furnish and install aluminum storefront entry and window systems, including hardware, glazing, and caulking, as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 06 2024: 'Door, Frame, And Hardware Installation' for installation of locking cylinders.
 - 2. Section 07 9213: 'Elastomeric Joint Sealant' for quality of sealants.
 - 3. Section 08 7103: 'Securing Devices' for furnishing of locking cylinders.
 - 4. Section 08 8100: 'Glass Glazing' for quality of glass glazing.

1.2 REFERENCES

- A. Association Publications:
 - 1. American Architectural Manufacturers Association (AAMA):
 - a. AAMA SFM 1-14, 'Aluminum Store Front and Entrance Manual'.
 - b. AAMA 501-15, 'Methods of Test for Exterior Walls'.
 - c. AAMA 609 & 610-15, 'Cleaning and Maintenance Guide for Architecturally Finished Aluminum' (combined documents).
 - d. AAMA 611-14, 'Voluntary Standards for Anodized Architectural Aluminum'.
 - e. AAMA 2605-17, 'Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels'.
- B. Definitions:
 - 1. Glass Surface:
 - a. Insulated glass unit:
 - 1) Surface 1: Exterior surface of outer lite.
 - 2) Surface 2: Interspace-facing surface of outer lite.
 - 3) Surface 3: Interspace-facing surface of inner lite.
 - 4) Surface 4: Interior surface of inner lite.
 - b. Monolithic glass:
 - 1) Surface 1: Exterior surface.
 - 2) Surface 2: Interior surface.
- C. Reference Standards:
 - 1. ASTM International:
 - a. ASTM B221-14, 'Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes'.
 - b. ASTM B456-17, 'Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium'.
 - c. ASTM B633-15, 'Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel'.
 - d. ASTM C920-14a, 'Standard Specification for Elastomeric Joint Sealants'.
 - e. ASTM E283-04(2012), 'Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen'.
 - f. ASTM E330/E330M-14, 'Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference'.

- g. ASTM E331-00(2016), 'Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference'.
2. International Building Code (IBC) (2015 or most recent edition adopted by AHJ):
 - a. Chapter 10, 'Means of Egress'.
3. International Code Council / American National Standards Institute:
 - a. ICC / ANSI A117.1-2009, 'Accessible and Usable Buildings and Facilities'.
4. National Fenestration Rating Council (NFRC):
 - a. NFRC 100-2014, 'Procedure for Determining Fenestration Product U-factors'.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference:
 1. Participate in pre-installation conference for storefront entrance sections.
 2. Schedule conference one (1) week before scheduled installation of storefront system.
 3. Participate in pre-installation conference held jointly with following section:
 4. In addition to agenda items specified in Section 01 3100, review following:
 - a. Review installation scheduling, coordination, placement of storefront entrances.
 - b. Review location of signage on entrance doors.
 - c. Review delivery, storage, and handling requirements.
 - d. Review safety issues.

1.4 SUBMITTALS

- A. Action Submittals:
 1. Product Data:
 - a. Manufacturer's literature or cut sheets.
 - b. Color and finish selections.
 2. Shop Drawings:
 - a. Show locations, sizes, etc, of hardware reinforcing.
 - b. Show wind loads and engineering for Project conditions.
 - c. Clearly mark components to identify their location in Project.
- B. Informational Submittals:
 1. Qualification Statement:
 - a. Installer:
 - 1) Provide Qualification documentation if requested by Architect or Owner.
- C. Closeout Submittals:
 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Operations and Maintenance Data:
 - 1) Maintenance, adjustment, and repair instructions.
 - 2) Cleaning and maintenance instructions for reflective glazing.
 - b. Warranty Documentation:
 - 1) Final, executed copy of Warranty.
 - a) Storefront warranty.
 - b) Storefront closers.
 - c. Record Documentation:
 - 1) Manufacturers documentation:
 - a) Manufacturer's literature or cut sheets for storefront system and for each item of hardware.
 - b) Color and finish selections.
 - c) Parts lists.

1.5 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:

1. Storefront System Performance Requirements:
 - a. Provide test reports from AAMA accredited laboratories certifying performances if requested:
 - 1) Air Leakage: Meet requirements of ASTM E283.
 - 2) Limit air leakage through assembly to **0.06 CFM/min/sq ft (.00003 m3/sm2)** of wall area at **6.24 PSF (300 Pa)** as measured in accordance with ASTM E283.
 - 3) Water Resistance: No water leakage when measured in accordance with ASTM E331 with static test pressure of **8PSF (384 Pa)** as defined by AAMA 501.
 - 4) Dynamic Water Resistance: No water leakage, when measured in accordance with AAMA 501 with dynamic test pressure of **8 PSF (384 Pa)**.
 - 5) Limit mullion wind load deflection of L/175 with full recovery of glazing materials, when measured in accordance with ASTM E330/E330M.
 - 6) System shall not deflect more than **1/8 inch (3 mm)** at center point, or **1/16 inch (1.58 mm)** at enter point of horizontal member, once dead load points have been established.
 - 7) System shall accommodate expansion and contraction movement due to surface temperature differential of **180 deg F (82 deg C)**.
 - 8) Seismic testing shall conform to AAMA recommended static test method for evaluating performance of curtain walls and storefront wall systems due to horizontal displacements associated with seismic movements and building sway.
 2. Provide wind load and impact testing by testing laboratory when required by local codes and jurisdictions.
 - a. See Section 01 4523 for Testing and Inspection administrative requirements and responsibilities for Testing Agencies and Section 01 4301 for Testing Agency Qualifications.
- B. Qualifications: Requirements of Section 01 4301 applies, but not limited to following:
 1. Manufacturer Qualifications:
 - a. Provide aluminum entrances and storefront systems produced by a firm experienced in manufacturing systems that are similar to those indicated for this project and that have a record of successful in service performance.
 2. Fabricator Qualifications:
 - a. Provide aluminum entrances and storefront systems fabricated by a firm experienced in producing systems that are similar to those indicated for this Project, and that have a record of successful in service performance.
 - b. Fabricator shall have sufficient production capacity to produce components required without causing delay in progress of the Work.
 3. Installer Qualifications:
 - a. Minimum three (3) years experience in storefront installations.
 - b. Minimum five (5) satisfactorily completed projects of comparable quality, similar size, and complexity in past three (3) years before bidding.
 - c. Upon request, submit documentation.

1.6 DELIVERY, STORAGE, AND HANDLING

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

1.7 WARRANTY

- A. Manufacturer Warranty:
 1. Door Construction:

- a. Lifetime warranty for normal use.
 - 1) Warranty does not include door installation, attached hardware and finish.
2. Closers:
 - a. Closer Manufacturer's standard warranty, 10 years minimum.

PART 2 - PRODUCTS

2.1 ASSEMBLIES

- A. Manufacturers:
 1. Category One VMR Approved Manufacturers. See Section 01 6200 for definitions of Categories:
 - a. Arcadia Inc., Vernon CA www.arcadiainc.com.
 - 1) Contact Information: Ken Martinek, (602) 734-5327 kmartinek@arcadiainc.com.
 - b. Kawneer North America, Norcross, GA, www.kawneer.com/kawneer/north_america.
 - 1) Contact Information: Bart Daniels cell (385) 214-4650 bart.daniels@alcoa.com.
- B. General:
 1. In addition to requirements shown or specified, comply with:
 - a. Applicable provisions of AAMA SFM 1, 'Aluminum Store Front and Entrance Manual' for design, materials, fabrication and installation of component parts.
- C. Design Criteria:
 1. Storefront System suitable for outside or inside glazing.
- D. Materials:
 1. Framing Components and Accessories:
 - a. Aluminum Extrusions:
 - 1) 6063-T6 aluminum alloy or meet requirements of ASTM B221, alloy GS 10a T6.
 - 2) Anchors, Clips, and Accessories:
 - a) Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated (properly isolated steel from aluminum).
 - 3) Fasteners:
 - a) Aluminum, nonmagnetic stainless steel or other materials to be non-corrosive and compatible with aluminum window members, trim hardware, anchors, and other components.
 - 4) Glazing Gasket:
 - a) Compression-type design with replaceable extruded EPDM rubber.
 - 5) Reinforcing Members:
 - a) Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.
 - 6) Sealant:
 - a) Structural Sealant meeting requirements of ASTM C1184 for fabrication within storefront system:
 - (1) Permanently elastic, non-shrinking, and non-migrating type for joint size and movement.
 - (2) Single-component neutral-curing silicone formulation compatible with system components specifically formulated and tested for use as structural sealant and approved by structural-sealant manufacturer for use in aluminum-framed systems indicated.
 - (3) Color: Black.
 - b) Joint Sealants used at perimeter of storefront framing system: Elastomeric Sealant as specified in Section 07 9213.

- c) Provide sealants for use inside of the weatherproofing system that have a VOC content of 250 g/L or less when required by local codes or AHJ.
 - 7) Tolerances:
 - a) Tolerances for wall thickness and other cross-sectional dimensions of storefront members in compliance with AA Aluminum Standards and Data.
 - b. Storefront Framing System:
 - 1) Brackets and Reinforcements:
 - a) Manufacturer's standard high-strength aluminum with non-staining, nonferrous shims for aligning system components.
 - 2) Fasteners and Accessories:
 - a) Manufacturer's standard corrosion-resistant, non-staining, non-bleeding fasteners and accessories compatible with adjacent materials.
 - 3) Perimeter Anchors:
 - a) When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.
 - c. Finish:
 - 1) Match doors.
 - d. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Non-Thermal, 2 inch (50 mm) Sightline:
 - a) Single Glazed:
 - (1) AR450 by Arcadia.
 - (2) Trifab VG 450 by Kawneer.
 - b) Double Glazed:
 - (1) AG451 by Arcadia.
 - (2) Trifab VG 451 by Kawneer.
2. Manually Operated Doors:
- a. Aluminum: 6063 T6 aluminum alloy, or meeting requirements of ASTM B221, alloy GS 10a T6.
 - b. Stiles:
 - 1) 3-1/2 inches by 1-3/4 inches by 0.125 inches (89 mm by 45 mm by 3.175 mm) thick nominal.
 - c. Top Rails:
 - 1) 3-1/2 inches by 1-3/4 inches by 0.125 inches (89 mm by 45 mm by 3.175 mm) thick nominal.
 - d. Bottom Rail:
 - 1) 10 inches minimum by 1-3/4 inches by 0.125 inches (254 mm minimum by 45 mm by 3.175 mm) thick nominal.
 - e. Construction:
 - 1) Manufacturer's standard.
 - f. Glazing Stops:
 - 1) Snap-in type with neoprene bulb-type glazing.
 - 2) Units shall be glazed from exterior side.
 - g. Weatherstripping:
 - 1) Neoprene bulb-type.
 - 2) Approved Products:
 - a) Peri-Plus Seal (PPS) by Arcadia.
 - b) Kawneer Sealair.
 - h. Factory Finishing:
 - 1) Fluorocarbon Carbon: comply with AAMA 2605:
 - a) Polyvinylidene Fluoride (PVDF) Resin-base finish (Kynar 500 or Hylar 5000) containing seventy (70) percent minimum (PVDF) in resin portion of formula and providing pencil hardness of 3H. Thermo-cured two-coat system consisting of corrosion inhibiting epoxy primer and topcoat factory-applied over properly pre-treated metal.
 - b) Color as selected by Architect from Storefront Manufacturer's standard colors:
 - c) Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories:
 - (1) BASF.
 - (2) PPG Industries, Inc.
 - (3) Valspar Corporation.

- i. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Non-Thermal:
 - a) MS362 Medium Stile by Arcadia.
 - b) 350 Medium Stile by Kawneer.
3. Glazing:
 - a. Glazing as specified in Section 08 8100: 'Glass Glazing'.
 - b. Glazing Gaskets:
 - 1) Compression-type design with replaceable extruded EPDM rubber.
 - c. Spacers and Setting Blocks: Elastomeric.
 - d. Bond-Breaker (Sealer) Tape: Standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.
 - e. Glazing Sealant:
 - 1) Structural Sealant meeting requirements of ASTM C1184:
 - a) Permanently elastic, non-shrinking, and non-migrating type for joint size and movement.
 - b) Single-component neutral-curing silicone formulation compatible with system components specifically formulated and tested for use as structural sealant and approved by structural-sealant manufacturer for use in aluminum-framed systems indicated.
 - c) Color: Black.
 - 2) Weather Sealant:
 - a) ASTM C920 for Type S, Grade NS, Class 25, Uses NT, G, A, and O; single-component neutral-curing formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weather seal sealant, and aluminum-framed-system manufacturers for this use.
 - b) Color: Match structural sealant.
 - 3) Provide sealants for use inside of the weatherproofing system that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
4. Hardware:
 - a. Manually Operated Doors:
 - 1) Hinging:
 - a) Top and bottom offset, ball bearing pivots per door leaf.
 - 2) Overhead Door Closers:
 - a) Provide parallel arms on closers unless door position requires otherwise.
 - b) Closers shall allow for 180 degree opening and not be used as stop.
 - c) Adjust closers to provide maximum opening force as required by governing code authority.
 - d) Closers shall have following features:
 - (1) Adjustable sweep speed.
 - (2) Adjustable backcheck.
 - (3) Non-handed, non-sized.
 - (4) Cush arm by LCN or equal by Norton.
 - e) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (1) Surface mounted.
 - (2) 4041 Series parallel arm by LCN.
 - (3) 7700 Series Parallel arm by Norton.
 - 3) Exit Devices:
 - a) Operation:
 - (1) Entry shall be by key. Device shall be locked by cylinder from outside. Key shall be removable when cylinder is in locked or unlocked position.
 - (2) Dogging operation shall be by accessible manufacturer's permanent knob, but not by removable allen wrench devices.
 - (3) Color: Equivalent to clear anodized.
 - (4) Exterior Trim: Pull equal to Kawneer CO-9 or Arcadia OPR-9.
 - b) Types:
 - (1) Double Doors Without Mullions: Concealed vertical rods.

- (2) All Other Doors: Rim Type. Provide type of strike that will allow installation of specified panic devices on storefront system specified.
 - c) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (1) Apex Series by Precision.
 - (2) 80 Series by Sargent.
 - (3) 98 or 99 Rim Series by Von Duprin.
 - 4) Sweep Strips:
 - a) Entrance Manufacturer's standard (cover cap with no exposed fasteners).
 - 5) Push / Pulls:
 - a) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (1) PBR and OPR-9 by Arcadia.
 - (2) Kawneer CP and CO-9, clear anodized.
- E. Fabrication:
 1. Construction shall meet Manufacturer's recommendations.
 2. Fabricate components that, when assembled, have following characteristics:
 - a. Profiles sharp, straight, and free of defects or deformations.
 - b. Accurately fit joints; make joints flush, hairline and weatherproof.
 - c. Means to drain water passing joints, condensation within framing members, and moisture migrating within system to exterior.
 - d. Physical and thermal isolation of glazing from framing members.
 - e. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 - f. Provisions for field replacement of glazing.
 - g. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
 - h. Framing members shall be internally reinforced and secured at head and sill as necessary for structural performance requirements and for hardware attachment.
 3. Fabricate in factory to dimensions required to fit framed openings detailed on Contract Documents. Joints shall be tightly closed.
 4. Mortise in manner to give maximum hardware-door connection strength and neatness of appearance. Adequately reinforce with back plates or rivnuts to hold pivots and closers.
 5. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
 6. Structural-Sealant-Glazed Framing Members: Include accommodations for using temporary support device to retain glazing in place while structural sealant cures.
 7. Storefront Framing: Fabricate components for assembly using manufactures standard installation instructions.
 8. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

PART 3 - EXECUTION

3.1 INSTALLERS

- A. Performance Standard Installers: See Section 01 6200 for definitions of Categories. See Section 01 4301 and 'Quality Assurance' in Part 1 'General' for Installer Qualifications of this specification:
 1. General Contractor responsible for Installer(s), verification of qualifications, and performance. Contact VMR Approved Manufacturer's Representative specified in Part 2 'Products' of this specification for potential installers if desired.

3.2 EXAMINATION

- A. Verification Of Conditions:
 1. Verify that framed openings comply with Contract Document requirements.

2. Verify floor is level across entire width of automatic door opening.
3. Verify sill conditions are level and/or sloped away from openings as specified.
4. Verify wall framing is dry, clean, sound, and free of voids and offsets, construction debris, sharp edges or anything that will prevent a successful installation of storefront system.
5. Notify Architect in writing if framed openings are incorrect.
 - a. Do not install storefront entry and window frames until deficiencies in framed openings have been corrected.
 - b. Commencement of Work by installer is considered acceptance of substrate.

3.3 INSTALLATION

- A. General:
 1. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.
 2. All installation shall be in accordance with manufacturer's published recommendations and in accordance with approved shop drawings.
 3. Do not install damaged components. Fit frame joints tight, free of burrs and distortion. Rigidly secure non-movement joints.
 4. Isolate metal surfaces in contact with incompatible metal or corrosive substrates, including wood, by applying sealer tape to prevent electrolytic action.
- B. Set plumb, square, level, and in correct alignment and securely anchor to following tolerances:
 1. Variation from plane: Limit to **1/8 inch (3 mm)** in **12 feet (3.6 meters)**; **1/4 inch (6 mm)** over total length.
 2. Offset from Alignment: For surfaces abutting in line, limit offset to **1/16 inch (1.6 mm)**.
 3. Offset at Corners: For surfaces meeting at corner, limit offset to **1/32 inch (0.8 mm)**.
 4. Diagonal measurements: Limit difference between diagonal measurements to **1/8 inch (3 mm)**.
 5. Sidelights: Line up horizontal rail in sidelight with door rail.
- C. Install doors without warp or rack. Adjust doors and hardware to provide 90 degree operation, tight fit at contact points and smooth operation.
- D. Install exterior window units with through wall sill flashing.
- E. Thresholds:
 1. Accurately cut thresholds to fit profile of storefront frame. Bed exterior thresholds in specified sealant at contact points with floor and make watertight.
 2. At Vestibule at Retail Area with Floor Mat:
 - a. Threshold to line up with threshold of 'Sliding Automatic Entrances, Section 08 4229 and 'Entrance Matting' Section 12 4843.
- F. Sealants:
 1. Apply in accordance with Section 07 9213 'Elastomeric Joint Sealant' requirements.
 2. Caulk joints between frames and walls, both interior and exterior to provide weather tight installation.
- G. Glazing Characteristics:
 1. Exterior Doors And Storefront:
 - a. Clear interior pane and Clear exterior pane with Low E treatment on surface 2.
 2. Interior Doors And Vestibules:
 - a. Clear, except door from Vestibule to Conference Room, obscure.
- H. Signage:
 1. Exterior Doors And Storefront:
 - a. Provide signage on door glazing of automatic doors to designate ENTRANCE.
 2. Interior Doors And Vestibules:
 - a. Provide signage on door glazing of automatic doors to designate EXIT.
 3. Storefront Exterior Windows:

- a. Double pane with reflective surface with glazing to the interior.

3.4 FIELD QUALITY CONTROL

- A. Field Tests And Inspections:
 1. Pull test doors, especially pairs of single doors separated by permanent mullions, to ensure security of opening.
 2. Make all necessary final adjustments to attain normal operation of each door and its mechanical hardware.
- B. Non-Conforming Work:: Non-conforming work as covered in the General Conditions applies, but is not limited to the following:
 1. Correct any work found defective or not complying with contract document requirements including removal and replacement of glass that has been broken, chipped, cracked, abraded, or damaged during construction period at no additional cost to the Owner.

3.5 ADJUSTING

- A. Adjust doors for proper operation after glazing entry. After repeated operation of completed installation, re-adjust door for optimum operating condition and safety if required.

3.6 PROTECTION

- A. During Installation:
 1. Installer's Responsibility:
 - a. During installation, all adjacent work shall be protected from damage.
- B. After Installation:
 1. General Contractor's Responsibility:
 - a. Institute protective measures required throughout remainder of construction period to ensure that aluminum entrances and storefronts will be without damage or deterioration, other than normal weathering, at time of acceptance.

3.7 CLEANING

- A. General:
 1. Installer's Responsibility:
 - a. Follow Manufacturer's written recommendations for cleaning and maintenance or guidelines of AAMA 609 & 610 'Cleaning and Maintenance Guide for Architecturally Finished Aluminum' (combined documents). Avoid damaging protective coatings and finishes.
 - b. Clean glass and aluminum surfaces, inside and out, promptly after installation. Remove excess glazing and sealant compounds, dirt, and other substances. Exercise care to avoid damage to coatings.
 - c. Remove nonpermanent labels, protective films, and clean surfaces following recommended procedures.
 - 1) Do NOT remove permanent ANSI/AAMA/CSA or NFRC labels.
- B. Waste Management:
 1. Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

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SECTION 08 5619**PASS WINDOWS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
 - 1. Pass-through window as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 06 2001: 'Common Finish Carpentry Requirements' for Installation of window units.
 - 2. Section 06 4512: 'Architectural Woodwork Wood Trim' for wood trim at window.
 - 3. Section 08 8100: 'Glass Glazing' for quality of glass.
 - 4. Section 09 9124: 'Interior Painted Metal' for finish Painting.

1.2 REFERENCES

- A. Reference Standards:
 - 1. ASTM International:
 - a. ASTM A1008/A1008M-15, 'Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable'.
 - b. ASTM C1036-16, 'Standard Specification for Flat Glass'.

1.3 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Manufacturer's literature or cut sheet and maintenance instructions.
 - b. Glazing information.
 - c. Color and finish selection.
 - 2. Shop Drawings:
 - a. Installation requirements including rough opening size, attachments, and anchors.
 - b. Details of keyed locking device.
- B. Informational Submittals:
 - 1. Manufacturer Instructions:
 - a. Manufacturer's standard printed installation instructions.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
 - 1. Ship glazed pass window units in wooden crates.
- B. Storage And Handling Requirements:
 - 1. Store in crate in safe, dry location until ready for installation.

PART 2 - PRODUCTS**2.1 ASSEMBLIES**

- A. Pass Through Window Track:
 - 1. Description:
 - a. Aluminum track with nylon or ball bearing steel rollers.
 - 2. Type One Acceptable Products:
 - a. Ezy-Roll Aluminum Track Number P1092 ANOD by Knape and Vogt, which includes:
 - 1) 1085 vinyl glides: Four (4) each.
 - 2) 1093 upper channel: One (1) each.
 - 3) 1095 shoe: Two (2) each.
 - 4) 1097 rollers: Four (4) each.
 - 5) 1099 lower track: One (1) each.
 - b. Equal as approved by Architect before bidding. See Section 01 6200.
 - 3. Sliding Window Lock:
 - a. Provide with four (4) keys.
 - b. Class Two Quality Standard:
 - 1) Number 965 NP Ratchet Lock by Knape & Vogt.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Installation as per Section 06 2001: 'Common Finish Carpentry Requirements':
 - 1. Set window frames level, plumb and square without distortion.

END OF SECTION

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

- A. Includes But Not Limited To:
 - 1. General requirements for finish hardware related to architectural wood and hollow metal doors.
- B. Related Requirements:
 - 1. Section 06 2024: 'Door, Frame, And Finish Hardware Installation' for installation of hardware.
 - 2. Section 06 4116: 'Plastic-Laminate-Faced Architectural Cabinets' for architectural woodwork hardware.
 - 3. Section 08 0601: 'Hardware Group and Keying Schedules'.
 - 4. Section 08 4113: 'Aluminum-Framed Entrances and Storefronts' for storefront hardware.

1.2 REFERENCES

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

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. Category One VMR 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.

2.2 FINISHES

A. Hardware Finishes:

1. Finishes for brass or bronze hardware items shall be:
 - a. ANSI / BHMA Finish Code 626.
 - 1) Description: Satin Chromium Plated.
 - 2) Base Metal: Brass. Bronze.
2. Finishes for flat goods items may be:
 - a. ANSI / BHMA Finish Code 630.
 - 1) Description: Satin Stainless Steel.
 - 2) Base Metal: Stainless Steel (300 Series).
3. Materials other than steel, brass, or bronze shall be finished to match appearance satin chromium plated, except flat goods which shall be satin stainless steel.

2.3 FASTENERS

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

PART 3 - EXECUTION

3.1 PREPARATION

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

END OF SECTION

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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, New Britain, CT www.stanleyworks.com.
- B. Hinges:
 - 1. Doors:
 - a. Sizes:
 - 1) Non-Fire-Rated Doors:
 - a) 1-3/4 inch 44.5 mm non-fire-rated wood doors in wood frames: 4 inches by 4 inches (100 mm by 100 mm).
 - b) 1-3/8 inch 35 mm wood or metal doors: 3-1/2 inches by 3-1/2 inches (89 mm by 89 mm).
 - 2. 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. Cylinders.
 - c. Interior exit devices.
- B. Related Requirements:
 - 1. Section 08 7101: Common Hardware Requirements.

1.2 REFERENCES

- A. Definitions:
 - 1. Grade 2 Standard Duty Key-In Lever Cylindrical Lockset:
 - a. Performance Features:
 - 1) Exceeds 400,000 ANSI cycles.
 - 2) Single motion egress provides easy emergency exit.
 - 3) Full 1 inch (25 mm) throwbolt with saw resistant hardened steel roller pin.
 - 4) Anti-drill design deadbolt. Two (2) ball bearings inserted to prevent drill attacks.
 - 5) ADA-compliant thumbturn.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
 - 1. Standard Key Delivery:
 - a. Include change keys with hardware.

PART 2 - PRODUCTS**2.1 MANUFACTURED UNITS**

- A. Manufacturers:
 - 1. Manufacturer List:
 - a. Abus by Home Security, Commercial Security and Safety Lockout, Phoenix, AZ www.abus.com.
 - b. Best Locks by Stanley, Indianapolis IN www.stanleysecuritysolutions.com.
 - c. Hager, St Louis, MO www.hagerhinge.com.
 - d. Ives, New Haven, CT www.iveshardware.com.
 - e. Marks USA, Amityville, NY www.marksusa.com.
 - f. Master Lock, Oak Creek, WI.
 - g. Rockwood, Manufacturing Co, Rockwood, PA www.rockwoodmfg.com.
 - h. Sargent, New Haven, CT www.sargentlock.com.
 - i. Schlage, Colorado Springs, CO www.schlage.com.
 - j. Von Duprin, Indianapolis, IN www.vonduprin.com.
 - k. 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.
-
- D. Standard Cylinders:
 - 1. Provide cylinders for interior exit devices requiring cylinders.
 - 2. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a. Match Manufacturer of locksets.
 - 3. Other Cylinders: Provide cylinders for interior exit devices requiring cylinders.
 - 4. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a. Match Manufacturer of locksets.
-
- E. Exit Devices:
 - 1. Use operable lever trim.
 - 2. Provide labeled hardware where required by local code authority.
 - 3. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a. Apex Series by Precision.
 - b. 80 Series by Sargent.
 - c. 99 or 98 Series by Von Duprin.
 - d. 7100 Series by Yale.

PART 3 - EXECUTION

3.1 CLOSE-OUT ACTIVITIES

- A. Owner's Instructions:
 - 1. Before Final Acceptance Meeting, send master keys to Steven Smith, Sandy UT FM Group.

END OF SECTION

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

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

PART 2 - PRODUCTS**2.1 MANUFACTURED UNITS**

- A. Standard Door Push / Pulls:
 - 1. Size: **15 inches (380 mm)** by **3-1/2 inch (89 mm)**.
 - 2. Type Two Acceptable Products:
 - a. PS3515, PL3515 / 80301 by Glynn-Johnson, Indianapolis, IN www.glynn-johnson.com.
 - b. 39E, 30S by Hager, St Louis, MO www.hagerhinge.com.
 - c. 8200, 8302 by Ives, Wallingford, CT www.iveshardware.com.
 - d. 70B, 105x70B by Rockwood Manufacturing Co, Rockwood, PA www.rockwoodmfg.com.
 - e. Equal as approved by Architect before installation. See Section 01 6200.

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

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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. 7900 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, Indianapolis IN www.stanlesecuritysolutions.com.
- 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. Closers shall allow for 180 degree opening without engaging stop function.
 - 4. Closers shall have following features:
 - a. Adjustable sweep speed.
 - b. Adjustable backcheck.
 - c. Non-handed, non-sized.
 - 5. 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 7107**PROTECTIVE PLATES AND TRIM****PART 1 - GENERAL****1.1 SUMMARY**

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

PART 2 - PRODUCTS**2.1 MANUFACTURED UNITS**

- A. Manufacturers:
 - 1. Type Two Acceptable Manufacturers:
 - a. Glynn-Johnson, Indianapolis, IN www.glynn-johnson.com.
 - b. Hager, St Louis, MO (800) 255-3590 or (314) 772-4400 www.hagerhinge.com.
 - c. Ives, Wallingford, CT www.iveshardware.com.
 - d. Rockwood Manufacturing Co, Rockwood, PA www.rockwoodmfg.com.
 - e. Equal as approved by Architect before installation. See Section 01 6200.
- B. Protective Plates:
 - 1. Material: 0.050 inch (1.27) mm thick Stainless Steel.
 - 2. Sizes:
 - a. Kick Plates: 10 inches (255) mm high by width of door less 3/4 inch (19 mm) on each side.
 - b. Armor Plates: 40 inches (1 000 mm) high by width of door less 3/4 inch (19 mm) on each side.

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

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

- A. Products Supplied But Not Installed Under This Section:
 - 1. Door stops.
 - 2. Door stops and holders.
- 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.
- C. Door Stops And Holders:
 - 1. Type Two Acceptable Products:
 - a. Hager: 268F, 268S or 256S, 256W.
 - b. Ives: WS444, WS449, FS446, FS450.
 - c. Rockwood: 472, 473, 476, 477.
 - d. 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. Acoustical seals.
 - 2. Smoke Gaskets.
 - 3. Thresholds (metal) where required for wood doors.
 - 4. Door bottoms/door sweeps.

- B. Related Requirements:
 - 1. Section 08 4113: 'Aluminum-Framed Entrances And Storefronts' for thresholds.
 - 2. Section 08 7101: 'Common Finish Hardware Requirements' for general finish hardware requirements and Approved Suppliers.
 - 3. Section 09 3013: 'Ceramic Tiling' for stone thresholds.

1.2 REFERENCES

- A. Association Publications:
 - 1. American Architectural Manufacturers Association (AAMA):
 - a. AAMA 609 & 609-09, 'Cleaning and Maintenance Guide for Architecturally Finished Aluminum' (combined document).
 - b. AAMA 611-12, 'Voluntary Standards for Anodized Architectural Aluminum'.
 - c. AAMA 701/702-11, 'Voluntary Specification for Pile Weatherstripping and Replaceable Fenestration Weatherseals'.
 - 2. National Association of Architectural Metal Manufacturers (NAAMM):
 - a. AMP 500-06, 'Metal Finishes Manual' for Architectural and Metal Products.

- B. Reference Standards:
 - 1. American National Standards Institute / Builders Hardware Manufacturers Association:
 - a. ANSI / BHMA A156.18-2012, 'Materials and Finishes'.
 - b. ANSI / BHMA A156.21-2014, 'American National Standard for Thresholds'.
 - 2. International Code Council / American National Standards Institute:
 - a. ICC / ANSI A117.1-2009, 'Accessible and Usable Buildings and Facilities'.

PART 2 - PRODUCTS**2.1 MANUFACTURED UNITS**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Hager, St Louis, MO www.hagerhinge.com.
 - b. NGP - National Guard Products, Memphis, TN www.ngpinc.com.
 - c. Pemko Manufacturing, Ventura, CA www.pemko.com.

- B. Acoustical Seals:
 - 1. Color as selected by Architect.
 - 2. Type One Acceptable Products:
 - a. Door Bottom Shoe for Wood Door:
 - 1) 13VDkB by NGP.

- 2) 211DV by Pemko.
 - b. Door Bottom Shoe for Metal Door:
 - 1) 779S-A by Hager.
 - 2) 35EV by NGP.
 - 3) 217AV by Pemko.
 - c. Equal as approved by Architect before bidding. See Section 01 6200.
- C. Smoke Gaskets:
- 1. Color as selected by Architect.
 - 2. Type One Acceptable Products:
 - a. 726 by Hager.
 - b. 5050 by NGP.
 - c. PK 55 by Pemko.
 - d. Equal as approved by Architect before bidding. See Section 01 6200.
- D. Sweepstrip (metal door bottom):
- 1. Clear anodized aluminum with black neoprene insert.
 - 2. Reduce infiltration of air, wind, dust, rain, and snow.
 - 3. Meet UL requirements.
 - 4. For use with saddle thresholds.
 - 5. Type One Acceptable Products:
 - a. 750S CLR by Hager.
 - b. 198N A by NGP.
 - c. 321 CN by Pemko.
 - d. Equal as approved by Architect before bidding. See Section 01 6200.
- E. Thresholds:
- 1. Type One Acceptable Products:
 - a. Design Criteria:
 - 1) Meet handicap accessibility requirements (ADA):
 - b. Interior Doors at Acoustic Seals, Approved Products:
 - 1) Carpet threshold (carpet to carpet):
 - a) 505S DBA by Hager.
 - b) 414 DKB by NGP.
 - c) 236 D by Pemko.
 - 2) Carpet threshold (carpet to concrete, wood, synthetic, or resilient flooring):
 - a) 417 DKB by NGP.
 - b) 174 D by Pemko.
 - c. Equals as approved by Architect before bidding. See Section 01 6200.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install smoke gaskets and acoustical seals in manner to give continuous air-tight fit.
- 1. Install smoke gaskets as per Manufacturer's installation requirements:
 - a. Hinge Jamb: Install smoke gaskets on jamb face of door frame so door will compress smoke gasket.
 - b. Header and Strike Jamb: Install smoke gaskets on face of stop of door frame so door will compress smoke gasket.
 - 2. Install acoustical seal with seal under door.

END OF SECTION

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

- A. Includes But Not Limited To:
1. Quality of glazing used in entries, doors, and windows.
- B. Related Requirements:
1. Sections Under 08 1000 Heading: 'Doors And Frames' for furnishing and installing of glazing for hollow metal doors and hollow metal sidelite windows.
 2. Sections Under 08 1000 Heading: 'Doors And Frames' for furnishing and installing of flush wood door lites in new doors.
 3. Section 08 4113: 'Aluminum-Framed Entrances And Storefronts' for furnishing and installing of glazing in aluminum-framed storefront.

1.2 REFERENCES

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

10. Visible Light Transmitted (VLT): Percent of total visible light (380-780 nanometers) that passes through glass. Lower the number, the less visible light transmitted.

B. Reference Standards:

1. American National Standards Institute:
 - a. ANSI Z97.1-2009, 'Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test'.
2. ASTM International:
 - a. ASTM C1036-16, 'Standard Specification for Flat Glass'.
 - b. ASTM C1048-12, 'Standard Specification for Heat-Treated Flat Glass - Kind H, Kind FT Coated and Uncoated Glass'.
 - c. ASTM C1172-14, 'Standard Specification for Laminated Architectural Flat Glass'.
 - d. ASTM C1281-16, 'Standard Specification for Preformed Tape Sealants for Glazing Applications'.
 - e. ASTM E2190-10, 'Standard Specification for Insulating Glass Unit Performance and Evaluation'.
3. Consumer Products Safety Commission (CPSC):
 - a. 16 CFR, Part 1201 CAT 1 and 11, 'Safety Standard for Architectural Glazing Materials'.

1.3 SUBMITTALS

A. Action Submittals:

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

B. Informational Submittals:

1. Qualification Statement:
 - a. Installer:
 - 1) Provide Qualification documentation if requested by Architect or Owner.

C. Closeout Submittals:

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

1.4 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:

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

B. Qualifications:

1. Installer: Requirements of Section 01 4301 applies, but not limited to following:
 - a. Satisfactorily completed at least three (3) installations of similar size, scope, and complexity in each of past two (2) years and be approved by glass product Manufacturer before bidding.
 - b. Upon request, submit documentation.

C. Certifications:

1. Labels showing strength, grade, thickness, type, and quality are required on each piece of glass.
2. Manufacturers/Fabricators certifying products furnished comply with project requirements.
3. Insulating-Glass Certification Program: Indicate compliance with requirements of Insulating Glass Certification Council on applicable glazing products.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
 - 1. Follow Manufacturer's instruction for receiving, handling, and protecting glass & glazing materials to prevent breakage scratching, damage to seals, or other visible damage.
 - 2. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- B. Storage And Handling Requirements:
 - 1. Follow Manufacturer's instruction for storing and protecting glass & glazing materials.
 - 2. Store materials protected from exposure to harmful environmental conditions and at temperatures and humidity conditions recommended by Manufacturer.
 - 3. Protect edge damage to glass, and damage/deterioration to coating on glass.

1.6 FIELD CONDITIONS

- A. Ambient Conditions:
 - 1. Do not proceed with glazing when ambient and substrate temperature conditions are outside the limits permitted by glazing material manufacturer or when joint substrates are wet due to rain, frost, condensation or other causes.

1.7 WARRANTY

- A. Manufacturer Warranty:
 - 1. Insulating Glass Warranty:
 - a. Manufacturer's standard form, signed by insulating-glass product Manufacturer/Fabricator, agreeing to replace insulating-glass units that exhibit failure of hermetic seal under normal use evidenced by obstruction of vision by dust, moisture, or film on interior surfaces of glass, for ten [10] years of date of installation.
 - 2. Installer's Warranty:
 - a. Form acceptable to Owner, signed by glass product Installer, agreeing to replace glass products that deteriorate, or that exhibit damage or deterioration of glass or glazing products due to faulty installation, for two (2) years from date of installation.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Manufacturers:
 - 1. Manufacturer Contact List for Low E Glazing:
 - a. AGC Flat glass North America, Kingsport, TN www.us.agc.com.
 - b. Carlex (subsidiary of Central Glass Co., Ltd., Nashville, TN www.carlex.com.
 - c. Guardian Industries Corp., Auburn Hills, MI www.guardian.com.
 - d. Oldcastle BuildingEnvelope, Santa Monica, CA www.oldcastlebe.com.
 - e. Pilkington North America Inc., Toledo, OH www.pilkington.com.
 - f. PPG Industries, Pittsburgh, PA www.ppgglass.com or PPG Canada Ltd, Glass Division, Toronto, ON (416) 789-3331.
- B. Design Criteria:
 - 1. Glazing for Fire-Rated Door and Window Assemblies: Glazing tested per NFPA 252 and NFPA 257, as applicable, for assemblies complying with NFPA 80 and listed and labeled per requirements of authorities having jurisdiction.
- C. Storefront Glazing:
 - 1. Thickness: 1/4 inch (6 mm).

2. Glazing shall have following characteristics:
 - a. Low-Emissivity (or Low E):
 - 1) Design Criteria:
 - a) Clear.
 - b) Insulated Glass: **1 inch (25 mm)** units with **1/2 inch (13 mm)** airspace and two (2) **1/4 inch (6 mm)** lites.
 - c) Meet requirements of ASTM C1036, Type I, Class I, Quality Q3.
 - d) Location: Surface 2.
 - 2) Type Two Low-Emissivity (or Low E) Acceptable Product:
 - a) Performance Standard:
 - (1) 70 percent Visible Light Transmission (VLT).
 - (2) 0.29 U-value winter.
 - (3) 0.27 U-value summer.
 - (4) 0.38 Solar Heat Gain Coefficient (SHGC).
 - (5) 0.44 Shading Coefficient.
 - (6) 11 percent Visible Light Reflectance.
 - b) Quality Standard:
 - (1) Solarban 60 (2) by PPG.
 - (2) Equal product by Acceptable Manufacturer as approved by Architect before bidding. See Section 01 6200.
 - 3) Acceptable Manufacturers:
 - a) AGC.
 - b) Guardian.
 - c) PPG.
 - d) Equal as approved by Architect before bidding. See Section 01 6200.
 - b. Glazing Below Door Height:
 - 1) Design Criteria:
 - a) Tempered.
 - b) Meet requirements of ASTM C1048, Kind FT, Condition A, Type I, Class I, Quality Q3.
- D. Interior Pass-Through Window Glazing:
1. Thickness: **1/4 inch (6 mm)**.
 2. Glazing shall have following characteristics:
 - a. Design Criteria:
 - 1) Clear:
 - 2) Tempered.
 - 3) Meet requirements of ASTM C1048, Kind FT, Condition A, Type I, Class I, Quality Q3.
- E. Fabrication:
1. Except where glass exceeds **66 inches (1 675 mm)** in width, cut clear glass so any wave will run horizontally when glazed.
 2. Sealed, Insulating Glazing Units:
 - a. Double pane, sealed insulating glass units. Install at exterior windows and exterior aluminum-framed storefront.
 - b. Unit Thickness: **5/8 inch (16 mm)** minimum, **one inch (25 mm)** maximum.
 - c. Type Seal:
 - 1) Metal-to-glass bond and separated by **1/2 inch (12.7 mm)** dehydrated air space.
 - 2) Use non-hardening sealants.
 - d. Category Four Approved Fabricators. See Section 01 6200 for definitions of Categories.
 - 1) Members of Sealed Insulating Glass Manufacturer's Association.

2.2 ACCESSORIES

- A. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- B. Glazing Tape: Butyl-based elastomeric tape with integral resilient tube spacer, 10 to 15 Shore A durometer hardness, black color, coiled on release paper; widths required for specified installation, complying with ASTM C1281 and AAMA 800 for application.

PART 3 - EXECUTION: Not Used

END OF SECTION

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DIVISION 09: FINISHES

09 0500 COMMON WORK RESULTS FOR FINISHES

09 0503 FLOORING SUBSTRATE PREPARATION

09 2000 PLASTER AND GYPSUM BOARD

09 2216 NON-STRUCTURAL METAL FRAMING
09 2226 METAL SUSPENSION SYSTEM: GYPSUM BOARD
09 2900 GYPSUM BOARD

09 3000 TILING

09 3013 CERAMIC TILING

09 5000 CEILINGS

09 5113 ACOUSTICAL PANEL CEILINGS
09 5323 METAL ACOUSTICAL SUSPENSION ASSEMBLIES

09 6000 FLOORING

09 6513 RESILIENT BASE AND ACCESSORIES
09 6816 SHEET CARPET: BACK CUSHION, DIRECT GLUE

09 7000 WALL FINISHES

09 73226 SISAL WALL COVERING

09 9000 PAINTS AND COATINGS

09 9001 COMMON PAINTING AND COATING REQUIREMENTS
09 9123 INTERIOR PAINTED GYPSUM BOARD, PLASTER
09 9124 INTERIOR PAINTED METAL
09 9125 INTERIOR PAINTED WOOD
09 9324 INTERIOR CLEAR-FINISHED HARDWOOD
09 9413 INTERIOR TEXTURED FINISHING

END OF TABLE OF CONTENTS

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

- A. Includes But Not Limited To:
 - 1. Coordination and scheduling of Owner Furnished Testing for Alkalinity and Concrete Moisture Testing of concrete slab as described in Contract Documents.
 - 2. Preparing floor substrate to receive flooring as described in Contract Documents.
- B. Related Requirements:
 - 1. Pre-Installation conferences held jointly with Section 09 0503 as described in Administrative Requirements on Part 1 of this specification section.
 - 2. Section 01 1200: 'Multiple Contract Summary'.
 - 3. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
 - 4. Section 09 6816: 'Sheet Carpeting'.

1.2 REFERENCES

- A. Association Publications:
 - 1. International Concrete Repair Institute: '*ICRI Concrete Slab Moisture Testing Program*' Rosemont, IL www.icri.org.
 - a. ICRI Certification: 'Concrete Slab Moisture Testing Technician, Tier 2, Grade 1'.
- B. Reference Standards:
 - 1. ASTM International:
 - a. ASTM F710-11, 'Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring'.
 - b. ASTM F1869-16a, 'Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride'.
 - c. ASTM F2170-16b, 'Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes'.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference:
 - 1. Participate in MANDATORY pre-installation conference held jointly if possible for all related Division 09 6000 'Flooring' used for Project.
 - 2. Schedule conference after substrate preparation and before installation of all flooring systems included for Project at same time if schedule permits.
 - 3. Conference may be held at project site or another convenient site. Participants may also attend by video or audio conference if approved by Project Manager.
 - 4. In addition to agenda items specified in Section 01 3100, review following:
 - a. Review condition of floor with regards to compliance with concrete installation tolerances and other work necessary to prepare floors for installation of flooring.
 - b. Review Testing Agency testing report of Concrete Moisture of concrete:
 - 1) Installer may verify Concrete Moisture of concrete.
 - 5. Review condition of floor with regard to compliance with concrete installation tolerances and other work necessary to prepare floors for installation of flooring.
 - 6. Review additional agenda items all related flooring sections.
- B. Scheduling:

1. Concrete Moisture Testing:
 - a. General Contractor Responsibility to provide:
 - 1) Maintain ambient temperatures and relative humidity conditions as specified in Field Conditions in Part 1 of this specification before Moisture Testing Agency will test for concrete moisture.
 - 2) Notify Owner to contact Moisture Testing Agency when building is enclosed and temperature and relative humidity meet requirements for testing.
 - 3) Provide access for and cooperate with Moisture Testing Agency.
 - b. Owner's Representative Responsibility to provide:
 - 1) Provide following information to Moisture Testing Agency at time of notification:
 - a) Digital copy of floor plan(s).
 - b) Indicate different flooring material areas and which rooms on floor plan(s) and finish schedule requiring additional tests if required.
 - c) Digital copy of Specification Section 09 0503 (this specification) from Contract Documents for this Project.
 - 2) Notify Moisture Testing Agency with 'Concrete Moisture Testing Request and Proposal' when building is enclosed and temperature and relative humidity meet requirements for testing:
 - a) Moisture Testing dates are established based on installation of carpet. Following schedule has been established for moisture testing:
 - (1) Notification by Owner' Representative to Testing Agency to be at least FORTY-FIVE (45) days minimum before installation of Sheet Carpeting. Proposed moisture testing date will be between TEN (10) and FIFTEEN (15) days of installation of carpet and identified on 'Concrete Moisture Testing Request and Proposal'.
 - (2) Testing Agency has THIRTY (30) days to schedule moisture testing with Owner.
 - (3) Testing Agency has no more than FIVE (5) calendar days to complete Moisture Testing and issue 'Certified Moisture Testing Report'.
 - (4) 'Certified Moisture Testing Report' to be given to Owner's Representative no less than TEN (10) days minimum before installation of Sheet Carpeting.
 - (5) Owner's Representative to give Carpet Manufacture(s) 'Certified Moisture Testing Report'.
 - c. Testing Agency will provide Moisture Testing for following flooring areas:
 - 1) Sheet Carpeting:
 - a) Moisture Testing for Sheet Carpeting required.
 - b) Moisture Testing and Testing Report requirements specified in Informational Submittals.
 - c) See individual flooring section for additional scheduling requirements if required.

1.4 SUBMITTALS

- A. Informational Submittals:
 1. Certificates:
 - a. Concrete Slab Moisture Technician:
 - 1) Provide current IFTI trained documentation and certified Field Technician certification. and/or
 - 2) Provide current ICRI 'Concrete Slab Moisture Testing Technician, Tier 2, Grade 1' Certification.
 - b. Certified Standard Moisture Testing Report:
 - 1) Report to include following:
 - a) Available to Testing Agency from Owner's Representative:
 - (1) Project Name.
 - (2) Property Number.
 - b) Test date.
 - c) Executive summary.
 - d) Certified Moisture and Alkalinity (pH) Test Report.
 - e) Project floor plan.
 - f) Project photographs including following information on each photograph:

- (1) Site location.
 - (2) Test hole number.
 - (3) Serial number probe.
 - (4) Relative Humidity (RH), Alkalinity (pH) and temperature reading.
 - (5) Property number.
 - g) Outlier Test (As specified in Field Quality Control Testing in Part 3 of this specification:
 - (1) Note test as Outlier Test for which hole number was conducted.
 - (2) Site location.
 - (3) Test hole number.
 - (4) Serial number probe.
 - (5) Relative Humidity (RH), Alkalinity (pH) and temperature reading.
 - (6) Property number.
 - 2) At completion of testing, Testing Agency shall submit Concrete Moisture Test Report for each flooring system included for project to following:
 - a) One (1) copy to Owner's Representative.
2. Special Procedure Submittals:
 - a. 'Concrete Moisture Testing Request and Proposal':
 - 1) Provided by Owner's Representative for each project to Testing Agency:
 - a) Testing Agency to fill out form with following information and return as instructed:
 - (1) Review request information.
 - (2) Add information as requested.
 - (3) Sign form.
 - (4) E-mail form back to Owner's Representative.
 - b. Certified Moisture Testing Report Distribution:
 - 1) Owner's Representative responsibilities after receiving Concrete Moisture Test Report:
 - a) Provide copies to following:
 - (1) One (1) copy to Architect.
 - (2) One (1) copy to Contractor.
 - (3) One (1) copy to Owner Furnished Carpet Manufacturer.
 - c. Moisture Testing Report Instructions:
 - 1) Carpet floor area testing for Alkalinity and Concrete Slab Moisture by Testing Agency Testing:
 - a) If 'all' Testing Agency's Special Procedure Submittal for RH concrete slab moisture testing results are less than ninety-one (91) percent:
 - (1) Include Option A as specified in Section 09 6816.
 - b) If 'any' Testing Agency's Special Procedure Submittal for RH concrete slab moisture testing results are ninety-one (91) percent or above, but less than ninety-six (96) percent maximum or less:
 - (1) Include Option B as specified in Section 09 6816.
 - c) If 'any' Testing Agency's Special Procedure Submittal for RH concrete slab moisture testing results are ninety-six (96) percent or more:
 - (1) Include Option C as specified in Section 09 6816.
 - d) Testing pH at surface of concrete slab must be conducted in accordance with ASTM F 710 not to exceed 9 pH.
 - (1) If pH is equal to or less than 9, proceed with installation according to manufacturing installation guidelines and in accordance of Contract Documents.
 - (2) If pH exceeds 9 and manufacture recommended cure exceeds \$500, contact Church Headquarters at carpet@ldschurch.org or call Carpet Contract Manager in Purchasing before proceeding with installation.
 - 2) Resilient Tile Flooring area testing for Alkalinity and Concrete Slab Moisture by Testing Agency Testing:
 - a) If Testing Agency Testing Results are seventy-five (75) percent RH or more:
 - (1) Remediation to be discussed with Owner's Representative and Manufacturer. Contact Church Headquarters at carpet@ldschurch.org or call Purchasing before proceeding with installation.
- 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 Reports of Alkalinity and Concrete Moisture testing.

1.5 QUALITY ASSURANCE

A. Testing and Inspection.

1. Owner will provide Field Testing for Alkalinity and Concrete Moisture of concrete slab before installation as specified in Field Quality Control in Part 3 of this specifications for flooring:
 - a. See Section 01 1200: 'Multiple Contract Summary'.
 - b. See Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
2. Category One VMR Testing Agency. See Section 01 6200 for definitions of Categories:
 - a. IFTI - Independent floor Testing & Inspection, Inc.:
 - 1) Contact Information: James Pouliot:
 - a) 1850 Gateway Blvd. Suite 230 Concord, CA 94520.
 - b) Phone: Office (800) 490-3657 x 207 or Cell (925) 819-1780.
 - c) Fax (877) 814-0338.
 - d) E-mail james.pouliot@ifti.com.

B. Qualifications.

1. Concrete Slab Moisture Technician:
 - a. IFTI trained and certified Field Technician.
and/or
 - b. ICRI 'Concrete Slab Moisture Testing Technician, Tier 2, Grade 1' Certification:
 - 1) Certification includes three (3) hour education session, written exam, and field testing performance exam based on ASTM standards.
 - 2) Certification valid for period of five (5) years from date of testing completion.
 - c. Provide documentation.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Storage And Handling Requirements:

1. Provide storage space and protection for flooring and installation accessories if materials are delivered before start of flooring installation.

1.7 FIELD CONDITIONS

A. Ambient Conditions:

1. Testing conditions inside building shall be brought to same ambient temperature and relative humidity levels to be normal at occupancy of building (service conditions). Service conditions include normal levels of humidity, lighting, heating, and air conditioning:
 - a. If service conditions are not possible, test conditions shall be **75 deg F (23.9 deg C) ± 10 deg F (minus 12.2 deg C)** maintain relative humidity between forty (40) and sixty (60) percent in spaces to receive testing.
2. Maintain these conditions forty-eight (48) hours prior to, and during testing. Otherwise, results may not accurately reflect amount of moisture which is present in concrete slab or would normally be emitted from or through concrete slab during normal operating conditions.

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

A. Flooring Preparation:

1. General:

- a. Prepare floor substrate in accordance with ASTM F710, 'Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring' (This standard is used for preparing concrete floors for all flooring).
 - 1) Required RH test and alkalinity test of concrete slab has been performed.
 - b. Concrete floor slab patching:
 - 1) Cracks, chips and joints must be properly patched or repaired.
 - c. Concrete surface cured, clean, dry, and free of dirt, dust, grease, wax, and other foreign substances that will compromise flooring installations.
 - 1) Removal of curing compounds.
 - 2) Remove paint, sealer, grease, oil, silicone sealants, and other materials incompatible with flooring adhesives.
 - 3) Removal of overspray from painted walls (essential so glue will stick).
 - d. Vacuum and damp mop floor areas to receive flooring before flooring installation.
2. Carpeted floor areas:
 - a. Prepare floor substrate in accordance with Carpet And Rug Institute (CRI) best practices to receive carpet installation and to provide installation that meets Carpet Manufacturer's warranty requirements.

B. Carpet Accessories:

1. Sundry items, such as adhesives, shall be conditioned to building ambient conditions before use.

3.2 FIELD QUALITY CONTROL

A. Field Tests:

1. General:

- a. Owner is responsible for Quality Assurance. Quality assurance performed by Owner will be used to validate Quality Control performed by Contractor.
- b. Quality Control is sole responsibility of Contractor as specified in Section 01 4523 'Testing And Inspection Services'.

2. Concrete Moisture and Alkalinity:

- a. Testing Agency will test interior concrete slabs before installation of floor coverings as directed by Architect and will include following:
 - 1) Interior concrete slab areas to be tested:
 - a) Section 09 6816 'Sheet Carpeting'.
 - 2) Standard Moisture Testing required of interior concrete slabs on grade:
 - a) General:
 - (1) Testing for concrete moisture shall be taken at concrete slab substrates scheduled to receive flooring as specified in Contract Drawings for complete flooring installation.
 - (2) Outlier Test: If one (1) test is abnormally different from other moisture tests, then additional test should be done. Outlier will be defined in this specification as moisture test that is at least fifteen (15) percent higher or lower than other tests at project building completed same day:
 - (a) Retesting should be done within **5 feet (1.50 m)** feet of original test hole.
 - (b) Contact Owner's Representative for the need to outlier test and additional testing fees will apply.
 - (3) Include required tests for carpeting and additional tests at each different type of flooring system included for project.
 - b) Bishop Storehouse:

- (1) Test density is required where floor coverings will be installed. Include testing at each type of flooring system included for project. Following are minimum recommended tests required:
 - (a) Family Services: Three (3) tests minimum in areas to receive carpet flooring.
 - (b) Provide additional testing as directed by Architect if necessary. For existing buildings, adjust tests accordingly.
- b. Approved Concrete Moisture Tests:
 - 1) Concrete Moisture Test (test used with Standard Moisture and Comprehensive Moisture Testing if included for project). See Section 01 6200:
 - a) Relative Humidity (RH) testing using in-situ probes in accordance with ASTM F2170 testing requirements:
 - (1) Check calibration of measuring instrument.
 - (2) Building ambient conditions are met before testing.
 - (3) Drill Hole:
 - (a) Drill and prepare test holes as per ASTM F2170 (correct hole-depth and hole diameter are required).
 - (b) Drill holes equal to forty (40) percent of slab's thickness for concrete slabs on grade and twenty (20) percent of slab's thickness for suspended concrete slabs (hole must be perpendicular (90 deg) to surface).
 - (4) Clean Hole:
 - (a) Follow Manufacturer's installation instructions for cleaning holes and inserting sensor.
 - (5) Insert Sensor:
 - (a) Follow Manufacturer's installation instructions for inserting sensor.
 - (6) Readings:
 - (a) Follow Manufacturer's installation instructions for taking readings.
 - (b) Two (2) hours after installation of sensor, RH reading will be recorded. (Two (2) hour read is in lieu of the seventy-two (72) hour ASTM standard)
 - (7) Future Testing:
 - (a) For future readings, replace protective cap by snapping it back into sensor.
 - (8) Test Report shall be submitted as specified in Informational Submittals in Part 1 of this specification.
 - (a) For future readings, replace protective cap by snapping it back into sensor.
 - b) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (1) Concrete moisture testing meter:
 - (a) Rapid RH 4.0 EX with Touch-n-Sense Technology and Rapid RH EX Smart Sensors by Wagner Meters, Rogue River, OR
www.wagnermeters.com.
 - 2) Alkalinity Testing (pH) Test:
 - a) Testing shall be performed in accordance with ASTM F710.
 - b) Test with pH meter or pH paper.
 - c) Testing shall be taken at every location and at each time concrete moisture test is performed at those locations.
 - d) Clean floor to remove all oil, dirt, dust and any floor coating or sealer.
 - (1) Lightly grind, sand, or bead blasting. Do not remove more than **1/8 inch (3 mm)** of concrete.
 - (2) Removal of more than **1/8 inch (3 mm)** may give high pH reading.
 - (3) Failure to remove laitance will produce low, inaccurate pH reading.
 - e) Place several drops of water on clean surface, forming puddle approximately **1 inch (25 mm)**:
 - (1) Allow puddle to set for sixty (60) ± five (5) seconds, then dip pH paper or meter into water.
 - (2) Remove immediately and record test result.
 - f) Testing to be performed concurrently with concrete moisture testing.

- g) Test Report shall be submitted as specified in Informational Submittals in Part 1 of this specification.

END OF SECTION

ATTACHMENTS

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Concrete Moisture Testing Request and Proposal

Owner's Representative to complete Concrete Moisture Testing Request section below. Send completed form to the Testing Agency. Testing Agency will complete Concrete Moisture Testing Proposal section and submit to Owner's Representative.

Concrete Moisture Testing Request

Project Information

Project Name		Date
Project address		Property number
City		Plan Type (new construction only)
State	Zip Code	Project Type New Construction Existing
Facility type Meetinghouse CES/S&I Temple Residential Family History Higher Education Welfare Facility		
Type of new flooring to be installed (check all that apply): Carpet Wood Resilient Seamless Resinous Synthetic Athletic		
Type of slab Below grade On grade Above grade/suspended		Age of slab? years months

Billing and Owner Contact Information

Submit quote and report to:		Project Manager	Facilities Manager
Project Manager		Phone	E-mail
Facilities Manager		Phone	E-mail
Billing address (Send Report to this address)		Street Address	
City		State	Zip code

Documents Provided to Testing Agency: (Owner Representative to provide the following to the Testing Agency)

- Digital copy of floor plans(s) indicating different flooring material areas.
- Indicate which areas on floor plans(s) and/or finish schedule requiring additional tests (if required).
- Digital copy of Specification Section 09 0503 from Contract Documents for this project.

New and R & I Meetinghouse Construction:

Allow thirty (30) days for testing agency to schedule the testing.
Testing and report to be completed 35-30 days prior to flooring installation

Carpet installation date	Rush service requested	
	Yes	No

New and R & I CES/S&I (stand-alone) and Welfare Facilities :

Allow thirty (30) days for testing agency to schedule the testing.
Testing and report to be completed 15-10 days prior to flooring installation.

Proposed testing date	Number of tests As per Section 09 0503
-----------------------	-------------------------------------------

Reference information:

Testing as per Section 09 0503 for floor preparation and ambient condition requirements to be performed prior to testing by Contractor or Owner.

Concrete Moisture Testing Proposal

Proposal #:

Testing Agency Contact Information

IFTI Independent Floor Testing & Inspection 1850 Gateway Blvd., Suite 230, Concord, CA 94520	Contact: James Pouliot E-mail: james.pouliot@ifti.com	Phone: (800) 490-3657 ext. 207 Fax: (877) 814-0338
-------------------------------------------------------------------------------------------------	----------------------------------------------------------	-------------------------------------------------------

Directions: Use this document to provide a proposal for testing by doing the following:

Review the request Information above. Email proposal to Owner Representative.

Scope of Work	Comments	Cost
Standard Testing		\$
Outlier Test		\$
Comprehensive Moisture Testing		\$
Additional Testing (if requested by Owner or Architect)		\$
Total		\$

Signatures This form must be signed before testing can proceed.

Testing Agency:	Owner Representative:
-----------------	-----------------------

Carpeting Pre-Installation Conference and Carpeting Checklist

Project Information		
Project	Scheduled Date of Carpet Installation	Conference Date
	Project Name:	
	Address:	Property Number
FM Group	FM Office Name:	
FM Address	Address:	
Project Description		
Conference Attendance		
Architect	Name:	
Contractor	Name:	
Project Manager	Name:	
Facility Manager	Name:	
Other	Name:	Title:
Other	Name:	Title:
Other	Name:	Title:
Manufacturer	Name:	
Carpet Installer	Company:	Name:

Carpeting Checklist

Schedule and Coordination

- Review carpet schedule for furnishing and installation carpet
- Review arrangements for building access and utilities
- Review meeting scheduled for inspection and sign-off
- Review coordination between other trades

Existing Projects

- Asbestos removal issues (for removal and installation only)
- Review extent of furniture moving, if required
- Review requirement to check for broken pews, opera chairs, or other furnishings prior to their removal, if required

Examination and Preparation

- Review Section 09 6816 'Sheet Carpeting' for floor preparation requirements
- Review building conditions and note areas of existing damage or other conditions not responsibility of carpet installer
- Review work necessary to prepare floors for installation of flooring
- Review if concrete flatness tolerance requirements meet specifications
- Review if additional leveling or patching may be required
- Review ambient condition requirements as specified in Specification Section 09 6816 'Sheet Carpeting'
- Review conditions not in compliance with installation requirements

Scope of Work

- Review scope of work outlined on Carpet Request Information Sheet submitted to Carpet Manufacturer
- Review Concrete Moisture Report
- Review Carpet color, type, and locations
- Review quantity of rolls and dye lots
- Review if Tile Carpeting is included for installation as specified in Section 09 6813 'Tile Carpeting'
- Review if Base is included as specified in Section 09 6513 'Resilient Base and Accessories'. Note locations used
- Review cleaning and disposal requirements
- Review protection requirements of carpet after installation of carpeting

I hereby certify that the Carpeting Checklist has been discussed at pre-installation conference and all items have been reviewed and addressed. I acknowledge that the Carpeting Checklist does not cover all requirements as specified for Project Specifications. Before installation, resolve any conflicts or concerns regarding changes in original scope of work and unforeseen conditions. Signed Checklist to be given to Owner's Representative and included in Closing Submittals.

Installer Signature: _____ Date: _____

SECTION 09 2216**NON-STRUCTURAL METAL FRAMING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install metal framing and furring systems and blocking as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 05 4010: 'Cold-Formed Load-Bearing Metal Framing'.
 - 2. Section 06 1100: 'Wood Framing' for wood blocking.
 - 3. Section 09 2226: 'Metal Suspension System' for furring on suspended ceilings.

1.2 REFERENCES

- A. Association Publications:
 - 1. Steel Framing Industry Association (SFIA):
 - a. SFIA 'Technical Guide for Cold-Formed Steel Framing Products', www.sfia.net.
 - 2. Steel Stud Manufacturers Association (SSMA):
 - a. 2015 IBC - SSMA 'Product Technical Guide'.
- B. Definitions:
 - 1. Non-Structural Member: Member in steel-framed system that is not part of the gravity load resisting system, lateral force resisting system or building envelope.
- C. Reference Standards:
 - 1. American Iron and Steel Institute (AISI):
 - a. AISI S220-11, 'North American Specification For The Design Of Cold-Formed Steel Framing – Nonstructural Members'.
 - 2. 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 A1003/A1003M-15, 'Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members'.
 - c. ASTM C645-14, 'Standard Specification for Nonstructural Steel Framing Members'.
 - d. ASTM C754-15, 'Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products'.
 - e. ASTM C1513-13, 'Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections'.
 - f. ASTM E119-15, 'Standard Test Methods for Fire Tests of Building Construction and Materials'.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conferences:
 - 1. Schedule pre-installation conference to be held after submittals have been reviewed and returned by Architect, but before beginning metal framing work.
 - 2. In addition to agenda items specified in Section 01 3100, review following:
 - a. Identify location of required blocking.

1.4 SUBMITTALS

- A. Action Submittals:
 - 1. Shop Drawings:
 - a. Show special components and installations not fully dimensioned or detailed in Manufacturer's Product data.
- B. Informational Submittals:
 - 1. Test And Evaluation Reports:
 - a. ATI, ICC or other Approved Testing Agency (active member) Evaluation Report.
 - 2. Manufacturer Instructions:
 - a. Technical product data, installation instructions, and recommendations for each component of system.

1.5 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. ICC approved.

PART 2 - PRODUCTS

2.1 SYSTEMS

- A. Manufacturers:
 - 1. Type One Acceptable Manufacturers:
 - a. CEMCO, City of Industry, CA www.cemcosteel.com.
 - b. ClarkDietrich Building Systems, West Chester, OH www.clarkdietrich.com.
 - c. Any member of Steel Framing Industry Association (SFIA).
 - d. Any member of Steel Stud Manufacturer's Association (SSMA).
 - e. Equal as approved by Architect before bidding. See Section 01 6200.
- B. Materials:
 - 1. Framing:
 - a. General:
 - 1) **20 gauge** minimum, unless noted greater on Drawings, meeting requirements of ASTM C645.
 - 2) Steel Sheet Components: Comply with ASTM C645 requirements for metal unless otherwise indicated.
 - 3) Steel Coating Requirement: Comply with ASTM C645 roll-formed from hot dipped galvanized steel complying with ASTM A1003/A1003M and/or ASTM A653/A653M G40 (Z120) or equivalent corrosion resistant coating. A40 galvanized products are not acceptable.
 - a) Coatings shall demonstrate equivalent corrosion resistance with evaluation report from approved testing agency.
 - b. Steel Studs and Runners: Cold-formed galvanized steel C-studs, as per ASTM C645 for conditions indicated.
 - c. Bridging, blocking, strapping, and other accessories shall be as described in Contract Documents or as required by Manufacturer's system.
 - d. Type One Acceptable Products:
 - 1) 362DS20P by CEMCO.
 - 2) ProSTUD 20 by ClarkDietrich Building Systems.
 - 3) 20 Ga 3-5/8 SS Series by Steeler Inc.
 - 4) Any member of Steel Framing Industry Association (SFIA).
 - 5) Any member of Steel Stud Manufacturer's Association (SSMA).
 - 6) Equal as approved by Architect before bidding. See Section 01 6200.
 - 2. Firestop Tracks:

- a. Top runner manufactured to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
3. Headers and Jambs - Heavy-Duty Stud:
 - a. Shape used to form header beams and jambs, columns or posts, of web depths indicated, unpunched, with stiffened flanges.
- C. Fasteners:
 1. Corrosion resistant coated, self-drilling, self-threading steel drill screws complying with ASTM C1513.

2.2 ACCESSORIES

- A. Sill Sealer: Closed-cell polyethylene foam, **1/4 inch (6 mm)** thick by width of plate.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Interface With Other Work:
 1. Coordinate with other Sections to provide blocking necessary for their work.
 2. Coordinate with other Sections for location of blocking required for installation of equipment and building specialties.
- B. Tolerances:
 1. **1/4 inch (6 mm)** in **20 feet (6 meters)**, non-cumulative in length of wall.
 2. **1/8 inch (3 mm)** in **10 feet (3 meters)** with **1/4 inch (6 mm)** maximum in height of wall.
 3. Distances between parallel walls shall be **1/4 inch (6 mm)** maximum along length and height of wall.
- C. Framing:
 1. Installation Standard: ASTM C754.
 2. Specifications of Stud Wall Manufacturer shall govern this work unless more stringent requirements are required by Contract Documents.
 3. Install specified sill sealer under sill plates of exterior walls and of acoustically insulated interior walls.
 4. Stiffen metal-framed walls with **3/4 inch (19 mm)** **1-1/2 inches (38 mm)** cold formed channels placed horizontally approximately **48 inch (1 200 mm)** on center and securely attach to each stud.
 5. Similarly reinforce door and window openings at headers with reinforcing channel extending **18 inches (450 mm)** minimum each side of opening.
 6. Apply double framing members at openings. Wrap multiple, adjacent framing members with duct tape or otherwise secure to eliminate 'chattering'.
 7. Use grommets at framing penetrations where unsecured items pass through.

END OF SECTION

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

A. Includes But Not Limited To:

1. Furnish and install metal suspension system for supporting gypsum drywall in typical ceiling and soffit areas and to support items penetrating ceiling as described in Contract Documents including:
 - a. Hanger wires, fasteners, main runners/tees, cross runners/tees, and wall molding/track.

B. Related Requirements:

1. Section 09 2900: 'Gypsum Board'.
2. Section 26 5100: 'Interior Lighting' for electrical fixtures installed in ceiling.
3. Division 21: 'Fire Suppression' for sprinklers installed in ceiling.
4. Division 23: 'Mechanical' for related sections for HVAC installed in ceiling.
5. Division 26: 'Electrical' for related electrical work.
6. Division 27: 'Communications' for related sound and video work.

1.2 REFERENCES

A. Association Publications:

1. The Ceilings & Interior Systems Construction Association (CISCA), 405 Illinois Avenue, 2B, St Charles IL. www.cisca.org.
 - a. '*Ceiling Systems Handbook*': Recommendations for direct hung acoustical tile and lay-in panel ceiling installation.
 - b. CISCA 3-4, '*Guidelines for Seismic Restraint for Direct-hung Suspended Ceiling Assemblies (zones 3-4)*' Covers Seismic Design Category D, E, and F.
 - c. '*Production Guide*': Practical reference for ceiling systems and estimating costs.

B. Definitions:

1. Ceiling Suspension System: System of metal members, designed to support a suspended ceiling. May accommodate lighting fixtures or air diffusers.
2. Clips: Designs to suit applications such as fire resistance, wind uplift and impact.
3. Compression Post (Vertical Strut, Seismic Struts): Rigid member used to provide lateral force bracing of suspension system.
4. Cross Runner, Cross Tee: Cross runner is secondary or cross beams of mechanical ceiling suspension system, usually supporting only acoustical tile. Cross tee is inserted into main runner to form different module sizes. In some suspension systems, however, cross runners also provide support for lighting fixtures, air diffusers and other cross runners.
5. Hanger Wires: Wire employed to suspend acoustical ceiling from existing structure. Standard material is **12 gauge (0.105 inch - 2.70 mm)** galvanized, soft annealed steel wire, conforming to ASTM A641/A641M. Heavier gauge wire is available for higher load carrying installations, or situations where hanger wire spacing exceeds **4 feet (1.20 m)** on center. Seismic designs or exterior installations subject to wind uplift may require supplemental bracing or substantial hanger devices such as metal straps, rods or structural angles.
6. Heavy-Duty Systems: Primarily used for installations in which the quantities and weights of ceiling fixtures (lights, air diffusers, etc.) are greater than those for ordinary commercial structure.
7. Main Beam, Main Runner, Main Tee: Primary or main beams of type of ceiling suspension system in which structural members are mechanically locked together. Provide direct support for cross runners and may support lighting fixtures and air diffusers, as well as acoustical tile. Supported by hanger wires attached directly to existing structure; or installed perpendicular to

- carrying channels and supported by specially designed sheet metal or wire clips attached to carrying channels.
- 8. Splay Wires: Wires installed at angle rather than perpendicular to grid.
- 9. Stiffening Brace: Used to prevent uplift of grid caused by wind pressure in exterior applications.

C. Reference Standards:

1. American Society of Civil Engineers/Structural Engineering Institute:
 - a. ASCE/SEI 7-10, 'Minimum Design Loads for Buildings and Other Structures'.
2. ASTM International:
 - a. ASTM A641/A641M-09a(2014), 'Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire'.
 - b. ASTM A653/A653M-15, 'Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process'.
 - c. ASTM A1008/A1008M-16, 'Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable'.
 - d. ASTM C635/C635M-13a, 'Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings'.
 - e. ASTM C636/C636M-13, 'Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels'.
 - f. ASTM C645-14, 'Standard Specification for Nonstructural Steel Framing Members'.
 - g. ASTM C754-17, 'Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products'.
 - h. ASTM C841-03(2013), 'Standard Specification for Installation of Interior Lathing and Furring'.
 - i. ASTM D610-08(2012), 'Standard Practice for Evaluating Degree of Rusting on Painted Steel Surfaces'.
 - j. ASTM E119-16a, 'Standard Test Methods for Fire Tests of Building Construction and Materials'.
 - k. ASTM E580/E580M-11b, 'Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions'.
3. International Building Code (IBC) (2015 or latest approved edition):
 - a. IBC 808.1.1.1, 'Suspended Acoustical Ceiling'.
4. Underwriters Laboratories (UL):
 - a. UL 263: 'Standard for Fire Test of Building Construction and Materials' (14th Edition).
 - b. UL 723, 'Standard for Safety Test for Surface Burning Characteristics of Building Materials' (10th Edition).

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate layout of suspension system with other construction that penetrates ceilings or is supported by them, including drywall furring, light fixtures, HVAC equipment, and fire-suppression systems.
2. All work above ceiling should be completed prior to installing suspended system. There should be no materials resting against or wrapped around suspension system, hanger wires or ties.

1.4 SUBMITTALS

A. Action Submittals:

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

B. Informational Submittals:

1. Certificates:
 - a. Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards.
 - b. Installer's certificates of training.
2. Manufacturer's Instructions:
 - a. Required for all Seismic Design Categories:
 - 1) Manufacturer's details and installation instructions for seismic bracing. If requested, provide copy of code requirements applicable to Project.

1.5 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 1. All system components conform to ASTM standards.
 2. Fire-Resistance Rating: UL approved metal suspension system.
 3. Seismic Standard: Acoustical ceilings shall be designed and installed to withstand effects of earthquake motions according to following requirements:
 - a. CISCA's Guidelines for Systems Requiring Seismic Restraint: Comply with CISCA's '*Guidelines for Seismic Restraint of Direct-Hung Suspended Ceiling Assemblies-Seismic Zones 3 & 4*' (Apply to Seismic Categories C, D, E & F).
 - b. Required for all Seismic Design Categories:
 - 1) Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E580/E580M.
 - 2) Meet seismic bracing requirements of ASCE 7, ASTM C635/C635M and ASTM C636/C636M or equivalent governing standard for project site.
- B. Qualifications. Requirements of Section 01 4301 applies, but not limited to following:
 1. Installer:
 - a. Installer training ('Ceiling Masters' training course or equivalent).
 2. Manufacturer:
 - a. Manufacturer in good standing of CISCA (Ceiling and Interior Systems Construction Association).

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
 1. Materials shall be delivered in original, unopened packages with labels intact.
- B. Storage And Handling Requirements:
 1. Materials shall be delivered in original, unopened packages with labels intact.
 2. Store material in fully enclosed space protected against damage from moisture, direct sunlight, surface contamination, and general damage.

1.7 WARRANTY

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

PART 2 - PRODUCTS

2.1 SYSTEMS

- A. Manufacturers:
 1. Type One Acceptable Systems:

- a. Drywall Grid by Armstrong World Industries, Lancaster, PA www.armstrongceilings.com.
 - b. Drywall Grid System by Chicago Metallic Corporation, Chicago, IL www.chicagometallic.com.
 - c. Drywall Suspension System - Flat Ceilings by USG, Chicago, IL www.usg.com.
 - d. Equal as approved by Architect before bidding. See Section 01 6200.
- B. Components:
1. Main Runners/Tee and Cross Runners/Tee:
 - a. Heavy-duty in accordance with ASTM C635/C635M.
 - b. Cold-formed from ASTM A653/A653M, CS Type B steel and hot dipped galvanized G-40 coating for interior ceilings.
 - c. Double-Web construction.
 2. Wall Track/Molding.
 3. Fasteners:
 - a. Nails are not permitted when subjected to direct tension such as installed vertically into bottom of structural member.
 - b. Metal attachment:
 - 1) Acoustical Eye Lag Screws:
 - a) **1/4 inch (6.4 mm)** screws zinc coated with self-drilling or self-piercing sharp point.
 - c. Wood attachment:
 - 1) Acoustical Eye Lag Screws:
 - a) **3 inch (76 mm) x 1/4 inch (6.4 mm)** screws zinc coated for wood joists with Type 17 self-drilling point.
 - d. Wire Tie to Metal Structural Member attachment:
 - 1) Wire wrapped to structural member with pigtail knot with three (3) tight wraps within **3 inch (76 mm)** length at top connection.
 4. Hanger Wires, Braces, and Ties:
 - a. Zinc-Coated, carbon-steel wire meeting requirements of ASTM A641/A641M, Class 1 zinc coating, soft temper.
 - b. Size:
 - 1) Standard size: **12 gauge (0.105 inch) (2.70 mm)** galvanized, soft annealed steel wire.
 - 2) Select wire diameter so its stress is less than yield when loaded at three (3) times hanger design load (ASTM C635/C635M), Table 1, 'Direct Hung') will be less than yield stress of wire, but provide not less than **12 gauge (0.105 inch) (2.70 mm)**.
 - c. Protect with rust inhibitive paint.
 5. Seismic Joint Clip:
 - a. Required for All Seismic Design Categories.
 - 1) Quality Standard Product:
 - a) SJCG by Armstrong.
 - b) Equal as approved by Architect before bidding. See Section 01 6200.
 6. Compression Posts/Struts:
 - a. Required for all Seismic Design Categories:
 - 1) Meet seismic requirements for Project.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification Of Conditions:
1. Inspect area receiving suspension system to identify conditions which will adversely affect installation.
 - a. Work trades work to be thoroughly dry and complete prior to installation.
 - b. Verify weather tightness of area to receive suspension system prior to installation.
 2. Notify Architect of unsuitable conditions in writing.
 - a. Do not install suspension system until adverse conditions have been remedied.

3.2 INSTALLATION

- A. Interface With Other Work:
1. All work above ceiling should be completed prior to installing suspended ceiling system including related work including: drywall furring work, acoustical tile, light fixtures, mechanical systems, electrical systems, and sprinklers.
- B. General:
1. Install suspension system in accordance with Manufacturer's written instructions, and in compliance with ASTM installation standard, and applicable codes as required by AHJ with modifications listed below except where Manufacturer's instructions are more stringent:
 - a. Main runners/tees hanger wires **48 inches (1 200 mm)** on center maximum.
 - b. Cross runners/tees hanger wires **24 inches (600 mm)** on center maximum.
 - c. Do not kink, twist, or bend hanger wires as a means of leveling assembly.
 2. Hanger Wires:
 - a. Install hanger wire to structure as required with necessary on center spacing to support expected ceiling load requirements, following local practices, codes and regulations. Attach with pigtail knot with three (3) tight wraps within **3 inch (76 mm)** length at each end.
 - b. Provide additional wires at light fixtures, grilles, and access doors where necessary by appropriate method in accordance with industry accepted practice.
 - c. Additional Hanger Wires: Wrapped tightly three (3) full turns within **3 inch (76 mm)** length to structure and component at locations where imposed loads could cause deflection exceeding 1/360 span.
- C. Seismic:
1. Required for All Seismic Design Categories:
 - a. Installation must be in accordance with ASCE 7.
- D. Tolerances:
1. Main Runners/Tees:
 - a. Installed and leveled to meet IBC requirements to within **1/4 inch (6.4 mm)** in **10 foot (3.05 m)** with supporting wire taut to prevent any subsequent downward movement of main runners when ceiling loads are imposed.
 2. Cross Runners/Tees:
 - a. Main runners, or other cross runners, must support cross runners to within **1/32 inch (0.8 mm)** of required center-to-center spacing. This tolerance must be noncumulative beyond **12 feet (3.60 m)**.
 - b. Intersecting runners must be installed to form right angle to supporting members.

3.3 FIELD QUALITY CONTROL

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

END OF SECTION

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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 05 4010: 'Cold-Formed Load-Bearing Metal Framing'.
 2. Section 07 9219: 'Acoustical Joint Sealants' for quality of acoustical sealants.
 3. Section 09 2216: 'Non-Structural Metal Framing'.
 4. Section 09 3013: 'Ceramic Tile' for installation of backerboard joint reinforcing.
 5. Section 09 9413: 'Interior Textured Finishing'.

1.2 REFERENCES

- A. Definitions:
1. Accessories: Metal or plastic beads, trim, or moulding used to protect or conceal corners, edges, or abutments of the gypsum board construction.
 2. Drywall Primer: Paint material specifically formulated to fill the pores and equalize the suction difference between gypsum board surface paper and the compound used on finished joints, angles, fastener heads, and accessories and over skim coatings.
 3. Skim Coat: Either a thin coat of joint compound trowel applied, or a material manufactured especially for this purpose and applied in accordance with manufacturer's recommendations, over the entire surface.
 4. Texturing: Regular or irregular patterns typically produced by applying a mixture of joint compound and water, or proprietary texture materials including latex base texture paint, to a gypsum board surface previously coated with drywall primer.
- B. Reference Standards:
1. ASTM International:
 - a. ASTM C11-16, '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 D4977/D4977M-03(2013), 'Standard Test Method for Granule Adhesion to Mineral Surfaced Roofing by Abrasion'.
 - i. ASTM D5420-16, 'Standard Test Method for Impact Resistance of Flat, Rigid Plastic Specimen by Means of a Striker Impacted by a Falling Weight (Gardner Impact)'.

- j. ASTM E84-16, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
- k. ASTM E90-09(2016), 'Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements'.
- l. ASTM E119-16a, 'Standard Test Method for Fire Tests of Building Construction and Materials'.
- m. ASTM E413-16, 'Classification for Rating Sound Insulation'.
- 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. Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.
 - b. Impact Resistant:
 - 1) Complies with Type X requirements of ASTM C1396/C1396M (Section 5).
 - 2) Meet requirements of ASTM D4977 (Modified) for Surface Abrasion and ASTM D5420 (Gardner Impact Test) for Surface Indentation.
 - 3) Overall thickness: 5/8 inch (15.9 mm).
 - 4) Minimum 20 gauge (0.912 mm) steel framing.
 - 5) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a) Hi-Impact XP Gypsum Board by National Gypsum.
 - b) Fiberock VHI (Very High Impact) Abuse-Resistant by USG.
 - c. Non-Fire-Rated Construction:
 - 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) Board installed in areas accessible to public shall have the following:
 - (1) Meet requirements of ASTM C1396/C1396M (Section 5).
 - (2) Surface paper: Face paper suitable for painting.
 - (3) Long edges: Tapered edge.
2. Glass Mat Gypsum Tile Backer:
 - a. Product meeting requirements of ASTM C1178/C1178M.
 - b. 5/8 inch (15.9 mm).
 - c. Square edges.
 - d. Category Four Approved Manufacturer. See Section 01 6200 for definitions of Categories:
 - 1) DensShield Tile Backer by Georgia Pacific.
 - 2) GlasRoc Tilebacker 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.
 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 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) 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 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'.
- 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.
- B. Related Requirements:
 - 1. Section 09 2900: 'Gypsum Board' for installation of backerboard behind ceramic tile, except for joint reinforcing.
 - 2. Section 22 1319: 'Facility Sanitary Sewer Specialties' for floor drains installed in ceramic tile floors.
- C. Products Installed But not Furnished Under This Section:
 - 1. Interior Ceramic Tile Joint Sealants:
- D. Related Requirements:
 - 1. Section 07 9213: 'Elastomeric Joint Sealants'.

1.2 REFERENCES

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

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

		E = Extended Open Time
R = Reaction Resin (Epoxies)	1 = Normal 2 = Improved	T = Slip-Resistant

- 1) Cementitious Adhesive (C): Mixture of hydraulic binding agents (e.g. portland cement), aggregates, and organic additives (e.g. latex polymers, moisture retention additive, etc...) to be mixed with water or latex admix before mixing.
- 2) Dispersion Adhesive (D): Ready-to-use mixture of organic binding agents in the form of an aqueous polymer dispersion, organic additives and mineral fillers - mastic type products.
- 3) Reaction Resin Adhesive (R): Single or multi-component mixture of synthetic resin, mineral fillers and organic additives in which curing occurs by chemical reaction – epoxy or urethane based products.
- 4) Class 1 (1): Adhesive has passed minimum pass level tests that are mandatory for that adhesive type.
- 5) Class 2 (2): Adhesive has passed same tests as Class 1 and/or other applicable tests, but at higher pass levels.
- 6) Fast-Setting (F): Adhesive with accelerated cure time that must achieve minimum strength requirements of fast setting adhesive. This designation does not apply to reaction resin adhesives (R).
- 7) Slip-Resistance (T): Downward movement of a tile applied to combed adhesive layer on vertical surface must be ≤ 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 F111-15, 'On-Ground or Above-Ground Concrete, Unbonded Mortar Bed, Ceramic Tile'.
 - b. TCNA F113-15, 'On-Ground or Above Ground Concrete, Ceramic Tile (Direct Bond w/Optional Membrane).
 - c. TCNA F115-15, 'On-Ground Concrete, Ceramic Tile, Epoxy or Furan Grout'.
 - d. TCNA F125a-15 'On Ground or Above Ground Concrete' – Crack Isolation Membrane – Ceramic Tile'.
 - e. TCNA W211-15, 'Masonry or Concrete, Bonded Mortar Bed, Ceramic Tile'.
 - f. TCNA W221-15, 'Solid Backing, Mortar Bed, Ceramic Tile'.
 - g. TCNA W244c-15, 'Wood or Metal Studs, Cement Backer Board, Ceramic Tile'.
 - h. 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. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Daltile.
 - b. Tile Sizes:
 - 1) Tile: 12 inches (305 mm) square.
 - 2) Cove Base: 6 inches by 8 inches (150 mm by 200 mm) with bull-nosed top:
 - a) External and internal corner pieces to match with bull-nosed top.
 - c. Category Four Approved Colors:
 - 1) Torreon, TN95 Cloud by Dal-Tile.
 - 2) Dotti Ivory by Interceramic.
2. Ceramic Tile:
 - a. Wall Tile:
 - 1) Walls: 4-1/4 inches by 4-1/4 inches (108 mm by 108 mm).
 - 2) Ceramic Tile Base:
 - a) 4-1/4 inch (108 mm) high, A3401 cove base.
 - b) When base only is installed at painted walls, use one course of cove base and one course of bull-nose wall tile.
 - 3) Category Four Approved Colors:
 - a) 0135 Almond by Daltile.
 - b) Canvas by Interceramic.
 - 4) Category Four Approved Accent Colors:
 - a) 0161 Urban Putty by Daltile.
 - b) IC Brites Tender Tan by Interceramic.

E. Materials:

1. Paver Tile:
 - a. Category Four Approved Products. See Section 01 6200 for definition of Categories:
 - 1) Porcealto Graniti by Daltile.
 - 2) Intertech by Interceramic.
2. Wall Tile:
 - a. Category Four Approved Products. See Section 01 6200 for definition of Categories:
 - 1) Semi-Gloss or Matte by Dal-Tile.
 - 2) IC Brites or Mattes or Bold Tones Series by Interceramic.
3. Mortar Bed:
 - a. Portland Cement: Meet requirements of ASTM C150/C150M, Type 1, designation shall appear on bag.
 - b. Hydrated Lime:
 - 1) Meet Requirements of one of following:
 - a) ASTM C206.
 - b) ASTM C207, Type S (designation shall appear on bag).
 - c. Sand: Clean, washed, well-graded, meeting requirements of ASTM C144 with gradation of 100 percent passing No. 8 sieve with not over five (5) percent passing No. 100 sieve.
 - d. Latex Additive; in lieu of all water:
 - 1) Design Criteria:
 - a) Meet material specification requirements of ANSI A118.4 or ANSI 118.11.
 - b) Meet ANSI installation specification requirements of ANSI A108.5.
 - c) Expansion joints complies with TCA method EJ171.
 - 2) Type Two Acceptable Products:
 - a) ARDEX: Ardex E 90 Mortar Admix.
 - b) CUSTOM: Thin-Set Mortar Admix.
 - c) LATICRETE: 4237 Latex Additive with 211 Powder.
 - d) MAPEI: Planicrete AC.
 - e) MERKRETE: 150 Latex Admixture.
4. Metal Trim:
 - a. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Tile / Carpet Junction: Schluter-RENO-AETK.
 - 2) Over Expansion Joints In Slabs: Schluter DILEX-BWS, color G, PG, or HB as selected by Architect.
5. Joint Sealants:

- a. Interior Ceramic Tile Joints are furnished in Section 07 9213 and installed in Section 09 3013 'Ceramic Tiling' including the following:
 - 1) Ceramic and paver cove base inside corners.
 - 2) Ceramic and paver tile joints.
 - b. Standard color to closely match grout joints as selected by Architect:
6. Backer Board Joint Reinforcing: **2 inch (50 mm)** wide glass fiber mesh tape.
7. Tile Setting Products:
- a. Use only products of same Manufacturer to validate warranty, unless otherwise acceptable to Ceramic Tile Supplier.
 - b. Use only products that meet Mortar Manufacturer's twenty five (25) year system warranty requirements.
 - c. Latex-Portland Cement Mortar For Floors:
 - 1) Design Criteria:
 - a) Meet ANSI material specification requirements of ANSI 118.4, ANSI 118.11, or ANSI A118.15.
 - b) Meet ANSI installation specification requirements of ANSI A108.4 or ISO material specification ISO13007 installation material specification and . C2ES1P2 performance requirements for adhesive.
 - 2) Category Four Approved Products. See Section 01 62 00 for definitions of Categories:
 - a) 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:
 - a) ARDEX: No. 25 Stormy Mist.
 - b) CUSTOM: No. 09 Natural Gray.
 - c) LATICRETE: No. 24 Natural Grey.
 - d) MAPEI: No. 11 Sahara Beige.
 - e) MERKRETE: Pro Epoxy D-162 True Taupe.
 - 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:
 - 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

* Optional

PART 3 - EXECUTION:**3.1 INSTALLERS**

- A. Acceptable Installers. See Section 01 4301:
1. Meet Quality Assurance Applicator 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 Of Mortar:
 1. Do not spread more mortar than can be covered within ten (10) to fifteen (15) minutes:
 - a. If 'skinning' occurs, remove mortar and spread fresh material.
 - b. Spread mortar with notches running in one (1) direction, perpendicular to pressing, pushing and pulling of tile during placement.
 2. Install tile before mortar has started initial cure:
 - a. For thin set mortar application, use notch trowel that will achieve the recommended coverage of mortar after tiles have been installed.
 3. Place tile in fresh mortar, press, push and pull tile slightly to achieve as near 100 percent coverage and contact of tile with setting material and substrate as possible:
 - a. Average contact area shall be not less than eighty (80) percent except on exterior or shower installations where contact area shall be ninety-five (95) percent when not less than three (3) tiles or tile assemblies are removed for inspection. The eighty (80) percent or ninety-five (95) percent coverage shall be sufficiently distributed to give full support of the tile.
 - b. Support corners and edges with mortar leaving no hollow corners or edges.
 4. Install so there is **1/8 inch (3 mm)** of mortar between tile and substrate after proper bedding:
 - a. Periodically remove sheets or individual tiles to assure proper bond coverage consistent with industry specifications.
 - b. If coverage is found to be insufficient, use a larger size notch trowel.
- G. Application Of Grout:
 1. Firmly set tile before applying grout:
 - a. This requires forty-eight (48) hours minimum.

2. Before grouting:
 - a. Remove all paper and glue from face of mounted tile.
 - b. Remove spacers or ropes before applying grouting:
3. Mixing Grout:
 - a. Use clean buckets and mixing tools:
 - 1) Use sufficient pressure and flow grout in progressively to avoid air pockets and voids.
 - b. Machine mixing of grout is preferred to assure uniform blend. To prevent trapping air bubbles into prepared grout, use slow speed mixer.
 - c. Slake for fifteen (15) minutes.
 - d. Water or latex additives used for mixing with dry grout shall be measured accurately.
4. Before grouting entire area, do a test area to assure there will be no permanent staining or discoloration of tile and to verify that excess grout can be easily removed from tile surface:
 - a. If necessary, pre-coat exposed surfaces of tile with a grout release recommended by Grout Manufacturer to facilitate removal of excess grout.
5. Installing Grout:
 - a. Use caution, when grouting glazed ceramic tiles to prevent scratching or damaging surface of tile.
 - b. Dampen dry joints prior to grouting with sand-portland cement grout, standard sanded cement grout, standard unsanded cement grout, polymer modified sanded tile grout, and polymer modified unsanded tile grout. Do not leave puddles of water in joints before grouting.
 - c. Keep an adequate joint depth open for grouting. Force maximum amount of grout into joints.
 - d. Apply grout to produce full, smooth grout joints of uniform width, and free of voids and gaps
 - 1) Fill joints of cushion edge tile to depth of cushion.
 - 2) Fill joints of square edge tile flush with surface.
 - 3) Fill joint between wall tile and bull-nosed paver tile base with floor grout.
 - e. Install floor tile with grout thickness of **3/16 inch (4.76 mm)** maximum.
 - f. Remove excess grout from surface of tile before it loses its plasticity or begins to set.
 - g. Finished grout shall be uniform in color, smooth, and without voids, pin holes, or low spots.
- H. Curing:
 1. Keep installation at **65 to 85 deg F (18 to 30 deg C)** during first eight (8) hours of cure. Shade area completely from sun during this period.
- I. Application of Joint Sealants:
 1. Apply joint sealants after grout has cured:
 - a. This requires forty-eight (48) hours minimum.
 2. Before applying sealant:
 - a. Remove spacers or ropes before applying joint sealants.
 - b. Apply backer rod and joint sealants at expansion joints.

3.5 FIELD QUALITY CONTROL

- A. Non-Conforming Work:
 1. Correct any work found cracked, chipped, broken, unbounded and otherwise defective or not complying with contract document requirements at no additional cost to the Owner.

3.6 CLEANING

- A. If one has been used, remove grout release and clean tile surfaces so they are free of grout residue and foreign matter:
 1. If a grout haze or residue remains, use a suitable grout haze remover or cleaner.
 2. Flush surface with clean water before and after cleaning.

3.7 PROTECTION

- A. Close to traffic areas where tile is being set and other tile work being done:
 - 1. Keep closed until tile is firmly set.
 - 2. Before, during, and after grouting, keep area clean, dry, and free from foreign materials and airflow that will interfere with setting and curing of grout.
- B. Newly tiled floors shall not be walked on nor worked on without using kneeling boards or equivalent protection of tiled surface.
- C. After cleaning, provide protective covering and maintain conditions protecting tile work from damage and deterioration:
 - 1. Where tiled surfaces will be subject to equipment or wheel traffic or heavy construction traffic, cover protective covering with **1/4 inch (6 mm)** hardboard, plywood, or similar material.

END OF SECTION

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SECTION 09 5113**ACOUSTICAL PANEL CEILINGS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install acoustical ceiling panels for suspended acoustical ceilings as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 09 5323: 'Metal Acoustical Suspension Assemblies'.
 - 2. Section 26 5100: 'Interior Lighting' for light fixtures.
 - 3. Division 23: Related sections for HVAC installed in ceiling.

1.2 REFERENCES

- A. Association Publications:
 - 1. The Ceilings & Interior Systems Construction Association (CISCA), *Ceiling Systems Handbook*. 405 Illinois Avenue, 2B, St Charles IL. www.cisca.org.
 - a. Recommendations for direct hung acoustical tile and lay-in panel ceilings.
- B. Definitions:
 - 1. Acoustical Panel: Form of a prefabricated sound absorbing ceiling element used with exposed suspension systems.
 - 2. Absorption: Materials that have capacity to absorb sound. Absorption is the opposite of reflection.
 - 3. Ceiling Attenuation Class (CAC): Rates ceiling's efficiency as barrier to airborne sound transmission between adjacent closed offices. Shown as minimum value, previously expressed as CSTC (Ceiling Sound Transmission Class). Single-figure rating derived from normalized ceiling attenuation values in accordance with classification ASTM E413, except that resultant rating shall be designated ceiling attenuation class. (Defined in ASTM E1414.) Acoustical unit with high CAC may have low NRC.
 - 4. Center Line: Line indicating midpoint of surface in either direction. Used as guide in starting ceiling.
 - 5. Class A: Fire classification for product with flame spread rating of no more than 25 and smoke developed rating not exceeding 50, when tested in accordance with ASTM E84 or UL 723.
 - 6. Flame Spread: The propagation of flame over a surface.
 - 7. Flame Spread Index: Comparative measure, expressed as a dimensionless number, derived from visual measurements of the spread of flame versus time for a material tested in accordance with ASTM E84 or UL 723.
 - 8. Interior Finish: Interior finish includes interior wall and ceiling finish and interior floor finish.
 - 9. Mineral Base: Ceilings composed principally of mineral materials such as fibers manufactured from rock or slab, with or without binders.
 - 10. Noise Reduction Coefficient (NRC): Average sound absorption coefficient measured at four frequencies: 250, 500, 1,000 and 2,000 Hertz expressed to the nearest integral multiple of 0.05. Rates ability of ceiling or wall panel or other construction to absorb sound. NRC is fraction of sound energy, averaged over all angles of direction and from low to high sound frequencies that is absorbed and not reflected.
 - 11. Reflection Factor: Percentage of light a surface reflects.
 - 12. Reveal Edge: Acoustical lay-in panels with step-down edge are intended for use in direct hung exposed suspension systems.
 - 13. Smoke-Developed Index: The numerical value assigned to a material tested in accordance with ASTM E84 or UL 723.

14. Sound Absorption: Property possessed by materials and objects, including air, of converting sound energy into heat energy. Sound wave reflected by surface always loses part of its energy. Fraction of energy that is not reflected is called sound absorption coefficient of reflecting surface. For instance, if material reflects 80 percent of sound energy, then sound absorption coefficient would be 20 percent (0.20).
15. Surface Burning Characteristic: Rating of interior and surface finish material providing indexes for flame spread and smoke developed, based on testing conducted according to ASTM Standard E84 or UL 723.
16. Textured Pattern: Granular or raised (fine, coarse, or a blend), felted or matted surface as an integral part of the basic product or superimposed on the product surface.

C. Reference Standards:

1. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRA):
 - a. ASHRAE Standard 62.1-2013, 'Ventilation for Acceptable Indoor Air Quality'.
2. ASTM International:
 - a. ASTM C423-17, 'Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method'.
 - b. ASTM D3273-16, 'Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber'.
 - c. ASTM E84-16, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
 - d. ASTM E119-16a, 'Standard Test Methods for Fire Tests of Building Construction and Materials'.
 - e. ASTM E1111/E1111M-14, 'Standard Test Method for Measuring the Interzone Attenuation of Open Office Components'.
 - f. ASTM E1264-14, 'Standard Classification for Acoustical Ceiling Products'.
 - g. ASTM E1414/E1414M-16, 'Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum'.
 - h. ASTM E1477 - 98a(2013), 'Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers'.
3. International Building Code (IBC) (2015 or latest approved Edition):
 - a. Chapter 8, 'Interior Finishes':
 - 1) Section 803, 'Wall And Ceiling Finishes':
 - a) 803.1.1, 'Interior Wall and Ceiling Finish Materials'.
 - b) 803.1.2, 'Room Corner Test for Interior Wall or Ceiling Finish Materials'.
4. National Fire Protection Association:
 - a. NFPA 101: 'Life Safety Code' (2015 edition).
 - b. NFPA 265: 'Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Textile Coverings on Full Height Panels and Walls', (2015 edition).
5. Underwriters Laboratories Inc.:
 - a. UL 723, 'Standard for Safety Test for Surface Burning Characteristics of Building Materials; Tenth Edition September 10 2008'. (Revision: September 13, 2010).

1.3 SUBMITTALS

A. Action Submittals:

1. Produce Data: Technical data for each type of acoustical ceiling unit required.
2. Sample: Minimum **6 inch (150 mm) x 6 inch (150 mm)** samples of specified acoustical panel.

B. Informational Submittals:

1. Certificates:
 - a. Manufacturer's certifications that products comply with specified requirements including laboratory reports showing compliance with specified tests and standards. For acoustical performance, each carton of material must carry approved independent laboratory classification of NRC, CAC, and AC.
2. Test And Evaluation Reports:
 - a. If requested by Owner, provide copies of Quality Assurance requirements for 'Class A' flame spread rating and 'Room-Corner Test'.

- C. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Warranty Documentation:
 - 1) Final, executed copy of Warranty.
 - b. Record Documentation:
 - 1) Manufacturers Documentation:
 - a) Manufacturer's literature.
 - b) Color and pattern selection.
- D. Maintenance Material Submittals:
 - 1. Extra Stock Materials:
 - a. Provide Owner with one (1) carton of each type of tile for future use.
 - 1) Packaged with protective covering for storage and identified with appropriate labels.

1.4 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Fire-Test-Response Characteristics: As determined by testing identical ceiling tile applied with identical adhesives to substrates according to test method indicated below by qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Surface-Burning Characteristics:
 - 1) Ceiling tile shall have Class A flame spread rating in accordance with ASTM E84 or UL 723 Type 1.
 - a) Class A (Flame spread index 0-25; Smoke-developed index 0-450).
 - b) Flash point: None.
 - 2. Passage of 'Room-Corner Test' as recognized by AHJ, is required for system. Adhesive cited in test literature is required for installation of ceiling tile on Project.
 - a. Room Corner Tests:
 - 1) ASTM E84, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
 - 2) IBC 803.2.1, 'Room Corner Test for Interior Wall or Ceiling Finish Materials'.
 - 3) NFPA 265: 'Room Corner Test for Interior Wall or Ceiling Finish Materials'.
 - 4) UL 723, 'Standard for Safety Test for Surface Burning Characteristics of Building Materials'.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Acceptance Requirements:
 - 1. Materials shall be delivered in original, unopened packages with labels intact.
- B. Storage And Handling Requirements:
 - 1. Store materials where protected from moisture, direct sunlight, surface contamination, and damage.
 - 2. Store in cool, dry location, out of direct sunlight and weather, and at temperatures between **32 deg F (0 deg C)** and **86 deg F (30 deg C)**.
 - 3. Handle acoustical ceiling panels carefully to avoid chipping edges or damage. Use no soiled, scratched, or broken material in the Work.

1.6 FIELD CONDITIONS

- A. Ambient Conditions:
 - 1. Building shall be enclosed, mechanical system operating with proper filters in place, and temperature and humidity conditions stabilized within limits under which Project will operate before, during, and after installation until Substantial Completion.
 - 2. Installation shall be at temperatures between **32 deg F (0 deg C)** and **86 deg F (30 deg C)** or as per Manufacturer recommendations.

1.7 WARRANTY

- A. Manufacturer's Warranty:
 - 1. Acoustical ceiling panels:
 - a. Manufacturer's warranty to be free from defects in materials and factory workmanship.
 - b. Manufacturer's warranty against sagging and warping.
 - c. Manufacturer's warranty against mold/mildew, and bacterial growth.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers Contact List:
 - 1. Armstrong World Industries, Lancaster, PA www.ceiling.com.
 - a. Contact Information:
 - 1) For pricing and ordering of tile, contact Sherry Brunt / Phyllis Miller at (800) 442-4212, FAX 800-233-5598, or bpo_strategic_accounts@armstrong.com.
 - 2) For Strategic Account information, contact Randy Lay at (303) 775-1409 ralay@armstrong.com.
 - 2. USG Interiors Inc, Chicago, IL www.usg.com.

2.2 MATERIALS

- A. Acoustic Ceiling Panels:
 - 1. Description:
 - a. Color: White (surface factory-applied).
 - b. Composition: Wet-formed mineral fiber.
 - 2. Design Criteria:
 - a. Acoustics:
 - 1) Noise Reduction Coefficient (NRC): ASTM C423; 0.70 minimum.
 - 2) Ceiling Attenuation Class (CAC): ASTM E1414/E1414M; 35 minimum.
 - b. Antimicrobial Protection: Resistance against growth of mold/mildew.
 - c. Classification:
 - 1) Meet requirements of ASTM E1264, Type III (mineral base with painted finish), Form 1 (nodular) or Form 4 (cast or molded), Pattern E1 (lightly textured).
 - d. Fire Performance: As specified in Quality Assurance in Part 1 of this specification.
 - e. Light Reflectance (LR): ASTM E1477; 0.83 minimum.
 - f. Sag Resistance: Resistance to sagging in high humidity conditions.
 - g. VOC: Low.
 - 3. Wide Face Design:
 - a. Design Criteria:
 - 1) Grid Face: **15/16 inch (24 mm)**.
 - 2) Size: 24 inch x 24 inch x 3/4" (**610 mm x 610 mm x 19 mm**).
 - 3) Edge profile: Angled Tegular:
 - b. Type One Acceptable Product:
 - 1) Quality Standard:
 - a) Cirrus, Item number 584 by Armstrong.
 - 2) Equal as approved by Architect before bidding. See Section 01 6200.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification Of Conditions:

1. Inspect for defects in support that are not acceptable.
 - a. All wet work (concrete, painting, and etc.) must be completed and dry.
 - b. Temperature conditions within Manufacturer's written recommendation.
2. Notify Architect of unsuitable conditions in writing.
 - a. Do not install acoustical ceiling panels until defects in support or environmental conditions are corrected.

3.2 PREPARATION

- A. Materials shall be dry and clean at time of application.
- B. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at borders, and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.

3.3 INSTALLATION

- A. Install acoustical panels in coordination with suspended system, with edges resting on flanges of main runner and cross tees. Cut and fit panels neatly against abutting surfaces. Support edges by wall moldings.
- B. Special Techniques:
 1. If recommended by Manufacturer, use tile one at a time from at least four (4) open boxes to avoid creating any pattern due to slight variations from box to box. Use tile from same color run in individual rooms to assure color match.
 2. Leave tile in true plane with straight, even joints.

3.4 FIELD QUALITY CONTROL

- A. Non-Conforming Work:
 1. Remove and replace defective materials at no additional cost to Owner including, but not limited to following:
 - a. Remove and replace damaged or broken acoustical ceiling panels.
 - b. Remove and replace discolored acoustical ceiling panels to match adjacent.
 - c. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

3.5 CLEANING

- A. Clean exposed surfaces of acoustical ceiling panels, including trim, edge moldings, and suspension members.
 1. Comply with Manufacturer's written instructions for cleaning and touch up of minor finish damage.
- B. Waste Management:
 1. Remove from site all debris connected with work of this Section.

END OF SECTION

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SECTION 09 5323**METAL ACOUSTICAL SUSPENSION ASSEMBLIES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
1. Furnish and install metal acoustical suspension system as described in Contract Documents including:
 - a. Suspension system framing.
 - b. Wire hangers, fasteners, main runners, cross tees, and wall angle moldings.
 2. Modifications to existing system as described in Contract Documents.
- B. Related Requirements:
1. Section 09 5113: 'Acoustical Panel Ceiling'.
 2. Section 26 5100: 'Interior Lighting' for electrical fixtures installed in ceiling.
 3. Division 21: 'Fire Suppression' for sprinklers installed in ceiling.
 4. Division 23: 'Mechanical' for related sections for HVAC installed in ceiling.
 5. Division 26: 'Electrical' for related electrical work.
 6. Division 27: 'Communications' for related sound and video work.

1.2 REFERENCES

- A. Association Publications:
1. The Ceilings & Interior Systems Construction Association (CISCA), 405 Illinois Avenue, 2B, St Charles IL. www.cisca.org.
 - a. '*Ceiling Systems Handbook*': Recommendations for direct hung acoustical tile and lay-in panel ceiling installation.
 - b. CISCA 0-2, '*Guidelines for Seismic Restraint for Direct-hung Suspended Ceiling Assemblies (zones 0-2)*' Covers Seismic Design Category C.
 - c. CISCA 3-4, '*Guidelines for Seismic Restraint for Direct-hung Suspended Ceiling Assemblies (zones 3-4)*' Covers Seismic Design Category D, E, and F.
 - d. '*Production Guide*': Practical reference for ceiling systems and estimating costs.
- B. Definitions:
1. Ceiling Suspension System: System of metal members, designed to support a suspended ceiling, typically acoustical ceiling. Also may be designed to accommodate lighting fixtures or air diffusers.
 2. Clips: Several clip designs are available to suit applications such as fire resistance, wind uplift and impact. Fire-resistance rated designs have exact requirements, including mandatory use of hold down clips for acoustical panels or tiles weighing less than **1 lb per sq ft (4.9 kg per sq m)**. For rooms with significant air pressure differential from adjacent spaces, retention clips may be necessary to retain panels in place. Maintaining air pressure values may also require perimeter panel seals, typically closed cell foam gasket with adhesive on one side.
 3. Compression Post (Vertical Strut, Seismic Struts): Rigid member used to provide lateral force bracing of suspension system.
 4. Cross Runner, Cross Tee: Cross runner is secondary or cross beams of mechanical ceiling suspension system, usually supporting only acoustical tile. Cross tee is inserted into main runner to form different module sizes. In some suspension systems, however, cross runners also provide support for lighting fixtures, air diffusers and other cross runners.
 5. Exposed Grid System: Structural suspension system for lay-in ceiling panels. Factory-painted supporting members are exposed to view. Exposed tee surfaces may be continuous or have integral reveal. Reveals are typically formed as channel or rail profiles extending down from tee leg.

6. Flange: Horizontal surface on face of tee, visible from below ceiling. Part of grid to which color cap is applied. Most grid system flanges are either **15/16 inch (24 mm)** or **9/16 inch (14 mm)**.
7. Hanger Wires: Wire employed to suspend acoustical ceiling from existing structure. Standard material is **12 gauge (0.105 inch - 2.70 mm)** galvanized, soft annealed steel wire, conforming to ASTM A641/A641M. Heavier gauge wire is available for higher load carrying installations, or situations where hanger wire spacing exceeds **4 feet (1.20 m)** on center. Seismic designs or exterior installations subject to wind uplift may require supplemental bracing or substantial hanger devices such as metal straps, rods or structural angles.
8. Heavy-Duty Systems: Primarily used for installations in which the quantities and weights of ceiling fixtures (lights, air diffusers, etc.) are greater than those for ordinary commercial structure.
9. Hold Down Clip: Mechanical fastener that snaps over bulb of grid system to hold ceiling panels in place.
10. Main Beam, Main Runner, Main Tee: Primary or main beams of type of ceiling suspension system in which structural members are mechanically locked together. Provide direct support for cross runners and may support lighting fixtures and air diffusers, as well as acoustical tile. Supported by hanger wires attached directly to existing structure; or installed perpendicular to carrying channels and supported by specially designed sheet metal or wire clips attached to carrying channels.
11. Splay Wires: Wires installed at angle rather than perpendicular to grid.
12. Stiffening Brace: Used to prevent uplift of grid caused by wind pressure in exterior applications.
13. Suspension System: Metal grid suspended from hanger rods or wires, consisting of main beams and cross tees, clips, splines and other hardware which supports lay-in acoustical panels or tiles. Completed ceiling forms barrier to sound, heat and fire. It also absorbs in-room sound and hides ductwork and wiring in plenum.
14. T-Bar: Any metal member of "T" cross section used in ceiling suspension systems.

C. Reference Standards:

1. American Society of Civil Engineers/Structural Engineering Institute:
 - a. ASCE/SEI 7-10, 'Minimum Design Loads for Buildings and Other Structures' (Section 9, 'Earthquake Loads).
2. ASTM International:
 - a. ASTM A568/A568M-15, 'Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for'.
 - b. ASTM C635/C635M-13a, 'Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings'.
 - c. ASTM C636/C636M-13, 'Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels'.
 - d. ASTM A641/A641M-09a(2014), 'Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire'.
 - e. ASTM A653/A653M-15, 'Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process'.
 - f. ASTM A1008/A1008M-15, 'Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable'.
 - g. ASTM B117-11, 'Standard Practice for Operating Salt Spray (Fog) Apparatus'.
 - h. ASTM C635/C635M-13a, 'Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings'.
 - i. ASTM C636/C636M-13, 'Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels'.
 - j. ASTM D610-08(2012), 'Standard Practice for Evaluating Degree of Rusting on Painted Steel Surfaces'.
 - k. ASTM E580/E580M-14, 'Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions'.
3. International Building Code (IBC) (2015 edition):
 - a. IBC 808.1.1.1, 'Suspended Acoustical Ceilings'.
4. International Code Council (ICC):
 - a. ICC/ESR-1222 (Reissued December 2013), 'USG Interiors, Inc'.
 - b. ICC/ESR-1308 (Reissued December 2014), 'Armstrong World Industries'.
5. Underwriters Laboratories / American National Standards Institute:
 - a. UL 263: 'Standard for Fire Test of Building Construction and Materials' (14th Edition).

- b. UL 723, 'Standard for Safety Test for Surface Burning Characteristics of Building Materials' (10th Edition).

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 1. Coordinate layout of suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, and fire-suppression systems.
 2. All work above ceiling should be completed prior to installing suspended system. There should be no materials resting against or wrapped around suspension system, hanger wires or ties.

1.4 SUBMITTALS

- A. Action Submittals:
 1. Product Data:
 - a. Provide Manufacturer's technical literature on suspension system including listing dimensions, load carrying capacity and standard compliance.
 2. Samples:
 - a. Minimum **8 inch (200 mm)** long samples of exposed wall molding and suspension system, including main runner/tee and cross runner/tee with couplings.
- B. Informational Submittals:
 1. Certificates:
 - a. Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards.
 - b. Installer's certificates of training.
 2. Manufacturer's Instructions:
 - a. Manufacturer's details and installation instructions for seismic bracing. If requested, provide copy of code requirements applicable to Project.

1.5 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 1. All system components conform to ASTM standards.
 2. Fire-Resistance Rating: UL approved metal suspension system.
 3. Meet seismic bracing requirements of ASCE 7, ASTM C635/C635M and ASTM C636/C636M or equivalent governing standard for project site.
 4. Seismic Standard: Acoustical ceilings shall be designed and installed to withstand the effects of earthquake motions according to the following:
 - a. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E580/E580M.
 - b. Cisca's Recommendations for Acoustical Ceilings: Comply with Cisca's '*Recommendations for Direct-Hung Acoustical Tile and Lay-in Panel Ceilings-Seismic Zones 0-2'* (Apply to Seismic Categories A & B).
 - c. Cisca's Guidelines for Systems Requiring Seismic Restraint: Comply with Cisca's '*Guidelines for Seismic Restraint of Direct-Hung Suspended Ceiling Assemblies-Seismic Zones 3 & 4'* (Apply to Seismic Categories C, D, E & F).
- B. Qualifications. Requirements of Section 01 4301 applies, but not limited to following:
 1. Installer:
 - a. Installer training (Ceiling Masters training course or equivalent).
 2. Manufacturer:
 - a. Manufacturer in good standing of Cisca (Ceiling and Interior Systems Construction Association).

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
 - 1. Materials shall be delivered in original, unopened packages with labels intact.
- B. Storage And Handling Requirements:
 - 1. Materials shall be delivered in original, unopened packages with labels intact.
 - 2. Store material in fully enclosed space protected against damage from moisture, direct sunlight, surface contamination, and general damage.

1.7 WARRANTY

- A. Manufacturer Warranty:
 - 1. Suspension system: Manufacturer warranty including repair or replacement of rusting as defined by ASTM D610 and defects in material or factory workmanship.

PART 2 - PRODUCTS

2.1 SYSTEM

- A. Manufacturers:
 - 1. Category Four Acceptable Manufacturers. See Section 01 6200 for definition of Categories:
 - a. Grid Face: **9/16 inch (14 mm)**.
 - 1) Armstrong World Industries, Lancaster, PA www.ceilings.com.
 - 2) USG Interiors Inc, Chicago, IL www.usg.com.
- B. Materials:
 - 1. Grid:
 - a. Systems shall meet requirements of ASTM C635/C635M, Heavy Duty suspension system required for Seismic Design Categories D, E, or F.
 - b. Exposed surfaces shall be finished with factory-applied white baked enamel.
 - c. Meet requirements of ASTM D610 for red rust.
 - d. Main runners and cross tees:
 - 1) All main beams and cross tees shall be commercial quality hot-dipped galvanized (galvanized steel, aluminum, or stainless steel) as per ASTM A653/A653M. Main beams and cross tees are double-web steel construction with type exposed flange design.
 - 2) Narrow-face design - main runners and cross tees shall have **9/16 inch (14 mm)** exposed face in a narrow revealed edge.
 - 2. Performance Standards:
 - a. DXL Systems by USG Interiors required for Seismic Design Categories D, E, or F.
 - 3. Wire Hangers, Braces, and Ties:
 - a. Zinc-Coated, carbon-steel wire meeting requirements of ASTM A641/A641M, Class 1 zinc coating, soft temper.
 - b. Size:
 - 1) Standard size: **12 gauge (0.105 inch) (2.70 mm)** galvanized, soft annealed steel wire.
 - 2) Select wire diameter so its stress is less than yield when loaded at three (3) times hanger design load (ASTM C635/C635M), Table 1, 'Direct Hung') will be less than yield stress of wire, but provide not less than **12 gauge (0.105 inch) (2.70 mm)**.
 - c. Protect with rust inhibitive paint.
 - 4. Wall Molding: Channel section of cold-rolled electro-galvanized steel.
 - 5. Edge Moldings and Trim: Metal or extruded aluminum of types and profiles indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations, including light fixtures, that fit type of edge detail and suspension system indicated. Provide moldings with exposed flange of same width as exposed runner.
 - 6. Hold-down Clips: As required by UL to prevent lifting of panels under unusual draft conditions.

7. Seismic Joint Clip:
 - a. Required for Seismic Design Categories D, E, or F.
 - b. Quality Standard Product:
 - 1) SJCG by Armstrong World Industries, Lancaster, PA www.armstrong.com.
 - 2) Equal as approved by Architect before bidding. See Section 01 6200.
8. Seismic Suspension System:
 - a. Required for Seismic Design Categories A, B, C, D, E, or F:
 - b. Design Criteria:
 - 1) Installation of ceiling system must be as prescribed by ICC-ES Evaluation Reports ESR-1222 or ESR-1308 and applicable code.
 - 2) Meet requirements of ASTM A568/A568M for hot-dipped galvanized, cold-rolled steel.
 - 3) Attach cross runners to wall with seismic clips.
 - c. Wall Molding Size: **7/8 inch (22 mm)** for all seismic design categories (code approved).
 - d. Category Four Acceptable Products. See Section 01 6200 for definition of Categories.
 - 1) ACM7 Clip by USG Inc, Chicago, IL www.usg.com.
 - 2) BERC-2 Clip by Armstrong World Industries, Lancaster, PA www.ceiling.com.
9. Compression Posts/Struts:
 - a. Required for Seismic Design Categories D, E, or F.
 - b. Meet seismic requirements for Project.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification Of Conditions:
 1. Inspect area receiving suspension system to identify conditions which will adversely affect installation.
 - a. Work trades work to be thoroughly dry and complete prior to installation.
 - b. Verify weather tightness of area to receive suspension system prior to installation.
 2. Notify Architect of unsuitable conditions in writing.
 - a. Do not install ceiling panels until adverse conditions have been remedied.

3.2 INSTALLATION

- A. Interface With Other Work:
 1. All work above ceiling should be completed prior to installing suspended ceiling system including related work including: drywall furring work, acoustical tile, light fixtures, mechanical systems, electrical systems, and sprinklers.
- B. General:
 1. Install suspension system and panels in accordance with Manufacturer's written instructions, and in compliance with ASTM C636/C636M, and with authorities having jurisdiction (AHJ).
- C. Lay out suspension system symmetrically about center lines of room unless shown otherwise by Contract Drawings. Lay out system so use of tiles less than 1/2 size is minimized.
- D. Suspend main runner/tee from overhead construction with hanger wires spaced **4 feet (1.20 m)** on center along length of main runner/tee. Install hanger wires plumb and straight. Hanger wires shall not be installed in convenience holes.
- E. Maintain suspension system in true plane with straight, even joints.
- F. Suspension system joints shall be straight and in alignment, and exposed surface flush and level. Wherever system abuts walls, columns, and other vertical surfaces, furnish and install appropriate molding.

- G. Install wall moldings at intersection of suspended ceiling and vertical surfaces. Miter corners where wall moldings intersect or install corner caps.
- H. Support edges with wall moldings.
- I. Locate light fixtures, speakers, and mechanical diffusers and grilles symmetrically in room insofar as possible (unless shown otherwise). Locate fixtures, speakers, diffusers, and grilles within suspension grid spaces and centered at least one (1) direction within grid. Installed fixtures shall not compromise ceiling performance.
- J. Pay particular attention to required hanger wire placement and fixture protection. Individual component deflection not to exceed 1/360 of span.
- K. Nails installed vertically into bottom of structural members, which are subject to pullout, shall not be used to support metal acoustical suspended assemblies:
 - 1. Nails may be used when installed horizontally into sides of structural members.
 - 2. Embedment must be at least **5/8 inch (15.9 mm)**.
- L. Screws, eyebolts or lag bolts used to support metal acoustical suspended assemblies must have minimum embedment of **5/8 inch (15.9 mm)** when installed into structural members.

3.3 FIELD QUALITY CONTROL

- A. Field Inspections:
 - 1. Inspect:
 - a. Suspended ceiling system.
 - b. Hangers, anchors and fasteners.
- B. Non-Conforming Work:
 - 1. Correct any work found defective or not complying with contract document requirements at no additional cost to Owner.

END OF SECTION

SECTION 09 6513**RESILIENT BASE AND ACCESSORIES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But not Installed Under this Section:
 - 1. Resilient base as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 09 6519: 'Resilient Tile Flooring' for installation of resilient base and accessories.

1.2 REFERENCES

- A. Definitions:
 - 1. Flame Spread: Propagation of flame over a surface.
 - 2. Flame Spread Index: The numerical value assigned to a material tested in accordance with ASTM E84 or UL 723.
 - 3. Resilient Wall Base Classification:
 - a. Type:
 - 1) TS: Rubber, vulcanized thermoset.
 - 2) TP: Rubber, thermoplastic.
 - 3) TV: Vinyl, thermoplastic.
 - b. Group:
 - 1) Group 1: Solid (homogeneous).
 - 2) Group 2: Layered (multiple layers).
 - c. Styles:
 - 1) Style A: Straight.
 - 2) Style B: Cove.
 - 3) Style C: Butt-to.
 - 4. Smoke-Developed Index: The numerical value assigned to a material tested in accordance with ASTM E84 or UL 723.
- B. Reference Standards:
 - 1. ASTM International:
 - a. ASTM E84-16, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
 - b. ASTM F1861-16, 'Standard Specification for Resilient Wall Base'.
 - 2. Underwriters Laboratories, Inc.:
 - a. UL 723: 'Standard for Safety Test for Surface Burning Characteristics of Building Materials'; (2010 - Tenth Edition).

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate completion of resilient base and accessories installation with other trades.
- B. Pre-Installation Conference:
 - 1. Participate in pre-installation conference as specified in Section 09 0503 and held jointly with Section 09 6813 and Section 09 6816 pre-installation conference.
 - 2. In addition to agenda items specified in Section 01 3100 and Section 09 0503, review following:
 - a. Review if stairs are included for Project.
 - b. Review if stair skirts are included for Project.

1.4 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Manufacturer's literature or cut sheet on base and adhesive.
 - b. Color selection.

1.5 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Fire-Test-Response Characteristics:
 - a. Surface-Burning Characteristics:
 - 1) Base shall have Class B flame spread rating in accordance with ASTM E84 or UL 723.

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 in dry space protected from weather at not less than 55 deg F (12.8 deg C) or more than 85 deg F (29.4 deg C) or as per Manufacturer's recommendation.
 - 2. Materials from containers which have been distorted, damaged or opened prior to installation will be rejected.

1.7 FIELD CONDITIONS

- A. Ambient Conditions:
 - 1. Store materials at not less than 70 deg F (21 deg C) for at least twenty four (24) hours before installation.
 - 2. Do not apply in temperatures below 70 deg F (21 deg C).

PART 2 - PRODUCTS

2.1 SYSTEMS

- A. Manufacturers:
 - 1. Manufacturers Contact List:
 - a. Burke Flooring, San Jose, CA www.burkemercer.com.
 - b. Flexco Corporation, Tuscumbia, AL www.marleyflexco.com.
 - c. Johnsonite, Chagrin Falls, OH or Johnsonite (Canada), Waterloo, ON www.johnsonite.com.
 - d. Roppe Corporation, Fostoria, OH www.roppe.com.
 - e. VPI, Corporation, Sheboygan, WI www.vpicorp.com.
- B. Materials:
 - 1. Wall Base:
 - a. General:
 - 1) Size:
 - a) Minimum body thickness: 1/8 inch by 4 inch (3 mm by 100 mm).
 - b) Length: not less than normal.
 - 2) Corners:
 - a) Use preformed, molded external corners for both inside and outside corners.
 - b) Butt joint interior corners.
 - c) Corners must meet same height and thickness requirements as wall base.

- b. Design Criteria:
 - 1) Meet requirements of ASTM F1861, Type TP or TS, Group 1 (solid), Style B (cove).
 - 2) Free from objectionable odors, blisters, cracks, and other defects affecting appearance or serviceability of rubber, and not containing fabric.
 - 3) Style: Cove.
 - c. Colors:
 - 1) Color pigments used shall be highly fade-resistant, insoluble in water, and resistant to light, alkali, and cleaning agents.
 - 2) Colors as selected by Architect from Manufacturer's standard colors.
 - d. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) RubberMyte Wall Base by Burke.
 - 2) Base 2000 Wall Base by Flexco.
 - 3) Rubber Wall Base by Johnsonite.
 - 4) Rubber Wall Base by Roppe.
 - 5) Rubber Wall Base by VPI.
2. Adhesive:
 - a. Use products recommended by Manufacturer for conditions of use.

PART 3 - EXECUTION

3.1 APPROVED INSTALLER

- A. Same Installer for Section 09 6519 shall install Section 09 6513.

3.2 EXAMINATION

- A. Verification Of Conditions:
 1. Inspect surfaces for conditions not suitable for installation. Surface to receive specified items shall be sound, clean, free from foreign matter, tightly nailed, and dry.
 2. Notify Architect of unsuitable conditions in writing:
 - a. Do not start work until defects are corrected.
 3. Commencement of Work by installer is considered acceptance of substrate.

3.3 PREPARATION

- A. Surface Preparation:
 1. Remedy cracks and minor irregularities in substrate in accordance with Manufacturer's recommendations.

3.4 INSTALLATION

- A. Base:
 1. Install in manner to produce smooth, even finished surfaces tightly jointed and accurately aligned.
 2. Fit specified items tightly. Use fillers where necessary. Fit neatly against projections, piping, electrical service outlets, etc.
 3. Secure specified items with specified adhesive. Cement substantially to vertical surfaces including rubber base to cabinet work base.
 4. Line up top and bottom lines of base throughout.
 5. Do not stretch base during installation.
 6. Roll until firm bond has been established. Leave level, free from buckles, cracks, and projecting edges.
 7. In wall runs longer than **12 inches (300 mm)**, install no lengths of base shorter than **12 inches (300 mm)** long.

3.5 FIELD QUALITY CONTROL

- A. Non-Conforming Work:
 - 1. Replace damaged materials at no additional cost to Owner.
 - 2. Damaged materials are defined as having cuts, gouges, scrapes or tears, and not fully adhered.

3.6 CLEANING

- A. General:
 - 1. Base:
 - a. Clean all exposed surfaces of base of adhesive spatter before it sets in accordance with Manufacturer's cleaning instructions.
 - b. Damp-mop surfaces to remove marks and soil.
 - 2. Adjacent Work:
 - a. Clean all exposed surfaces of adjoining areas of adhesive spatter before it sets.

3.7 PROTECTION

- A. Base:
 - 1. Cover material until Substantial Completion.
 - 2. Keep traffic away until adhesive has set.

END OF SECTION

SECTION 09 6816**SHEET CARPETING: Back Cushion, Direct Glue****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But Is Not Limited To:
1. Coordination, sequencing, and scheduling installation of Owner-Furnished carpet, carpet base, carpet accessories, leveling compounds as described in Contract Documents and including following:
 - a. Testing of Alkalinity and Concrete Moisture of concrete slab as specified in Section 09 0503 'Floor Substrate Preparation'.
 - b. Maintain Building Ambient Conditions including normal levels of humidity, lighting, heating, and air conditioning for acceptability for beginning floor preparation and carpet installation.
 - c. Protection of carpet after installation of carpeting as required.
- B. Related Requirements:
1. Section 01 1200: 'Multiple Contract Summary' for carpet and carpet base excluded from Contract and furnished and installed by Owner. This Section establishes quality of materials and installation for information of Contractor, Architect, and Owner's Representatives.
 2. Section 09 0503: 'Flooring Substrate Preparation' for:
 - a. Floor substrate preparation.
 - b. Field Testing for Alkalinity and Concrete Moisture of concrete slab.
 - c. Pre-installation conference for Sections under 09 6000 heading 'Flooring'.
 3. Section 09 6513: 'Resilient Base And Accessories' for resilient base.

1.2 REFERENCES

- A. Association Publications:
1. The Carpet and Rug Institute (CRI), Dalton, GA www.carpet-rug.org. Standard for Installation Specification of Commercial Carpet:
 - a. CRI Indoor Air Quality (IAQ):
 - 1) CRI Green Label Plus Certification.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
1. Coordinate completion of carpet installation with other trades.
- B. Pre-Installation Conference:
1. Participate in MANDATORY pre-installation conference as specified in Section 09 0503.
 2. Schedule pre-installation conference before installation of flooring system.
 3. Conference may be held at project site or another convenient site. Participants may also attend by video or audio conference if approved by Project Manager.
 4. Schedule conference after substrate preparation and ONE (1) week before installation of flooring system.
 5. In addition to agenda items specified Section 01 3100 and Section 09 0503, review following:
 - a. Review Testing Agency testing report of Alkalinity and Concrete Moisture of concrete slab.
 - 1) Follow Testing Agency report regarding Alkalinity and Concrete Moisture of concrete slab as specified in Section 09 0503 'Floor Substrate Preparation'.
 - b. Review Owner's Representative schedule for furnishing and installation carpet.
 - c. Review Flooring Manufacturer's installation conditions verification procedure and requirements.

- d. Review Building Ambient Conditions including normal levels of humidity, lighting, heating, and air conditioning for acceptability for beginning floor preparation and carpet installation.
 - e. Review cleaning and disposal requirements.
 - f. Review protection requirements of carpet after installation of carpeting.
- C. Scheduling:
1. Testing Agency to provide testing for Alkalinity and Concrete Moisture of concrete slab as specified in Section 09 0503 'Floor Substrate Preparation'.
 2. Notify Flooring Installer when Building Ambient Conditions requirements are met before installation of flooring system.
 3. Notify Owner's Representative to coordinate installation of carpet.

1.4 SUBMITTALS

- A. Closeout Submittals:
1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Warranty Documentation:
 - 1) Copy of Warranty.
 - b. Record Documentation:
 - 1) Owner will provide Project Carpet Request Documentation forms in both hard copy and digital format:
 - a) Carpet Request Information Sheet.
 - b) Carpet Vendor Quotation.
 - c) Carpet Preinstallation Meeting Agenda.
 - d) Carpet Installation Notice to Proceed or Cancel.
 - e) Carpet Inspection and Completion.
 - f) Carpet Overage Report and Completion.
 - g) Carpet Quotation Change Request.
 - 2) Owner to provide Testing Agency Testing Report of Alkalinity and Concrete Moisture testing for project.
- B. Maintenance Material Submittals:
1. Extra Stock Materials:
 - a. Leave piece of carpet consisting of **12 sq yds (10 sq m)**, and **25 lineal feet (7.62 meters)** minimum of carpet cove base.
 - b. Roll up and tie securely.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. General:
1. Comply with instructions and recommendations of Manufacturer for special delivery, storage, and handling requirements.
- B. Delivery And Acceptance Requirements:
1. Deliver materials and accessories necessary for completion of carpet installation to site before beginning installation of carpet.
 2. Do not deliver materials before date scheduled for installation.
 3. Transport carpet in manner that prevents damage and distortion. Bending or folding individual carpet rolls or cuts from rolls is not recommended. When bending or folding is unavoidable for delivery purposes, carpet is required to be unrolled and allowed to lie flat immediately upon arrival at installation site.
- C. Storage And Handling Requirements:
1. Store carpet and related materials in a climate-controlled, dry space.
 2. Protect carpet from soil, dust, moisture and other contaminants and store on a flat surface.
 3. Stacking heavy objects on top of carpet rolls or stacking more than three rolls is prohibited.

1.6 FIELD CONDITIONS

A. Ambient Conditions:

1. Building Conditions:
 - a. Conditions inside building shall be brought to levels to be normal at occupancy of building. Conditions include normal levels of humidity, lighting, heating, and air conditioning. (HVAC must be in operation thru out carpet installation):
 - 1) Carpet installation is not to begin until HVAC system is operational and following conditions are maintained for at least forty-eight (48) hours before, during and seventy-two (72) hours after completion:
 - a) Carpet is to be installed when indoor temperature is between 65° - 95° F (18° - 35° C) with maximum relative humidity of 65%.
 - b) Substrate surface temperature should not be less than 65° F (18° C) at time of installation.
 - c) Do not allow temperature of indoor carpeted areas to fall below 50° F (10° C), regardless of age of installation.
 - 2) Maintain fresh air ventilation after installation for seventy-two (72) hours minimum or until lingering odors are gone.
2. Concrete Slab:
 - a. General:
 - 1) Do not install carpet over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have Alkalinity range and Concrete Moisture Vapor Emission Rate (MVER) as specified in Section 09 0503 'Floor Substrate Preparation'.
 - 2) Final determination as to whether or not concrete slab is dry enough for flooring installation should be based on evaluating both Alkalinity and Concrete Moisture Vapor Emission Rate (MVER) testing as specified in Section 09 0503 'Floor Substrate Preparation'.
 - b. Alkalinity:
 - 1) Do not install sheet carpeting if alkalinity of concrete surface exceeds pH level 9. Corrective procedures are required.
 - c. Concrete Moisture Vapor Emission Rate (MVER):
 - 1) Testing conditions inside building shall be brought to same ambient temperature and relative humidity levels to be normal at occupancy of building. Conditions include normal levels of humidity, lighting, heating, and air conditioning.
 - 2) Follow requirements specified in Section 09 0503 'Floor Substrate Preparation' before installation of carpet.

1.7 WARRANTY

A. Manufacturer Warranty:

1. Provide Carpet Manufacturer's standard Warranty which includes following:
 - a. Warranty shall cover defects in installation, workmanship, and installation materials.
 - b. Warranty includes specific workmanship warranties for delamination, edge raveling, fuzzing, pilling, and other textural changes which can be controlled through proper manufacturing (no fraying, zippering, delamination, edge raveling, fuzzing, pilling in carpet is acceptable for any reason).
 - c. Warranty terms will include inspection of defective area within fifteen (15) days of receipt of written notice from Owner and completion of corrective work within forty-five (45) days, unless other arrangements are made in writing with Owner on case-by-case basis.
 - d. Carpet defect or installation defect:
 - 1) Carpet Manufacturer may use any reasonable means to cure first three (3) breaches of warranty affecting an area of carpeting bounded by natural breaks such as doorways, ('affected carpet area'). Such cure must preserve as uniform a blended appearance, acceptable to Carpet Manufacturer and Owner, as exists throughout Installation Site at time of breach.
 - 2) If carpet defect or installation defect continues to appear after three (3) separate notices for correction from Owner, replace carpet where defects have occurred.

- e. If Carpet Manufacturer follows installation requirements of Section 09 0503 'Floor Substrate Preparation' Carpet Manufacture accepts liability of carpet installation for said given time as outlined in Special Warranty regardless of any climate or condition changes affecting RH levels of floor substrate.
- 2. Special Warranty:
 - a. Sheet Carpeting:
 - 1) General:
 - a) Appearance Retention to be provided with Special Warranty requirements if not already included in Standard Warranty.
 - 2) Bishop's Storehouse, Deseret Industries:
 - a) Office Areas:
 - (1) Owner Carpet Program Product: Provide fifteen (15) year minimum or Carpet Manufacturer's better Warranty on carpet system.
 - b) Retail Space:
 - (1) Owner Carpet Program Product: Provide ten (10) year minimum or Carpet Manufacturer's better Warranty on carpet system.

PART 2 - PRODUCTS

2.1 OWNER-FURNISHED PRODUCTS

- A. Category One VMR Manufacturers. See Section 01 6200 for definitions of Categories:
 - 1. Materials supplied for carpet installation shall be complete package from specified Carpet Manufacturer:
 - a. Tandus Centiva., Dalton, GA www.tandus-centiva.com.
 - 1) Contact Information: Tracy Riddle - cell (801) 580-5147 fax (866) 861-7522
Tracy.Riddle@Tarkett.com.
- B. Materials:
 - 1. Carpet:
 - a. Category Four Approved Manufacturer and Color / Patterns. See Section 01 6200 for definitions of Categories:
 - 1) Tandus Centiva: Style: 04346 Ensign, color DI 86172.
 - 2. Carpet Base:
 - a. 4-1/2 inch (115 mm) wide base. Top edge of base serged with 1-1/4 inch (32 mm) polyester binding fabric to coordinate with Owner's color scheme. Roll edges of binding fabric under and sew along top edge of carpet cove base.
 - b. Category Four Approved Manufacturer, Style, and Color. See Section 01 6200 for definitions of Categories:
 - 1) Tandus Centiva: Style 04346 Ensign, color DI 86172.

2.2 ACCESSORIES

- A. Carpet Accessories: Snap-in vinyl reducer strips and vinyl track.
- B. Floor Leveling Compound, Floor Patching Compound, And Latex Underlayment: As recommended and approved by Carpet Manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions:
 - 1. Carpet Areas:

- a. Verify concrete surfaces are sufficiently cured and moisture content is within acceptable levels before beginning installation as specified in Section 09 0503, 'Floor Substrate Preparation'. If test results exceed limitations, do not proceed with installation, until problem has been corrected:
 - 1) Notify Owner's Representative in writing if floor surface is not acceptable to install carpet:
 - a) Do not lay carpeting over unsuitable surface. Commencing installation constitutes acceptance of floor and approval of existing conditions.
- B. Evaluation And Assessment:
 - 1. Carpet Areas:
 - a. Variation In Grade:
 - 1) Plus or minus 1/8 inch (3 mm) in any 10 foot (3 meter) of floor slab and distance between high point and low point of slab of 1/2 inch (13 mm).
 - b. Testing Procedure:
 - 1) Place ends of straightedge on 3/8 inch (10 mm) high shims.
 - 2) Floor is satisfactory if 1/4 inch (6 mm) diameter steel rod rolled under straightedge will not touch anywhere along 10 foot (3 meter) length and 1/2 inch (13 mm) diameter steel rod will not fit under straightedge anywhere along 10 foot (3 meter) length.
 - c. Notify Owner's Representative in writing if floor surface is not acceptable to install carpet:
 - 1) Do not lay carpet over unsuitable surface. Commencing installation constitutes acceptance of floor and approval of existing conditions.

3.2 PREPARATION

- A. Carpet Areas:
 - 1. Flooring Preparation:
 - a. Owner-Furnished Product Supplier's Responsibility:
 - 1) Prepare floor substrate in accordance with 'CRI Carpet Installation Standard' best practices to receive carpet installation and to provide installation that meets warranty requirements.
 - 2) Verify concrete surface cured, clean, dry, and free of foreign substances that will compromise carpet and/or installation.
 - b. Concrete floor slab patching:
 - 1) Cracks, chips and joints must be properly patched or repaired.
 - c. Concrete surface cured, clean, dry, and free of foreign substances that will compromise carpet and/or other flooring installations:
 - 1) Removal of curing compounds.
 - 2) Remove paint, sealer, grease, oil, silicone sealants, and other materials incompatible with flooring adhesives.
 - 3) Removal of overspray from painted walls (essential so glue will stick).
 - d. Moisture vapor emission tests and alkalinity test of concrete slab has been preformed.
 - e. Vacuum and damp mop floor areas to receive flooring before flooring installation.
 - 2. Relaxing / Conditioning Carpet:
 - a. Highly recommended that carpet be unrolled and allowed to relax in installation area for time period that conforms to requirements of manufacturer of product being installed:
 - b. Protect carpet adequately from soil, dust, moisture and other contaminants.
 - c. Sundry items, such as adhesives, should also be conditioned.
 - 3. Carpet Accessories:
 - a. Owner-Furnished Product's Responsibility:
 - 1) Sundry items, such as adhesives, shall be conditioned to building ambient conditions before use.

3.3 INSTALLATION

- A. Carpet:
 - 1. General:

- a. Install carpet and carpet base in accordance with 'CRI Carpet Installation Standard' and Manufacturer's written instructions supplied with product.
 - b. Adhesion of carpet cushion (or secondary backing) to floor substrate and adhesion of carpet primary and secondary backings shall be continuous on floor surface so there are no bubble, ridges, or any separation of carpet from backings or backing from floor substrate caused by failure of carpet, backings or cushion, and adhesives as a system.
 - c. Install carpet under edge of metal thresholds where possible. Use specified carpet accessories at exposed edges.
2. Seaming Requirements:
- a. Seal seams in accordance with Carpet Manufacturer's instructions and according to CRI Carpet Installation Standard (2009) as applicable. Seam carpet base only at inside corners.
 - b. No seam separation in carpet and no more observable seams from any standing position than that which is unavoidable using best seaming materials and practices available at time of installation.
 - c. Lay rooms parallel to respective Corridors. Seam to permit best use of available carpet.
 - d. Quarter turning allowed only at cross-Corridors longer than **24 feet (7.315 m)**.
 - e. Use single or double seams at doorways (single seams preferred). Run nap of pieced carpet in same direction.

B. Carpet Base:

1. Precut base so seams occur only at inside corners.
2. Scribe base to floor.
3. Spread adhesive over back side of base up to bottom of serging on edge or apply three **3/16 inch (4.76 mm)** minimum diameter beads of adhesive placed one inch apart on back of base with top bead placed **2 inch (50 mm)** down from serged edge of base and spread adhesive over back surface of base up to bottom edge of serging.
 - a. Bird's mouth finish should only be required when door frame is flush with wall.
 - b. If bird's mouth is required, terminate at door frames or vertical trim with 45 degree angle, bird mouth cut so serged edge turns down to contact frame or trim.
4. Do not allow adhesive beyond edge of base. Remove excess adhesive.
5. Do not use staples, nails, screws or other mechanical fasteners.

3.4 FIELD QUALITY CONTROL

A. Field Tests:

1. Carpeting:
 - a. See Section 09 0503 'Flooring Substrate Preparation' for Field Testing for Alkalinity and Concrete Moisture of concrete slab.

B. Field Inspections:

1. Carpeting:
 - a. Unacceptable carpet after installation shall include but not be limited to:
 - 1) Delaminating carpet from backings.
 - 2) Fiber loss less than specified.
 - 3) Edge raveling.
 - 4) Fuzzing of carpet fibers.
 - 5) Pilling of carpet fibers.
 - 6) Appearance retention less than control samples attached to Agreement.
 - 7) Dye bleeding.
 - 8) Zippering fibers in carpet.
 - 9) Color streaking.
 - 10) Irregular tufts of fiber.
 - b. Unacceptable workmanship shall include but not be limited to:
 - 1) Improper floor preparation before installation.
 - 2) Failure of adhesive to completely adhere carpet to floor resulting in bubbles, ridges, or ripples where carpet has separated from floor.
 - 3) Seams that do not comply with specified requirements:
 - a) Raveled or untrimmed seams.
 - b) Seams not sealed, level, straight, or even.

- c) Open seams.
 - d) Seams visibly open when viewed by Project Manager from standing position.
 - 4) Sequence rolls, commercial match issues created by rolls being installed out of sequence will require correction or replacement.
 - 5) Failure to properly install carpet next to walls and door frames to eliminate gaps or puckering of carpet.
 - 6) Use of unspecified carpet.
 - 7) Carpet base ends not finished to terminate at door frames or vertical trim shall have 45 degree angle 'birdsmouth' finish.
 - 8) Adhesive exposed on carpet, on carpet base, beyond edges of carpet base, and on other surfaces of building.
 - 9) Carpet base that is not scribed to fit against floor with no gaps.
 - 10) Carpet base attached by means other than acceptable carpet base adhesive.
- C. Non-Conforming Work:
- 1. Carpeting:
 - a. Basis of Acceptable Carpeting: Source Quality Control Testing:
 - 1) Carpet products not meeting Design Criteria and Source Quality Control Testing of this specification will be considered unacceptable carpeting.
 - b. Unacceptable Carpeting:
 - 1) Unacceptable carpeting will be rejected and shall be repaired or replaced at no additional cost to Owner. Owner's Representative will determine reasonable location of acceptable transition points for removal of unacceptable carpet. Minimum replacement size shall be:
 - a) Between nearest existing seams.
 - b) Between natural transition points or **12 feet (3.6 meters)** of running length.

3.5 ADJUSTING

- A. Inspect and make necessary adjustments within one (1) month after mechanical heat or other heat has been supplied continuously in finished areas.

3.6 CLEANING

- A. General:
 - 1. Carpeting:
 - a. Carpet Installer's Responsibility:
 - 1) Remove any soiling and/or staining from carpet.
 - 2) Remove excessive adhesive with manufacturer recommended adhesive removers.
- B. Damage to building:
 - 1. Carpeting:
 - a. Carpet Installer's Responsibility:
 - 1) Carpet Installer responsible for cleaning and repair of all damaged surfaces to their original condition from carpet installation.
- C. Waste Management:
 - 1. Contractor's Responsibility:
 - a. Provide adequate waste receptacles (dumpsters) and dispose of Owner Furnished materials from building and property as specified in Section 01 7400.
 - 2. Carpet Installer's Responsibility:
 - a. All work areas are to be kept clean, clear and free of debris at all times.
 - b. Disposal of rubbish, wrapping paper, scraps, and trimmings in provided dumpster(s).

3.7 PROTECTION

- A. Protection of Carpeting:
 - 1. Contractor's Responsibility:
 - a. No traffic of any kind on newly installed carpet for minimum of twenty-four (24) hours after installation is completed.
 - b. No wheeled traffic of any kind placement of furniture or equipment on carpet for minimum of forty-eight (48) hours after completion of carpet installation.
 - c. Protect carpet adequately from soil, dust, moisture and other contaminants after carpet installation.
 - d. Protect carpet from abuse, vandalism, or damage occurring after installation is complete.

END OF SECTION

SECTION 09 7226**SISAL WALL COVERING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnishing and installing wall covering 'Type A' (Sisal) as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 06 4512: 'Architectural Woodwork Wood Trim' for wood trim for sisal wall covering.
 - 2. Section 09 2900: 'Gypsum Board' for priming of gypsum board.

1.2 REFERENCES

- A. Definitions:
 - 1. Class A: Fire classification for product with flame spread rating of no more than 25 and smoke developed rating not exceeding 50, when tested in accordance with ASTM E84 or UL 723.
 - a. Flame Spread: The propagation of flame over a surface.
 - b. Flame Spread Index: The numerical value assigned to a material tested in accordance with ASTM E84 or UL 723.
 - c. Smoke-Developed Index: The numerical value assigned to a material tested in accordance with ASTM E84 or UL 723.
 - d. Surface Burning Characteristic: Rating of interior and surface finish material providing indexes for flame spread and smoke developed, based on testing conducted according to ASTM Standard E84 or UL 723.
- B. Reference Standards:
 - 1. ASTM International:
 - a. ASTM E84-16, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
 - 2. International Building Code (IBC) (2015 or latest approved edition):
 - a. Chapter 8, 'Interior Finishes':
 - 1) Section 803, 'Wall And Ceiling Finishes':
 - a) 803.1.3, 'Room Corner Test for Textile Wall Coverings and Expanded Vinyl Wall Coverings'.
 - b) 803.1.4, 'Acceptance Criteria for Textile and Expanded Vinyl Wall Coverings Tested to ASTM E84 or UL 723'.
 - 3. National Fire Protection Association:
 - a. NFPA 101: 'Life Safety Code' (2015 Edition).
 - b. NFPA 265: 'Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Textile Coverings on Full Height Panels and Walls', (2015 Edition).
 - 4. Underwriters Laboratories, Inc.:
 - a. UL 723: 'Standard for Safety Test for Surface Burning Characteristics of Building Materials'; (2010 - Tenth Edition).

1.3 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Manufacturer's literature or cut sheet.
 - b. Maintenance instructions.
 - c. Color and pattern selection.

- B. Informational Submittals:
 - 1. Test And Evaluation Reports:
 - a. Copies of Quality Assurance requirements for 'Class A' flame spread rating and 'Room-Corner Test'.
 - 2. Qualification Statement:
 - a. Installer:
 - 1) Provide Qualification documentation if requested by Architect or Owner.
- C. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Operations and Maintenance Data:
 - 1) Cleaning and maintenance instructions.
 - b. Record Documentation:
 - 1) Manufacturers Documentation:
 - a) Manufacturer's literature or cut sheets.
 - b) Color and pattern selections.

1.4 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Fire-Test-Response Characteristics: As determined by testing identical wall coverings applied with identical adhesives to substrates according to test method indicated below by qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Surface-Burning Characteristics:
 - 1) Wall covering shall have Class A flame spread rating in accordance with ASTM E84 or UL 723 Type 1.
 - a) Class A (Flame spread index 0-25; Smoke-developed index 0-450).
 - b) Flash point: None.
 - 2. Passage of 'Room-Corner Test' as recognized by AHJ, is required for system. Adhesive cited in test literature is required for installation of wall covering on Project.
 - a. Room Corner Tests:
 - 1) ASTM E84, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
 - 2) IBC 803.1.3, 'Room Corner Test for Textile Wall Coverings and Expanded Vinyl Wall Coverings'.
 - 3) IBC 803.1.4, 'Acceptance Criteria for Textile and Expanded Vinyl Wall Coverings Tested to ASTM E84 or UL 723'.
 - 4) NFPA 265, 'Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Textile Coverings on Full Height Panels and Walls'.
 - 5) UL 723, 'Standard for Safety Test for Surface Burning Characteristics of Building Materials'.
- B. Qualifications:
 - 1. Installer: Requirements of Section 01 4301 applies, but not limited to following:
 - a. Minimum three (3) years experience in wall covering installations.
 - b. Minimum five (5) years satisfactorily completed projects of comparable quality, similar size, and complexity in past three (3) years before bidding.
 - c. Agree to view 'No-Flame Sisal Wall Covering Recommended Installation Procedures' provided by Owner found on internet in AEC Webpage under Training in Menu tab. Contact Architect for access to video. This requirement may be waived by Owner, if Installer has viewed video before or can document at least two (2) satisfactorily completed projects of comparable size using sisal wall coverings in past three (3) years before bidding.
 - d. Upon request, submit documentation and video verification.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:

1. Deliver materials in sealed containers with Manufacturer's labels intact.

B. Storage And Handling Requirements:

1. Store materials in protected area at temperatures below 90 deg F (32 deg C) and above 50 deg F (10 deg C). Keep from freezing.
2. Keep container tightly closed in a well ventilated area, and store upright when not in use.
3. Shelf life: One (1) year minimum - Unopened containers.

1.6 FIELD CONDITIONS

A. Ambient Conditions:

1. Apply when the temperature is between 50 deg F (10 deg C) minimum and 100 deg F (38 deg C) maximum and relative humidity is less than seventy five (75) percent.
2. Provide good ventilation.

1.7 WARRANTY

A. Manufacturer Warranty:

1. Provide five (5) year warranty against manufacturing defects.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer Contact List:

1. Design Materials Inc, Kansas City, KS www.dmikc.com.
2. Fibreworks, Louisville, KY www.fibreworks.com.

2.2 DESCRIPTION

A. Colors:

1. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a. Color to match existing sisal which is to remain.

2.3 MATERIALS

A. Sisal Wall Covering:

1. 100 percent fire-treated sisal yarn.
2. 1/4 inch (6 mm) pile height, 48 oz/sq yd (1 627 grams/sq meter) minimum. Sisal to be installed full height on walls shall be furnished in 9 or 13 foot (2.75 or 3.96 meters) wide goods.
3. Reversible weave type, without backing.

2.4 ACCESSORIES

A. Wall Covering Adhesive:

1. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a. 257 Sisal Adhesive by Fibreworks.
 - b. Sisal Adhesive No. 1-422 by Design Materials.

B. Seam Cement:

1. Type Two Acceptable Products:

- a. 8415 Glue-Down Carpet Seam Adhesive by Roberts Consolidated Industries, Div QEP, Henderson, NV www.robertsconsolidated.com.
- b. Equal as recommended by Wall Covering Manufacturer with approval of Architect before installation. See Section 01 6200.

PART 3 - EXECUTION

3.1 INSTALLERS

- A. Acceptable Installers:
 1. Meet Quality Assurance Installer Qualifications as specified in Part 1 of this specification.

3.2 EXAMINATION

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

3.3 INSTALLATION

- A. Apply wall covering in accordance with Manufacturer's instructions, available on DVD from Owner through Architect. See Quality Assurance Installer Qualifications as specified in Part 1 of this specification.
- B. Using specified adhesive, glue continuously to surface to be covered with wall covering. Apply adhesive in accordance with Manufacturer's recommendations.
- C. Run 'ribs' in weaving horizontally (panel style) when installing wall covering full height. If sisal installed only as wainscoting, 'ribs' may be installed vertically. Install wall covering so it extends to within **1/8 inch (3 mm)** of floor slab.
- D. Carry sisal around corners approximately **6 inch (152 mm)** making no outside corner cuts.

END OF SECTION

SECTION 09 9001

COMMON PAINTING AND COATING REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To:
 1. Common procedures and requirements for field-applied painting and coating.
- B. Related Requirements:
 1. Section 07 9213: 'Elastomeric Joint Sealants' for quality of Elastomeric Joint Sealants.
 2. Sections under 09 9000 heading 'Paints and Coatings'.
 - a. Pre-Installation conferences held jointly with Section 09 9001.
 3. 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.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conferences:
 - 1. Schedule painting pre-installation conference after delivery of paint or coatings and before or at same time as application of field samples.
 - a. Coordinate pre-installation conferences of all related painting and coating Sections under 09 9000 heading 'Paints and Coatings'.
 - b. Schedule conference before preparation of control samples as specified in Sections under 09 9000 heading 'Paints and Coatings'.
 - c. Conference to be held at same time as Section 09 2900 to review gypsum board finish preparation.
 - 2. In addition to agenda items specified in Section 01 3100, review following:
 - a. Review Quality Assurance for Approval requirements.
 - b. Review Quality Assurance Field Sample requirements.
 - c. Review Submittal requirements for compliance for MPI Approved Products.
 - d. Review Design Criteria requirements.
 - e. Review Cleaning requirements.
 - f. Review painting schedule.
 - g. Review safety issues.
 - 3. Review additional agenda items from Sections under 09 9000 heading 'Paints and Coatings'.

1.4 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Include following information for each painting product, arranged in same order as in Project Manual.
 - 1) Manufacturer's cut sheet for each product indicating ingredients and percentages by weight and by volume, environmental restrictions for application, and film thicknesses and spread rates.
 - 2) Provide one (1) copy of 'MPI Approved Products List' showing compliance for each MPI product specified.
 - a) MPI Information is available from MPI Approved Products List using the following link: <http://www.paintinfo.com/mpi/approved/index.shtml>.
 - 3) Confirmation of colors selected and that each area to be painted or coated has color selected for it.
 - 2. Samples: Provide two 4 inch by 6 inch (100 mm by 150 mm) minimum draw-down cards for each paint or coating color selected for this Project.
- B. Informational Submittals:
 - 1. Manufacturer Instructions:
 - a. Manufacturer's substrate preparation instructions and application instruction for each painting system used on Project.
 - 2. Qualification Statement:
 - a. Applicator:
 - 1) Provide Qualification documentation if requested by Architect or Owner.
- C. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Record Documentation:
 - 1) Manufacturer's documentation:
 - a) Manufacturer's cut sheet for each component of each system.
 - b) Schedule showing rooms and surfaces where each system was used.
- D. Maintenance Materials Submittals:
 - 1. Extra Stock Materials:

- a. Provide painting materials in Manufacturer's original containers and with original labels in each color used. Label each can with color name, mixture instructions, date, and anticipated shelf life.
- b. Provide one (1) quart of each finish coat and one (1) pint of each primer and of each undercoat in each color used.

1.5 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approval:
 1. Conform to work place safety regulations and requirements of those authorities having jurisdiction for storage, mixing, application and disposal of all paint and related hazardous materials.
 2. Paint and painting materials shall be free of lead and mercury, and have VOC levels acceptable to local jurisdiction.
 3. Master Painters Institute (MPI) Standards:
 - a. Products: Comply with MPI standards indicated and listed in 'MPI Approved Products List'.
 - b. Preparation and Workmanship: Comply with requirements in 'MPI Architectural Painting Specification Manual' for products and coatings indicated.
- B. Qualifications:
 1. Applicator: Requirements of Section 01 4301 applies, but not limited to following:
 - a. Minimum five (5) years experience in painting installations.
 - b. Minimum five (5) satisfactorily completed projects of comparable quality, similar size, and complexity in past three (3) years before bidding.
 - c. Maintain qualified crew of painters throughout duration of the Work.
 - d. Upon request, submit documentation.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
 1. Deliver specified products in sealed, original containers with Manufacturer's original labels intact on each container.
 2. Deliver amount of materials necessary to meet Project requirements in single shipment.
- 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.
 - 2) Color Level III: (Family Services area)
 - a) Number and placement of interior and exterior paint colors and gloss levels shall be Color Level III from MPI Manual, PDCA P3-93 as modified in following paragraph.
 - b) Several paint colors or gloss levels will be selected for same substrate within designated interior rooms or exterior areas.

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. Acceptable Applicators. See Section 01 4301:

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. Surface Preparation:
 - 1. Prepare surfaces in accordance with MPI requirements and requirements of Manufacturer for each painting system specified, unless instructed differently in Contract Documents. Bring conflicts to attention of Architect in writing.
 - 2. Fill minor holes and cracks in wood surfaces to receive paint or stain.
 - 3. Surfaces to be painted shall be clean and free of loose dirt. Clean and dust surfaces before painting or finishing.
 - 4. Do no exterior painting while surface is damp, unless recommended by Manufacturer, nor during rainy or frosty weather. Interior surfaces shall be dry before painting. Moisture content of materials to be painted shall be within tolerances acceptable to Paint Manufacturer.
 - 5. Sand woodwork smooth in direction of grain leaving no sanding marks. Clean surfaces before proceeding with stain or first coat application.

3.4 APPLICATION

- A. Interface With Other Work:
 - 1. Coordinate with other trades for materials and systems that require painting before installation.
 - 2. Schedule painting and coating work to begin when work upon which painting and coating work is dependent has been completed. Schedule installation of pre-finished and non-painted items, which are to be installed on painted surfaces, after application of final finishes.
- B. Paint or finish complete all surfaces to be painted or coated as described in Contract Documents, including but not limited to following items.
 - 1. Finish casework and wood trims that are specified to be installed under Section 06 2001 and that are not called out to be factory-or shop-finished. Back prime wood elements to be installed against concrete or masonry or that may be subjected to moisture.
 - 2. Paint mechanical, electrical, and audio/visual items that require field painting as indicated in Contract Documents. These include but are not limited to:
 - a. Gas pipe from gas meter into building.
 - b. Mechanical flues and pipes penetrating roof.
 - c. Electrical panel and disconnect enclosures.
 - 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

ATTACHMENTS**PART 4 - PAINT COLOR SCHEDULE**

- A. Related Requirements:
 - 1. Section 09 9112 'Exterior Painted Ferrous Metal'.
 - 2. Section 09 9114 'Exterior Painted CMU'.
 - 3. Section 09 9122 'Interior Painted CMU'.
 - 4. Section 09 9123 'Interior Painted Gypsum Board-Plaster'.
 - 5. Section 09 9124 'Interior Painted Metal'.
 - 6. Section 09 9125 'Interior Wood Paint'.
 - 7. Section 09 9324 'Interior Clear-Finished Hardwood'.

- B. Category Four Colors. See Section 01 6200 for definitions of Categories:
 - 1. Interior:
 - a. Interior Walls:
 - 1) SW 7036 Accessible Beige by Sherwin Williams.
 - b. Interior Walls in Family Services Area only:
 - 1) PPG1023-3 Ashen by PPG below chair rail (Family Services only).

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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 and 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 Bishop Storehouse Projects.
 - 3. Section 09 9413: 'Interior Textured Finishing' for textured finishes.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conferences:
 - 1. Participate in pre-installation conference as specified in Section 09 2900.
 - a. In addition to agenda items specified in Section 01 3100 and Section 09 2900, review following:
 - 1) Review finish level requirements of gypsum wallboard as specified in Section 09 2900.
 - 2. Participate in pre-installation conference as specified in Section 09 9001.

PART 2 - PRODUCTS**2.1 SYSTEM**

- A. Manufacturers:
 - 1. Category Four Approved Manufacturers and Products. See Section 01 6200 for definitions of Categories.
 - a. Products listed in edition of MPI Approved Product List current at time of bidding and later are approved, providing they meet VOC requirements in force where Project is located.
- B. Description:
 - 1. Rest Rooms And Custodial Rooms:
 - a. New Surfaces: Use MPI(a) INT 9.2F Waterborne Epoxy Finish system.
 - 2. All Other:
 - a. New Surfaces: Use MPI(a) INT 9.2B Latex Finish system.
- C. Performance:
 - 1. Design Criteria:
 - a. New Surfaces: MPI Premium Grade finish requirements.
 - b. Gloss / Sheen Required:
 - 1) Rest Rooms And Custodial Rooms: Gloss Level 6.

- 2) Remaining Painted Surfaces: Gloss Level 5.
2. Color Quality Standards:
 - a. PPG #A0069 Prism White.
- D. Materials:
 1. Primers:
 - a. MPI Product 50, 'Primer Sealer, Latex, Interior'.
 2. Finish Coats:
 - a. Rest Rooms And Custodial Rooms:
 - 1) Buildings with only Gypsum Board surfaces in rooms:
 - a) MPI Product 115, 'Epoxy-Modified Latex, Interior, Gloss (MPI Gloss Level 6)'.
 - 2) Buildings with CMU and Gypsum Board surfaces in same rooms:
 - a) MPI Product 77, 'Epoxy, Gloss'.
 - b. Remaining Painted Surfaces:
 - 1) MPI Product 141, 'Latex, Interior, High Performance Architectural, Semi-Gloss (MPI Gloss Level 5)'.

PART 3 - EXECUTION

3.1 APPLICATION

- A. General: See appropriate paragraphs of Section 09 9001.
- B. New Surfaces:
 1. Primer: Apply primer to be covered with other paint coats with roller only, or with spray gun and back-rolled.

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'.
 - a. 'Attachment: Paint Color Schedule' for Bishop Storehouse Projects.
 - 2. Section 23 0553: 'I. D. For HVAC Piping And Equipment' for field painting requirements of HVAC piping and equipment.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conferences:
 - 1. Participate in pre-installation conference as specified in Section 09 9001.
- B. Sequencing:
 - 1. Paint brackets furnished under Section 05 5871 before installation of bracket.

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.
 - 2. Galvanized Metal:
 - a. New Surfaces: Use MPI(a) INT 5.3J Latex Finish system
 - 3. Aluminum:
 - a. New Surfaces: Use MPI(a) INT 5.4E Waterborne Light Industrial Finish system.
- C. Performance:
 - 1. Design Requirements:
 - a. New Surfaces: MPI Premium Grade finish requirements.
 - b. Gloss / Sheen Level Required: Gloss Level 5.
 - 2. Color Quality Standard:
 - a. ICI # A1775 Stone Harbor.
- D. Materials:
 - 1. Primers:

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- 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.

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 Bishop Storehouse 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.
- C. Performance:
 - 1. Design Criteria:
 - a. New Surfaces: MPI Premium Grade finish requirements.
 - b. 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. 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.

END OF SECTION

SECTION 09 9324**INTERIOR CLEAR-FINISHED HARDWOOD****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Preparing and finishing of new interior clear finished hardwood as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 06 2210: 'Miscellaneous Wood Trim'.
 - 2. Section 06 4512: 'Architectural Woodwork Wood Trim'.
 - 3. Section 08 1429: 'Interior Flush Wood Doors'.
 - 4. 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 Bishop Storehouse Projects.

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) Owner will provide existing stain color sample from project for custom match.

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.

END OF SECTION

SECTION 09 9413**INTERIOR TEXTURED FINISHING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and apply texturing on walls and ceilings as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 09 2900: 'Gypsum Board' for priming.
 - 2. Section 09 9001: 'Common Painting And Coating Requirements' for:
 - a. Pre-installation conference for Sections under 09 9000 heading 'Paints and Coatings'.
 - 3. Section 09 9123: 'Interior Painted Gypsum Board, Plaster' for finish painting.

1.2 REFERENCES

- A. Definitions:
 - 1. Drywall Texture: Compound rolled, sprayed, or troweled onto sheetrock after taping and floating of joints is complete. Uses same material as joint compound, but thinned down with water and applied to wall surface:
 - a. Light Orange Peel: Sprayed texture leaves light splatter on walls. Resembles peel of orange. If done with fine spray, can be one of the lightest, least noticeable of the texture styles.
 - b. Light Skip Trowel - Texture is applied to ceilings with trowel. Trowel marks may be left on surface to give a rustic, hand crafted look.
 - c. Smooth - Smooth application of texture over sheetrock wall that feathers out sheetrock joints, and creates even, non-textured wall.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conferences:
 - 1. Participate in pre-installation conference as specified in Section 09 9001.
 - 2. In addition to agenda items specified in Section 01 3100 and Section 09 9001, review following:
 - a. Review control samples.

1.4 SUBMITTALS

- A. Action Submittals:
 - 1. Samples:
 - a. Light Orange Peel Texture:
 - 1) Provide minimum of three (3) **24 inch (600 mm)** square control samples on primed gypsum wallboard of 'light orange peel' texture to show possible variations.
 - b. Light Skip Trowel Texture:
 - 1) Provide minimum of three (3) **24 inch (600 mm)** square control samples on primed gypsum wallboard of 'light orange peel' texture to show possible variations.

1.5 QUALITY ASSURANCE

- A. Field Samples:
 - 1. Before performing work of this Section, prepare control samples.

2. Architect will inspect control sample at pre-installation conference following preparation of control sample. When sample is approved, work of this Section may proceed. Approved samples will be kept at site at all times work of this section is being performed.

PART 2 - PRODUCTS

2.1 SYSTEM

- A. Manufacturers:
 1. Manufacturer Contact List:
 - a. National Gypsum, Charlotte, NC www.nationalgypsum.com.
 - b. U S Gypsum Co, Chicago, IL www.usg.com.
- B. Materials:
 1. Class Two Quality Standards: See Section 01 6200.
 - a. ProForm Perfect Spray EM/HF by National Gypsum.
 - b. Sheetrock Wall & Ceiling Texture by U S Gypsum.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Location:
 1. Walls:
 - a. Light Orange Peel Texture.
 - b. Smooth: where existing walls are smooth.
 2. Ceilings:
 - a. Light Orange Peel Texture.
 - b. Smooth: where existing ceilings are smooth.
- B. Finishing:
 1. Light Orange Peel Texture:
 - a. After gypsum board is taped, sanded, and primed, apply texture. Closely match samples accepted by Architect.

END OF SECTION

DIVISION 10: SPECIALTIES

10 1000 INFORMATION SPECIALTIES

10 1495 MISCELLANEOUS INTERIOR SIGNAGE

10 2000 INTERIOR SPECIALTIES

10 2113 METAL TOILET COMPARTMENTS

10 2813 COMMERCIAL TOILET ACCESSORIES

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 Four Approved Standard Interior Signs. See Section 01 6200 for definitions of Categories:
 - 1. Visual Identity Office:
 - a. Contact Information:
 - 1) 50 E. North Temple St. Rm. 2350, Salt Lake City, UT 84150-3232.
 - 2) Phone: 1-801-240-1302.
 - 3) Fax: 1-801-240-5997.
 - 4) vidoffice@ldschurch.org.
 - 2. Room Signs: Molded clear acrylic sub-surface graphics sign with set-screw to attach to included mounting bracket.
 - a. Provide tactile / braille features in signage.
 - 3. Cabinet Door Signs: Flat clear acrylic sub-surface graphics sign with mounting adhesive in position.
 - 4. Color:
 - a. Background: Welfare Gray.
 - b. 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.

END OF SECTION

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SECTION 10 2113**METAL TOILET COMPARTMENTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Salvage, store and reinstall metal toilet compartments with new hardware as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 06 1100: 'Wood Framing' for blocking in wood framing for compartment installation and door bumper.
 - 2. Section 09 2216: 'Non-Structural Metal Framing' for blocking in non-load-bearing metal framing for compartment installation and door bumper.
 - 3. Section 10 2813: 'Commercial Toilet Accessories'.

1.2 REFERENCES

- A. Reference Standards:
 - 1. ASTM International:
 - a. ASTM A167-99(2011), 'Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.'
 - b. ASTM A484/A484M-16, 'Standard Specification for General Requirements for Stainless Steel Bars, Billets, and Forgings'.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Storage And Handling Requirements:
 - 1. Store and handle in compliance with Manufacturer's instructions and recommendations.

PART 2 - PRODUCTS**2.1 MANUFACTURED UNITS**

- A. Toilet And Miscellaneous Partitions:
 - 1. Anchorages and fasteners:
 - a. Concealed: Non-corrosive, protective finish.
 - b. Tamper resistant Torx Head with pin screws.
 - 2. Hardware:
 - a. Each door:
 - 1) Gravity type hinges with double handed, nylon bottom cam, adjustable for partial door closing position, bottom hinge finished flush with door bottom.
 - 2) Sliding or concealed door bolt with emergency access.
 - 3) Door strike and keeper with rubber bumper.
 - 4) Coat hook / door bumper.
 - b. Finish: Chrome plated.
 - c. Meet requirements of ASTM B86, Alloy AG 40A.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification Of Conditions:
 - 1. Field verify dimensions.
 - 2. Verify that necessary blocking has been installed in framed walls for partition installation and for place where coat hook / door bumper will strike wall.

3.2 INSTALLATION

- A. Install pilasters rigid, plumb, and level. Maintain proper door openings. Anchor pilaster to floor with Type 304 stainless steel fasteners embedded **2 inches (50 mm)** into concrete slab below setting bed.
- B. Secure panels to walls with two stirrup brackets minimum attached near top and bottom of each panel. Use fasteners of length to provide **one inch (25 mm)** embedment into blocking or masonry.
- C. Secure overhead brace to face sheets with two fasteners minimum per face. Set door tops parallel with brace. Set door bottom **12 inches (300 mm)** above floor.
- D. Plinth to be level with and snug to floor.

3.3 FIELD QUALITY CONTROL

- A. Non-Conforming Work: Non-conforming work as covered in the General Conditions applies, but is not limited to the following:
 - 1. Correct any work found defective or not complying with contract document requirements at no additional cost to the Owner.

3.4 ADJUSTING

- A. Lubricate hardware as recommended by Manufacturer.
- B. Set hinges on out-swinging doors to return to nearly closed position.
- C. Perform final adjustments to pilaster leveling devices, door hardware, and other operating parts of partition assembly just before Substantial Completion.

3.5 CLEANING

- A. Remove protective masking. Clean exposed surfaces of partitions, hardware, fittings, and accessories.
- B. Touch-up minor scratches and other finish imperfections using materials and methods recommended by Manufacturer.

END OF SECTION

SECTION 10 2813**COMMERCIAL TOILET ACCESSORIES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Included But Is Not Limited To:
 - 1. Selected accessories for Rest Rooms:
 - a. Grab Bars.
 - b. Mirrors.
 - c. Sanitary Napkin Disposal Container.
 - d. Single Robe Hook.
 - 2. Salvage, store and reinstall existing accessories in existing restrooms 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. Products Furnished and Installed by Owner under Separate Contract:
 - 1. Selected accessories for Rest Rooms:
 - a. Paper 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-15, '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 C1036-16, '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 A117.1-2009, '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. Furnish and Install by Owner:
 - 1. 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: (Install on door at Restrooms without toilet partitions / compartment)
 - 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

DIVISION 11: EQUIPMENT

11 3000 RESIDENTIAL EQUIPMENT

11 3113 RESIDENTIAL KITCHEN APPLIANCES

END OF TABLE OF CONTENTS

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SECTION 11 3113**RESIDENTIAL KITCHEN APPLIANCES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Installed But Not Furnished Under This Section:
 - 1. Refrigerator and microwave oven.
- B. Related Requirements:
 - 1. Section 01 6400: Owner will furnish Appliances. This Section establishes quality of materials for information of Contractor, Architect, and Owner's Representatives.
 - 2. Division 26: 'Electrical' for outlets and electrical service.

1.2 SUBMITTALS

- A. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Record Documentation:
 - 1) Manufacturers Documentation:
 - a) Manufacturer's literature packaged for each appliance.

PART 2 - PRODUCTS**2.1 OWNER-FURNISHED PRODUCTS**

- A. Category Two National Contract Manufacturers. See Section 01 6200 for definitions of Categories:
 - 1. Under-Counter Refrigerator (Employment Center and Family Services Module only):
 - a. Approved Manufacturer:
 - b. General Electric.
 - 2. Microwave Oven:
 - a. Approved Manufacturers:
 - 1) General Electric.
 - 2) Panasonic.
 - 3) Samsung.
 - 4) Amana.
- B. Manufactured Units:
 - 1. Under-Counter Refrigerator:
 - a. 4 cu ft (0.113 cu m) capacity.
 - b. Dimensions: 34-1/2 inches (863 mm) high by 18-7/8 inches (472 mm) wide by 20-3/4 inches (519 mm) deep.
 - c. Color: White.
 - 2. Microwave Oven:
 - a. 800 watts.
 - b. Dimensions: 12 inches high by 24 inches wide by 13 inches deep (300 mm high by 200 mm wide by 325 mm deep).
 - c. Color: White.

PART 3 - EXECUTION: Not Used

END OF SECTION

DIVISION 21: FIRE SUPPRESSION

21 1000 WATER-BASED FIRE SUPPRESSION SYSTEMS

21 1313 WET-PIPE SPRINKLER SYSTEMS

END OF TABLE OF CONTENTS

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SECTION 21 1313**WET-PIPE SPRINKLER SYSTEMS****PART 1 - GENERAL****1.1 SUMMARY**

A. Includes But Not Limited To:

1. Modify existing complete wet-pipe fire sprinkler system to provide full coverage of modified areas as described in Contract Documents.

1.2 REFERENCES

A. Association Publications:

1. Underwriters Laboratories, Inc.:
 - a. UL Directory B, 'Fire Protection Equipment, Directory B' (2011).

B. Reference Standards:

1. American Society of Mechanical Engineers:
 - a. ASME B1.20.1-2013, 'Pipe Threads, General Purpose (Inch)'.
 - b. ASME B1.20.1M-2006 (R2011), 'Pipe Threads, General Purpose (Metric)'.
 - c. ASME B16.1-2015, 'Grey Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250'.
 - d. ASME B16.3-2011, 'Malleable Iron Threaded Fittings: Classes 150 and 300'.
 - e. ASME B16.4-2011, 'Gray Iron Threaded Fittings, Classes 125 and 250'.
 - f. ASME B16.5-2013, 'Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard'.
2. American Water Works Association:
 - a. AWWA C606-15, 'Grooved and Shouldered Joints'.
3. American Welding Society:
 - a. AWA B2.1/B2.1M-2014, 'Specification for Welding Procedure and Performance Qualification', (5th Edition).
4. ASTM International:
 - a. ASTM A53/A53M-12, 'Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless'.
 - b. ASTM A135/A135M-09(2014), 'Standard Specification for Electric-Resistance-Welded Steel Pipe'.
 - c. ASTM A234/A234M-15, 'Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service'.
 - d. ASTM A395/A395M-99(2014), 'Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures'.
 - e. ASTM A536-84(2014), 'Standard Specification for Ductile Iron Castings'.
 - f. ASTM A795/A795M-13, 'Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use'.
5. National Fire Protection Association / American National Standards Institute:
 - a. NFPA 13: 'Standard for the Installation of Sprinkler Systems', (2016 Edition or latest AHJ approved edition).
 - b. NFPA 24: 'Standard for the Installation of Private Fire Service Mains and their Appurtenances' (2016 Edition).
 - c. NFPA 25: 'Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems', (2014 Edition).
 - d. NFPA 101: 'Life Safety Code', (2015 Edition).

1.3 SUBMITTALS

A. Action Submittals:

1. Shop Drawings:

- a. Size sprinkler system using NFPA 13 hydraulic calculation design method based on water supply evaluation performed at building site:
 - 1) On submittals, refer to sprinkler heads by sprinkler identification or model number published in appropriate agency listing or approval. Trade names and other abbreviated designations are not acceptable.
- b. Submittal Procedure:
 - 1) After award of Contract and before purchase of equipment, submit seven sets of shop drawings with specifications and hydraulic calculations to Fire Sprinkler Consultant and two (2) sets to local jurisdiction having authority for fire prevention for review. If pipe schedule method is used, submit copies of schedules in NFPA 13 used in sizing pipe.
 - 2) After integrating Fire Sprinkler Consultant's and AHJ's comments into drawings, licensed certified fire protection engineer of record who designed fire protection system shall stamp, sign, and date each sheet of shop drawings and first page of specifications and calculations.
 - 3) Submit stamped documents to Owner and to AHJ for fire prevention for final approval.
 - 4) After final approval, submit four copies of approved stamped documents to Fire Sprinkler Consultant.
 - 5) Failure of system to meet requirements of authority having jurisdiction and/or approved stamped construction documents shall be corrected at no additional cost to Owner.

B. Informational Submittals:

1. Certificates:

- a. Provide one (1) copy of completed NFPA 13 'Contractor's Material and Test Certification for Aboveground Piping' as specified in 'Field Quality Control' in Part 3 of this specification:

2. Qualification Statement:

- a. Licensed fire protection engineer or fire protection system designer:
 - 1) Licensed for area of Project.
 - 2) Certified by NICET to level three minimum.
 - 3) Provide Qualification documentation if requested by Fire Sprinkler Consultant or Owner's Representative.
- b. Installer:
 - 1) Provide Qualification documentation if requested by Fire Sprinkler Consultant or Owner's Representative.

C. Closeout Submittals:

1. Include following in Operations And Maintenance Manual specified in Section 01 7800:

a. Operations and Maintenance Data:

- 1) Maintenance and instructions.
 - a) List of system components used indicating name and model of each item.
 - b) Manufacturer's maintenance instructions for each component installed in Project.
 - c) Instructions shall include installation instructions, parts numbers and lists, operation instructions of equipment, and maintenance and lubrication instructions.

b. Warranty Documentation:

- 1) Include copies of required warranties.

c. Record Documentation:

- 1) Include copies of approved shop drawings.
- 2) Provide master index showing items included.
- 3) Provide name, address, and phone number of Architect, Fire Sprinkler Consultant, General Contractor, and Fire Protection subcontractor.
- 4) Provide operating instructions to include:
 - a) General description of fire protection system.
 - b) Step by step procedure to follow for shutting down system or putting system into operation.

- 5) Provide signed copy of NFPA 13 'Contractor's Material and Test Certification for Aboveground Piping'.
2. Instruction of Owner (as specified in Part 3 of this specification):
 - a. Provide Owner with latest version of NFPA 25.
- D. Maintenance Material Submittals:
 1. Extra Stock Materials:
 - a. Spare sprinkler heads in the quantity recommended by NFPA 13 selected in representative proportion to quantity used in Project and in accordance with NFPA 13 (Six (6) spare sprinkler heads minimum). Do not include dry barrel Pendent and dry barrel Sidewall sprinkler heads.
 - b. Provide spare heads in cabinet with sprinkler head wrench for each type of head used. After approval of cabinet and contents, mount cabinet in convenient location in Riser Room.

1.4 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies:
 1. Unless noted otherwise, system shall conform to:
 - a. NFPA 13, 'Light & Ordinary Hazard Occupancies'.
 - b. NFPA 24, 'Service Mains and Their Appurtenances, Private'.
 - c. NFPA 25, 'Inspection, Testing, and Maintenance'.
 - d. NFPA 101, 'Life Safety Code'.
 - e. Requirements of local water department and local authority having jurisdiction for fire protection.
 - f. Underwriters Laboratories Publication, UL Directory B, 'Fire Protection Equipment Directory', current edition at time of Pre-Bid Meeting.
 - g. Comply with backflow prevention requirements and, if required, include device in hydraulic calculations.
 - h. Applicable rules, regulations, laws, and ordinances.
- B. Qualifications:
 1. Licensed fire protection engineer or fire protection system designer certified by NICET to level three minimum and engaged in design of fire protection systems. Engineer / designer shall:
 - a. Licensed for area of Project.
 - b. Minimum five (5) years experience in fire protection system installations.
 - c. Minimum five (5) satisfactorily completed installations in past three (3) years of projects similar in size, scope, and complexity required for this project before bidding.
 - d. Be responsible for overseeing preparation of shop drawings, hydraulic calculations where applicable, and system installation.
 - e. Make complete inspection of installation.
 - f. Provide corrected record drawings to Owner with letter of acceptance.
 - g. Certify that installation is in accordance with Contract Documents.
 - h. Upon request, submit documentation.
 2. Installer:
 - a. Licensed for area of Project.
 - b. Minimum five (5) years experience in fire protection system installations.
 - c. Minimum five (5) satisfactorily completed installations in past three (3) years of projects similar in size, scope, and complexity required for this project before bidding.
 - d. Upon request, submit documentation.

PART 2 - PRODUCTS

2.1 SYSTEM

- A. Manufacturers:
 1. Manufacturer Contact List:

- a. Croker Corp, Elmsford, NY www.croker.com.
 - b. Gruvlock by Anvil International, Portsmouth, NH www.anvilintl.com.
 - c. HO Trerice Company, Oak Park, MI www.hotco.com.
 - d. Kennedy Valve, Elmira, NY www.kennedyvalve.com.
 - e. Milwaukee Valve Co, New Berlin, WI www.milwaukeevalve.com.
 - f. Mueller Company, Decatur, IL www.muellerflo.com.
 - g. Nibco Inc, Elkhart, IN www.nibco.com.
 - h. Notifier by Honeywell, Northford, CT www.notifier.com.
 - i. Potter Electric Signal Company, St. Louis, MO www.pottersignal.com.
 - j. Potter-Roemer, Cerritos, CA www.potterroemer.com.
 - k. Reliable Automatic Sprinkler Co, Mount Vernon, NY www.reliablesprinkler.com.
 - l. System Sensor, St Charles, IL www.systemsensor.com.
 - m. TYCO Fire & Building Products, Lansdale, PA www.tyco-fire.com.
 - n. Victaulic Company of America, Easton, PA or Victaulic Company of Canada, Rexdale, ON www.victaulic.com.
 - o. Viking Corp, Hastings, MI www.vikingcorp.com.
- B. Description:
1. Automatic wet-pipe fire sprinkler system starting at flange in Fire Riser Room and extending throughout heated portions of building.
 2. Cold attic areas and roof overbuild areas over Entry Lobbies and Vestibules protected with auxiliary anti-freeze system(s).
 3. Sprinklers not required in areas with fire-retardant treated wood.
 4. Dry sprinkler heads preferred over and into Vestibules.
- C. Performance:
1. Design Criteria:
 - a. Area of Application and Corresponding Design Density:
 - 1) Serving Area and Mechanical, Electrical, and Janitorial Areas:
 - a) Ordinary Hazard Group 1.
 - b) Design density = 0.15 gpm per sq ft over 1,500 sq ft (140 sq m).
 - 2) Storage Areas:
 - a) Ordinary Hazard Group 2.
 - b) Design density = 0.20 gpm per sq ft over 1,500 sq ft (140 sq m).
 - 3) All Other Areas:
 - a) Light Hazard.
 - b) Design density = 0.10 gpm per sq ft over 1,500 sq ft (140 sq m).
 - 4) Increase remote areas by 30 percent where ceiling / roof is sloped more than 2 inches (50 mm) per ft.
 - 5) Remote areas may be reduced within parameters indicated in NFPA 13 for use of quick response sprinklers throughout.
 - b. Maximum Coverage per Sprinkler Head:
 - 1) Ordinary Hazard Areas: 130 sq ft (12.1 sq meters).
 - 2) Attic Areas: 120 sq ft (11.2 sq meters).
 - 3) Light Hazard Areas: 225 sq ft (20.1 sq meters).
 - c. Design Area shall be hydraulically most remote area in accordance with NFPA 13.
 - 1) Provide a 10% safety allowance under adjusted water flow supply curve.
 - d. Maximum velocity of water flow within piping: 20 feet (6.1 m) per sec.
- D. Components:
1. General: Use only domestically manufactured cast iron pipe fittings, valves, sprinkler heads, and other components.
 - a. Pipe of foreign manufacture that meets ASTM Standards is acceptable.
 - b. Ductile iron fittings of foreign manufacture are acceptable.
 2. Pipe:
 - a. Schedule 40 Welded Steel:
 - 1) Exterior, Above Ground: Schedule 40 hot-dip galvanized welded steel meeting requirements of ASTM A53/A53M, ASTM A135/A135M or ASTM A795/A795M.
 - 2) Interior, Above Ground: Schedule 40 black welded steel meeting requirements of ASTM A53/A53M, ASTM A135/A135M or ASTM A795/A795M.

- 3) Connections:
 - a) **2 inches (50 mm)** And Smaller: Screwed, flanged, or roll grooved coupling system.
 - b) **2-1/2 inches (64 mm)** And Larger: Flanged or roll grooved coupling system.
- 3. Fittings:
 - a. Usage:
 - 1) **2 inches (50 mm)** And Smaller: Welded, screwed, flanged, or roll grooved coupling system. For use with schedule 40 carbon steel pipe.
 - 2) **2-1/2 inches (64 mm)** And Larger: Welded, flanged, or roll grooved coupling system.
 - b. Types And Quality:
 - 1) Screwed:
 - a) Cast iron meeting requirements of ANSI B16.4 or ductile iron meeting requirements of ANSI B16.3 and ASTM A536, Grade 65-45-12.
 - b) Threaded fittings and pipe shall have threads cut to ANSI B1.20.1.
 - c) Do not extend pipe into fittings to reduce waterway.
 - d) Ream pipe after cutting to remove burrs and fins.
 - 2) Flanged: Steel meeting requirements of ANSI B16.5.
 - 3) Welded:
 - a) Carbon steel meeting requirements of ASTM A234/A234M.
 - b) Weld pipe using methods complying with AWS B2.1, level AR-3. Welding procedures and performance of welders shall comply with AWS B2.1, level AR3.
 - 4) Roll Grooved Pipe Coupling System:
 - a) Ductile iron meeting requirements of ASTM A395/A395M and ASTM A536, and UL listed.
 - b) Grooved products used on Project shall be from same manufacturer. Grooving tools shall be as recommended by manufacturer of grooved products.
 - c) Category Four Approved Products: See Section 01 6200 for definition of Categories:

	Gruvlok	Tyco (Grinnell)	Victaulic
Rigid Couplings	7401	772	Style 005
Flexible Couplings ¹	7000	705	Style 75
Flange Adaptors ²	7012	71	Style 744
Grooved Coupling Gaskets ³	'E' EPDM	Grade 'E' EPDM	'E' EPDM ⁴

¹ Use in locations where vibration attenuation, stress relief, thermal expansion, or seismic design is required / needed.

² Class 125 or 150.

³ Temperature rated **30 to 150 deg F (minus one to plus 65 deg C)**. NSF-61 certified.

⁴ Grade 'A'.

- c. Use of saddle or hole cut type mechanical tees is **NOT APPROVED**.
- 4. Sprinkler Heads:
 - a. Concealed Pendant:
 - 1) Design Criteria:
 - a) Adjustable cover.
 - b) UL / CASA listed and approved.
 - c) Coordinate concealed cover finish with Fire Sprinkler Consultant.
 - 2) Type One Acceptable Products:
 - a) Wet Pendant, Flat Profile:
 - (1) Reliable: F4FR.
 - (2) Victaulic: Model 3802.
 - (3) Viking: Model VK462.
 - (4) Tyco (Grinnell): Model RF11.
 - (5) Equal as approved by Fire Sprinkler Consultant before bidding. See Section 01 6200.
 - b) Dry Pendant:

- (1) Flat Profile:
 - (a) Tyco (Grinnell): DS-C.
 - (b) Victaulic: V3618.
 - (2) Equal as approved by Fire Sprinkler Consultant before bidding. See Section 01 6200.
- b. Pendant Sprinklers:
- 1) Design Criteria:
 - a) UL / CASA listed and approved.
 - b) Where guards or escutcheons are required, use chrome plated sprinkler guards and escutcheons that are listed, that are approved by Sprinkler Manufacturer for use with head, and that are supplied by Sprinkler Manufacturer.
 - 2) Type One Acceptable Products:
 - a) Reliable: F1FR.
 - b) Tyco: TY-FRB.
 - c) Victaulic: Model V2704.
 - d) Viking: VK302.
 - e) Equal as approved by Fire Sprinkler Consultant before bidding. See Section 01 6200.

2.2 ACCESSORIES

- A. Manufacturers:
1. Manufacturer Contact List:
 - a. Anvil International, Portsmouth, NH www.anvilintl.com.
 - b. Eaton, Highland, IL www.cooperblineline.com.
- B. Hangers, Rods, And Clamps:
1. Design Criteria:
 - a. Galvanized, unless specified otherwise, and UL/CASA listed and labeled for service intended.
 - b. Hanger supports for sprinkler piping to conformance with NFPA 13.
 2. Class One Quality Standard:
 - a. Hangers and accessories shall be Anvil numbers specified or equals by B-Line by Eaton.
 - b. Pipe Ring Hangers: Equal to Anvil Fig 69.
 - c. Riser Clamps: Equal to Anvil Fig. 261.

PART 3 - EXECUTION

3.1 INSTALLERS

- A. Acceptable Installers. See Section 01 4301:
1. Meet Quality Assurance Installer Qualifications as specified in Part 1 of this specification.

3.2 EXAMINATION

- A. Drawings:
1. Fire Protection Drawings show general arrangement of piping. Follow as closely as actual building construction and work of other trades will permit. Install system so it drains.
 2. Consider Architectural and Structural Drawings part of this work insofar as these drawings furnish information relating to design and construction of building. These Drawings take precedence over Fire Protection Drawings.
 3. Because of small scale of Drawings, it is not possible to indicate all offsets, fittings, and accessories that may be required. Investigate structural and finish conditions affecting this work

and arrange work accordingly, providing such fittings, valves, and accessories required to meet conditions and to enable system to drain.

3.3 INSTALLATION

- A. Install sprinkler systems in accordance with requirements of latest edition of NFPA 13 and as specified below:
 - 1. Provide maintenance access to equipment.
 - 2. Conceal sprinkler lines installed in occupied areas.
 - 3. Install piping system, except for dry heads, so it will not be exposed to freezing temperatures.
 - 4. Do not use dropped, damaged, or used sprinkler heads.
 - 5. Brace and support system to meet seismic zone requirements for building site.

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 0553 IDENTIFICATION FOR PLUMBING PIPES AND EQUIPMENT
- 22 0719 PLUMBING PIPING INSULATION

22 1000 PLUMBING PIPES AND PUMPS

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

22 3000 PLUMBING EQUIPMENT

- 22 3413 INSTANTANEOUS, TANKLESS, GAS DOMESTIC WATER HEATERS

22 4000 PLUMBING FIXTURES

- 22 4213 COMMERCIAL WATER CLOSETS AND URINALS
- 22 4216 COMMERCIAL LAVATORIES AND SINKS
- 22 4700 DRINKING FOUNTAINS AND WATER COOLERS

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 8400: 'Firestopping' for quality of penetration firestop systems to be used on Project and submittal requirements.
 - 3. Section 07 9213: 'Elastomeric Joint Sealant' for quality at building exterior.
 - 4. Sections Under 09 9000 Heading: 'Paints And Coatings' for painting of plumbing items requiring field painting.
 - 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 Approvals:
1. Perform work in accordance with applicable provisions of Plumbing Codes applicable to Project. Provide materials and labor necessary to comply with rules, regulations, and ordinances.
 2. In case of differences between building codes, laws, local ordinances, utility company regulations, and Contract Documents, the most stringent shall govern. Notify Architect in writing of such differences before performing work affected by such differences.
 3. Identification:
 - a. Motor and equipment name plates as well as applicable UL / ULC and AGA / CGA labels shall be in place when Project is turned over to Owner.
- B. Qualifications. Requirements of Section 01 4301 applies, but not limited to following:
1. Plumbing Subcontractor:
 - a. Company specializing in performing work of this section.
 - 1) Minimum five (5) years experience in plumbing installations.
 - 2) Minimum five (5) satisfactorily completed installations in past three (3) years of projects similar in size, scope, and complexity required for this project before bidding.
 - b. Upon request, submit documentation.
 2. Installer:
 - a. Licensed for area of Project.
 - b. Designate one (1) individual as project foremen who shall be on site at all times during installation and experienced with installation procedures required for this project.
 - c. Upon request, submit documentation.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
1. Accept valves on site in shipping containers with labeling in place.
 2. Provide temporary protective coating on cast iron and steel valves.
 3. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- B. Storage And Handling Requirements:
1. In addition to requirements specified in Division 01, stored material shall be readily accessible for inspection by Architect until installed.
 2. Store items subject to moisture damage in dry, heated spaces.

1.5 WARRANTY

- A. Manufacturer Warranty:
 - 1. Provide certificates of warranty for each piece of equipment made out in favor of Owner.
- B. Special Warranty:
 - 1. Guarantee plumbing systems to be free from noise in operation that may develop from failure to construct system in accordance with Contract Documents.
 - 2. If plumbing sub-contractor with offices located more than 150 miles (240 km) from Project site is used, provide service / warranty work agreement for warranty period with local plumbing sub-contractor approved by Architect. Include copy of service / warranty agreement in warranty section of Operation And Maintenance Manual.

PART 2 - PRODUCTS

2.1 COMPONENTS

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

PART 3 - EXECUTION

3.1 INSTALLERS

- A. Acceptable Installers:
 - 1. Meet Quality Assurance Installer Qualifications as specified in Part 1 of this specification.

3.2 EXAMINATION

- A. Drawings:
 - 1. Plumbing Drawings show general arrangement of piping, equipment, etc. Follow as closely as actual building construction and work of other trades will permit.
 - 2. Consider Architectural and Structural Drawings part of this work insofar as these drawings furnish information relating to design and construction of building. These drawings take precedence over Plumbing Drawings.

3. Because of small scale of Drawings, it is not possible to indicate all offsets, fittings, and accessories that may be required. Investigate structural and finish conditions affecting this work and arrange work accordingly, providing such fittings, valves, and accessories required to meet conditions.
- B. Verification Of Conditions:
1. Examine premises to understand conditions that may affect performance of work of this Division before submitting proposals for this work. Examine adjoining work on which plumbing work is dependent for efficiency and report work that requires correction.
 2. Ensure that items to be furnished fit space available. Make necessary field measurements to ascertain space requirements including those for connections and furnish and install equipment of size and shape so final installation shall suit true intent and meaning of Contract Documents. If approval is received by Addendum or Change Order to use other than originally specified items, be responsible for specified capacities and for ensuring that items to be furnished will fit space available.
 3. Check that slots and openings provided under other Divisions through floors, walls, ceilings, and roofs are properly located. Perform cutting and patching caused by neglecting to coordinate with Divisions providing slots and openings at no additional cost to Owner.
 4. No subsequent allowance for time or money will be considered for any consequence related to failure to examine site conditions.
- C. Unforeseen Conditions:
1. Relocate/or remove and reinstall, any piping or plumbing fixtures or devices which are encountered during demolition which conflict with the new construction or which are to accommodate the new construction. The piping, devices, or fixtures are to be relocated to accommodate the new construction and service shall be maintained for its function. Remove device covers or fixtures which conflict with the new construction and reinstall the same after other trades have completed their work.

3.3 PREPARATION

- A. Changes Due To Equipment Selection:
1. Where equipment specified or otherwise approved requires different arrangement or connections from that shown in Contract Documents, submit drawings showing proposed installations.
 2. If proposed changes are approved, install equipment to operate properly and in harmony with intent of Contract Documents. Make incidental changes in piping, ductwork, supports, installation, wiring, heaters, panelboards, and as otherwise necessary.
 3. Provide additional motors, valves, controllers, fittings, and other equipment required for proper operation of systems resulting from selection of equipment.
 4. Be responsible for proper location of rough-in and connections provided under other Divisions.

3.4 INSTALLATION

- A. Interface With Other Work:
1. Furnish exact location of electrical connections and complete information on motor controls to installer of electrical system.
 2. Furnish sleeves, inserts, supports, and equipment that are to be installed by others in sufficient time to be incorporated into construction as work proceeds. Locate these items and confirm that they are properly installed.
- B. Cut carefully to minimize necessity for repairs to previously installed or existing work. Do not cut beams, columns, or trusses.
- C. Locating Equipment:
1. Arrange pipes and equipment to permit ready access to valves, cocks, unions, traps, and to clear openings of doors and access panels.

2. Adjust locations of pipes, equipment, and fixtures to accommodate work to interferences anticipated and encountered.
 3. Install plumbing work to permit removal of equipment and parts of equipment requiring periodic replacement or maintenance without damage to or interference with other parts of equipment or structure.
 4. Determine exact route and location of each pipe before fabrication.
 - a. Right-Of-Way:
 - 1) Lines that pitch shall have right-of-way over those that do not pitch. For example, plumbing drains shall normally have right-of-way.
 - 2) Lines whose elevations cannot be changed shall have right-of-way over lines whose elevations can be changed.
 - b. Offsets, Transitions, and Changes in Direction:
 - 1) Make offsets, transitions, and changes in direction in pipes as required to maintain proper head room and pitch of sloping lines whether or not indicated on Drawings.
 - 2) Furnish and install all traps, air vents, sanitary vents, and devices as required to effect these offsets, transitions, and changes in direction.
- D. Penetration Firestops:
1. Install Penetration Firestop System appropriate for penetration at plumbing systems penetrations through walls, ceilings, roofs, and top plates of walls.
- E. Sealants:
1. Seal openings through building exterior caused by penetrations of elements of plumbing systems.
 2. Furnish and install acoustical sealant to seal penetrations through acoustically insulated walls and ceilings.
- F. Furnish and install complete system of piping, valved as indicated or as necessary to completely control entire apparatus:
1. Pipe drawings are diagrammatic and indicate general location and connections. Piping may have to be offset, lowered, or raised as required or directed at site. This does not relieve this Division from responsibility for proper installation of plumbing systems.
 2. Arrange piping to not interfere with removal of other equipment, ducts, or devices, or block access to doors, windows, or access openings:
 - a. Arrange so as to facilitate removal of tube bundles.
 - b. Provide accessible flanges or ground joint unions, as applicable for type of piping specified, at connections to equipment and on bypasses.
 - 1) Make connections of dissimilar metals with di-electric unions.
 - 2) Install valves and unions ahead of traps and strainers. Provide unions on both sides of traps.
 - c. Do not use reducing bushings, bull head tees, close nipples, or running couplings. Street elbows are allowed only on potable water pipe **3/4 inch (19 mm)** in diameter and smaller.
 - d. Install piping systems so they may be easily drained
 - e. Install piping to insure noiseless circulation.
 - f. Place valves and specialties to permit easy operation and access. Valves shall be regulated, packed, and glands adjusted at completion of work before final acceptance.
 3. Do not install piping in shear walls.
 4. Cut piping accurately to measurements established at site. Remove burr and cutting slag from pipes.
 5. Work piping into place without springing or forcing. Make piping connections to pumps and other equipment without strain at piping connection. Remove bolts in flanged connections or disconnect piping to demonstrate that piping has been so connected, if requested.
 6. Make changes in direction with proper fittings.
 7. Expansion of Thermoplastic Pipe:
 - a. Provide for expansion in every **30 feet (9 meters)** of straight run.
 - b. Provide **12 inch (300 mm)** offset below roof line in each vent line penetrating roof.
 8. Expansion of PEX Pipe: Allow for expansion and contraction of PEX pipe as recommended by Pipe Manufacturer.
- G. Sleeves:

1. Do not place sleeves around soil, waste, vent, or roof drain lines passing through concrete slabs on grade.
2. Provide sleeves around pipes passing through concrete or masonry floors, walls, partitions, or structural members. Seal sleeves with specified sealants. Follow Pipe Manufacturer's recommendations for PEX pipe penetrations through studs and floor slabs.
3. Sleeves through floors shall extend **1/4 inch (6 mm)** above floor finish in mechanical equipment rooms above basement floor. In other rooms, sleeves shall be flush with floor.
4. Sleeves through floors and foundation walls shall be watertight.

H. Escutcheons:

1. Provide spring clamp plates where pipes run through walls, floors, or ceilings and are exposed in finished locations of building. Plates shall be chrome plated heavy brass of plain pattern and shall be set tight on pipe and to building surface.

3.5 REPAIR / RESTORATION

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

3.6 FIELD QUALITY CONTROL

A. Field Tests:

1. Perform tests on plumbing piping systems. Furnish devices required for testing purposes.

B. Non-Conforming Work:

1. Replace material or workmanship proven defective with sound material at no additional cost to Owner.
2. Repeat tests on new material, if requested.

3.7 CLEANING

A. Remove dirt, grease, and other foreign matter from each length of piping before installation:

1. After each section of piping used for movement of water or steam is installed, flush with clean water, except where specified otherwise.
2. Arrange temporary flushing connections for each section of piping and arrange for flushing total piping system.
3. Provide temporary cross connections and water supply for flushing and drainage and remove after completion of work.

B. Clean exposed piping, equipment, and fixtures. Remove stickers from fixtures and adjust flush valves.

3.8 CLOSEOUT ACTIVITIES

A. Instruction of Owner:

1. Instruct building maintenance personnel and Stake Physical Facilities Representative in operation and maintenance of plumbing systems utilizing Operation And Maintenance Manual when so doing.
2. Conduct instruction period after Substantial Completion inspection when systems are properly working and before final payment is made.

3.9 PROTECTION

- A. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system. Cap or plug open ends of pipes and equipment to keep dirt and other foreign materials out of system. Do not use plugs of rags, wool, cotton waste, or similar materials.

3.10 SEISMIC RESTRAINT

- A. Restrain all equipment and piping in compliance with the Authority Having Jurisdiction and the Building Code.

END OF SECTION

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SECTION 22 0529**HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Common hanger and support requirements and procedures for plumbing systems.
- B. Products Installed But Not Furnished Under This Section:
 - 1. Paint identification for gas piping used in HVAC equipment.
- C. Related Requirements:
 - 1. Section 05 0523: 'Metal Fastening' for quality and requirements for welding.
 - 2. Section 07 8400: 'Firestopping' for quality of Penetration Firestop Systems to be used on Project and submittal requirements.
 - 3. Sections Under 09 9000 Heading: Painting of mechanical items requiring field painting.
 - 4. Slots and openings through floors, walls, ceilings, and roofs provided under other Divisions in their respective materials.
 - 5. Section 23 0529: 'Hangers And Supports For HVAC Piping And Equipment' for gas piping used with HVAC equipment.
 - 6. Section 23 0553: 'Identification For HVAC Piping And Equipment' for paint identification of gas piping used with HVAC equipment.

1.2 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Manufacturer's catalog data for each manufactured item.

PART 2 - PRODUCTS**2.1 ASSEMBLIES**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Anvil International, Portsmouth, NH www.anvilintl.com.
 - b. Cooper B-Line, Highland, IL www.b-line.com.
 - c. Unistrut, Wayne, MI www.tyco-unistrut.com.
- B. Materials:
 - 1. Hangers, Rods, And Inserts
 - a. Galvanized and UL approved for service intended.
 - b. Support horizontal piping from hangers or on roller assemblies with channel supports, except where trapeze type hangers are explicitly shown on Drawings. Hangers shall have double nuts.
 - 1) Support insulated pipes 2 inches (in diameter and smaller with adjustable swivel ring hanger with insulation protection shield. Gauge and length of shield shall be in accordance with Anvil design data.
 - a) Type Two Acceptable Products:
 - (1) Swivel Ring Hanger: Anvil Fig. 69.
 - (2) Insulation Protection Shield: Anvil Fig. 167.

- (3) Equals by Cooper B-Line.
- 2) Support insulated pipes 2-1/2 inches (in diameter and larger with clevis hanger or roller assembly with an insulation protection shield. Gauge and length of shield shall be according to Anvil design data.
 - a) Type Two Acceptable Products:
 - (1) Clevis Hanger: Anvil Fig. 260.
 - (2) Roller Assembly: Anvil Fig. 171.
 - (3) Insulation Protection Shield: Anvil Fig. 167.
 - (4) Equals by Cooper B-Line.
- 3) Support uninsulated copper pipe 2 inches (in diameter and smaller from swivel ring hanger, copper plated and otherwise fully suitable for use with copper tubing. Support non-copper uninsulated pipes from swivel ring hanger.
 - a) Type Two Acceptable Products:
 - (1) Swivel Ring Hanger For Copper Pipe: Anvil Fig. CT-69.
 - (2) Swivel Ring Hanger For Other Pipe: Anvil Fig. 69.
 - (3) Equals by Cooper B-Line.
- 4) Support uninsulated copper pipe 2-1/2 inches (in diameter and larger from clevis hanger, copper plated hangers and otherwise fully suitable for use with copper tubing. Support non-copper uninsulated pipes from clevis hanger.
 - a) Type Two Acceptable Products:
 - (1) Clevis Hanger For Copper Pipe: Anvil Fig. CT-65.
 - (2) Clevis Hanger For Other Pipe: Anvil Fig. 260.
 - (3) Equals by Cooper B-Line.
- c. Support rods for single pipe shall be in accordance with following table:

Rod Diameter	Pipe Size
3/8 inch	2 inches and smaller
1/2 inch	2-1/2 to 3-1/2 inches

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

Rods		Number of Pipes per Hanger for Each Pipe Size						
Number	Diameter	2 Inch	2.5 Inch	3 Inch	4 Inch	5 Inch	6 Inch	8 Inch
2	3/8 Inch	Two	0	0	0	0	0	0
2	1/2 Inch	Three	Three	Two	0	0	0	0

- 1) Size trapeze angles so bending stress is less than 10,000 psi.
- e. Riser Clamps For Vertical Piping:
 - 1) Type Two Acceptable Products:
 - a) Anvil Fig. 261.
 - b) Equals by Cooper B-Line.
- f. Steel Deck Bracket:
 - 1) Class Two Quality Standard: Equal to Unistrut P1000 with clamp nut, minimum 6 inch length.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Piping:
 - 1. Properly support piping and make adequate provisions for expansion, contraction, slope, and anchorage.
 - a. Except for underground pipe, suspend piping from roof trusses or clamp to vertical walls using Unistrut and clamps. Do not hang pipe from other pipe, equipment, or ductwork. Laying of piping on any building element is not allowed.

- b. Supports For Horizontal Piping:
 - 1) Support metal piping at 96 inches on center maximum for pipe 1-1/4 inches or larger and 72 inches on center maximum for pipe 1-1/8 inch or less.
 - 2) Support thermoplastic pipe at 48 inches on center maximum.
 - 3) Support PEX pipe at 32 inches minimum on center.
 - 4) Provide support at each elbow. Install additional support as required.
 - c. Supports for Vertical Piping:
 - 1) Place riser clamps at each floor or ceiling level.
 - 2) Securely support clamps by structural members, which in turn are supported directly from building structure.
 - 3) Provide clamps as necessary to brace pipe to wall.
 - d. Attach Unistrut to structural steel roof supporting structure. Spacing and support as described above.
 - e. Insulate hangers for copper pipe from piping by means of at least two layers of Scotch 33 plastic tape.
2. Gas piping Identification:
- a. Apply paint identification for gas piping used with HVAC equipment as specified in Section 23 0553.

END OF SECTION

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SECTION 22 0553**IDENTIFICATION FOR PLUMBING PIPES AND EQUIPMENT****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install identification of plumbing piping and equipment as described in Contract Documents.

PART 2 - PRODUCTS**2.1 SYSTEM**

- A. Materials:
 - 1. Labels:
 - a. Equipment Identification:
 - 1) Black formica, with white reveal when engraved.
 - 2) Lettering to be **3/16 inch (5 mm)** high minimum.
 - 2. Paint:
 - a. One Coat Primer:
 - 1) 6-2 Quick Drying Latex Primer Sealer over fabric covers.
 - 2) 6-205 Metal Primer under dark color paint.
 - 3) 6-6 Metal Primer under light color paint.
 - b. Finish Coats: Two coats 53 Line Acrylic Enamel.
 - c. Performance Standard: Paints specified are from Pittsburgh Paint & Glass (PPG), Pittsburgh, PA www.pittsburghpaints.com or PPG Canada Inc, Mississauga, ON (800) 263-4350 or (905) 238-6441.
 - d. Type Two Acceptable Products. See Section 01 6200.
 - 1) Paint of equal quality from following Manufacturers may be submitted for Architect's approval before use. Maintain specified colors, shades, and contrasts.
 - a) Benjamin Moore, Montvale, NJ www.benjaminmoore.com or Toronto, ON (800) 304-0304 or (416) 766-1176.
 - b) ICI Dulux, Cleveland, OH or ICI Paints Canada Inc, Concord, ON www.dulux.com.
 - c) Sherwin Williams, Cleveland, OH www.sherwin-williams.com.

PART 3 - EXECUTION**3.1 APPLICATION**



- A. Labels:
 - 1. Identify following items with specified labels fastened to equipment with screws (unless noted otherwise):
 - a. Water Heaters.
 - 2. Engrave following data from Equipment Schedules on Drawings onto labels:
 - a. Equipment mark.
 - b. Room(s) served.
 - c. Panel and breaker from which unit is powered.
- B. Painting:
 - 1. Only painted legends, directional arrows, and color bands are acceptable.

2. Locate identifying legends, directional arrows, and color bands at following points on exposed piping of each piping system:
 - a. Adjacent to each item of equipment.
 - b. At point of entry and exit where piping goes through wall.
 - c. On each riser and junction.
 - d. Every 25 feet (7.6 m) on long continuous lines.
 - e. Stenciled symbols shall be one inch high and black.

3.2 ATTACHMENTS

A. Schedules:

1. Pipe Identification Schedule:
 - a. Apply stenciled symbols as follows:

Pipe Use	Abbreviation	Direction of Flow
Domestic Cold Water	CW	
Domestic Hot Water	HW	

END OF SECTION

SECTION 22 0719

PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To:
 - 1. Furnish and install insulation on hot and cold water lines, fittings, valves, and accessories as described in Contract Documents.
 - 2. Furnish and install insulation on roof 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		
	Up to 1-1/4 In	1-1/2 to 2 In	Over 2 In
45 - 130 Deg F	1/2 In	1/2 In	One In
 - 3) Performance Standards: Fiberglas ASJ by Owens-Corning.
 - 4) Type One Acceptable Manufacturers:
 - a) Childers Products.
 - b) Knauf.
 - c) Manson.
 - d) Owens-Corning.
 - e) Johns-Manville.
 - f) Equal as approved by Architect before bidding. See Section 01 6200.
 - b. Fitting, Valve, And Accessory Covers:
 - 1) PVC.
 - 2) Performance Standard: Zeston by Johns-Manville.

- 3) Type One Acceptable Manufacturers:
 - a) Knauf.
 - b) Speedline.
 - c) Johns-Manville.
 - d) Equal as approved by Architect before bidding. See Section 01 6200.
2. Below Grade Metal Piping:
 - a. Insulation:
 - 1) 1/2 inch thick.
 - 2) Category Four Acceptable Products. See Section 01 6200 for definition of Categories:
 - a) SS Tubolit by Armacell.
 - b) ImcoLock by Imcoa.
 - c) Nomalock or Therma-Cel by Nomaco.
 - b. Joint Sealant:
 - 1) Category Four Acceptable Products. See Section 01 6200 for definition of Categories:
 - a) Armacell 520.
 - b) Nomaco K-Flex R-373.
3. Pex Piping, Above And Below Grade:
 - a. Insulation:
 - 1) 1/2 inch thick.
 - 2) Category Four Acceptable Products. See Section 01 6200 for definition of Categories:
 - a) SS Tubolit by Armacell.
 - b) ImcoLock by Imcoa.
 - c) Nomalock or Therma-Cel by Nomaco.
 - b. Joint Sealant:
 - 1) Category Four Acceptable Products. See Section 01 6200 for definition of Categories:
 - a) Armacell 520.
 - b) Nomaco K-Flex R-373.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Above Grade Piping:
 1. Apply insulation to clean, dry piping with joints tightly butted.
 2. Install insulation in manner to facilitate removal for repairs. Place sections or blocks so least possible damage to insulation will result from inspection or repairs of piping or equipment.
 3. Adhere 'factory applied vapor barrier jacket lap' smoothly and securely at longitudinal laps with white vapor barrier adhesive. Adhere 3 inch wide self-sealing butt joint strips over end joints.
 4. Fittings, Valves, And Accessories:
 - a. Insulate with same type and thickness of insulation as pipe, with ends of insulation tucked snugly into throat of fitting and edges adjacent to pipe insulation tufted and tucked in.
 - b. Cover insulation with one piece fitting cover secured by stapling or taping ends to adjacent pipe covering.
 - 1) Alternate Method: Insulate fittings, valves, and accessories with one inch of insulating cement and vapor seal with two 1/8 inch wet coats of vapor barrier mastic reinforced with glass fabric extending 2 inches onto adjacent insulation.
 5. Pipe Hangers:
 - a. Do not allow pipes to come in contact with hangers.
 - b. Provide 16 ga by 6 inch long galvanized shields at each pipe hanger to protect pipe insulation from crushing by clevis hanger.
 6. Pipe Hangers:
 - a. Do not allow pipes to come in contact with hangers.
 - b. Pipe Shield:
 - 1) Provide schedule 40 PVC by 6 inch (150 mm) long at each clevis and/or unistrut type hanger.
 - 2) Provide 16 ga by 6 inch long galvanized shields at each pipe hanger to protect pipe insulation from crushing by clevis hanger.

- 3) Provide 22 ga by 6 inch long galvanized shield at each pipe hanger to protect insulation from crushing by Unistrut type hanger.

B. Below Grade Piping:

1. Slip underground pipe insulation onto pipe and seal butt joints.
2. Where slip-on technique is not possible, slit insulation, apply to pipe, and seal seams and joints.

END OF SECTION

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

- A. Includes But Not Limited To:
 - 1. Furnish and install potable water piping and connect to existing lines complete with necessary valves, connections, and accessories inside building 1 500 mm as described in Contract Documents. Field verify existing piping as required.
- B. Related Requirements:
 - 1. Section 22 0501: 'Common Piping Requirements'.
 - 2. Section 22 0719: 'Plumbing Piping Insulation'.

1.2 REFERENCES

- A. Reference Standards:
 - 1. American 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'.
 - 2. 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'.
 - 3. NSF International Standard:
 - a. NSF P171, 'Protocol for Chlorine Resistance of Plastic Piping Materials' (1999).
 - 4. 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 SUBMITTALS

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

1.4 QUALITY ASSURANCE

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

PART 2 - PRODUCTS

2.1 SYSTEMS

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Cash Acme, Cullman, AL www.cashacme.com
 - b. Cla-Val Company, Costa Mesa, CA or Cla-Val Canada Ltd, Beamsville, ON www.cla-val.com.
 - c. Conbraco Industries Inc, Matthews, NC www.conbraco.com or Conbraco (Honeywell Ltd), Scarborough, ON (416) 293-8111.
 - d. Hammond Valve, New Berlin, WI www.hammondvalve.com.
 - e. Handy & Harmon Products Div, Fairfield, CT www.handyharmon.com or Handy and Harmon of Canada Ltd, Rexdale, ON (800) 463-1465 or (416) 675-1860.
 - f. Harris Products Group, Cincinnati, OH www.harrisproductsgroup.com.
 - g. Honeywell Inc, Minneapolis, MN www.honeywell.com.
 - h. Leonard Valve Co, Cranston, RI www.leonardvalve.com.
 - i. Milwaukee Valve Co, New Berlin, WI www.milwaukeevalve.com.
 - j. Nibco Inc, Elkhart, IN www.nibco.com.
 - k. Rehau, Leesburg, VA www.rehau-na.com.
 - l. Sloan Valve Co, Franklin Park, IL www.sloanvalve.com.
 - m. Spence Engineering Co, Walden, NY www.spenceengineering.com.
 - n. Uponor Inc, Apple Valley, MN www.uponor-usa.com.
 - o. Viega ProPress, Wichita, KS www.viega-na.com.
 - p. Watts Regulator Co, Andover, MA www.wattsreg.com.
 - q. Wilkins (Zurn Wilkins), Paso Robles, CA www.zurn.com.
 - r. Zurn PEX, Inc., Commerce, TX www.zurnpex.com.
 - B. Materials:
 - 1. Design Criteria:
 - a. All drinking water products, components, and materials above and below grade used in drinking water systems must meet NSF International Standards for Lead Free.
 - b. No CPVC allowed.
 - 2. Pipe:
 - a. Copper:
 - 1) Above-Grade:
 - a) Meet requirements of ASTM B88, Type L.
 - 2) Below-Grade:
 - a) Meet requirements of ASTM B88, Type K. **3/4 inch (19 mm)** minimum under slabs.
 - b) **2 inches (50 mm)** And Smaller: Annealed soft drawn.
 - b. Cross-Linked Polyethylene (PEX):
 - 1) Certified with NSF International against NSF Standards NSF/ANSI 14, NSF/ANSI 61, NSF/ANSI 372, and NSF P171 Protocol.
 - 2) Copper tube size (CTS) outside dimensions and Standard Dimension Ratio (SDR) of 9.
 - 3) Pressure rated for **160 psi (1.10 MPa)** at **73 deg F (22.8 deg C)**, **100 psi (0.69 MPa)** at **180 deg F (82 deg C)**, and **80 psi (0.552 MPa)** at **200 deg F (93 deg C)**.
 - 4) Marked with Manufacturer's name, design pressure and temperature ratings, and third party certification stamp for NSF-PW.
 - 5) Manufactured by Engel or peroxide method (PEX-A) or by silane method (PEX-B).

- 6) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) Raupex by Rehau.
 - b) Wirsbo Aquapex by Uponor.
 - c) ViegaPEX by Viega.
 - d) Zurn PEX by Zurn PEX.
3. Fittings:
 - a. For Copper Pipe: Wrought copper.
 - b. For PEX Pipe:
 - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) Everloc by Rehau.
 - b) Viega PEX Press Zero Lead Fittings with attached stainless steel sleeves or Viega PEX Press Radel-R Polymer with attached stainless steel sleeves by Viega.
 - c) ProPEX fittings by Uponor including EP flow-through multiport tees.
 - d) Zurn PEX XL, DZR and CR fittings.
4. Connections For Copper Pipe:
 - a. Above-Grade:
 - 1) Sweat copper type with 95/5 or 96/4 Tin-Antimony solder, Bridgit solder, or Silvabrite 100 solder. Use only lead-free solder.
 - 2) Viega ProPress System
 - b. Below Grade:
 - 1) Brazed using following type rods:
 - a) Copper to Copper Connections:
 - (1) AWS Classification BCuP-4 Copper Phosphorus (6 percent silver).
 - (2) AWS Classification BCuP-5 Copper Phosphorus (15 percent silver).
 - 2) Copper to Brass or Copper to Steel Connections: AWS Classification BA5-Silver (45 percent silver).
 - 3) Do not use rods containing Cadmium.
 - 4) Brazing Flux:
 - a) Approved Products:
 - (1) Stay-Silv white brazing flux by Harris Product Group.
 - (2) High quality silver solder flux by Handy & Harmon.
 - 5) Joints under slabs acceptable only if allowed by local codes.
5. Ball Valves:
 - a. Use ball valves exclusively unless otherwise specified. Ball valves shall be by single manufacturer from approved list below.
 - b. Valves shall be two-piece, full port for **150 psi (1.03 MPa)** SWP.
 - 1) Operate with flow in either direction, suitable for throttling and tight shut-off.
 - 2) Body: Bronze, **150 psig (1.03 MPa)** wsp at **350 deg F (177 deg C)** and **400 psig (2.76 MPa)** wog.
 - 3) Seat: Bubble tight at **100 psig (0.69 MPa)** under water.
 - c. Class One Quality Standard: Nibco T585 or S585.
 - 1) Equal by Conbraco 'Apollo,' Hammond, Milwaukee, or Watts.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Locate cold water lines a minimum of **6 inches (150 mm)** from hot water line.

3.2 FIELD QUALITY CONTROL

- A. Field Tests:
 1. Before pipes are covered, test systems in presence of Architect/Engineer at **125 psig (0.86 MPa)** hydrostatic pressure for four (4) hours and show no leaks.
 2. Disconnect equipment not suitable for **125 psig (0.86 MPa)** pressure from piping system during test period.

3.3 CLEANING

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

END OF SECTION

SECTION 22 1313**FACILITY SANITARY SEWERS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
1. Furnish and install soil, waste, and vent piping systems and connect with existing waste and vent lines as described on bid documents. Field verify existing piping as required
 2. Perform excavation and backfill required by work of this Section.
- B. Related Requirements:
1. Sections Under 07 3000 Heading: Furnishing and installing of roof jacks and pipe flashing at roof.
 2. Section 07 8400: 'Firestopping' for quality of firestopping material.
 3. Section 22 0501: 'Common Plumbing Requirements'.
 4. Section 22 1319: 'Facility Sanitary Sewer Specialties' for furnishing of sewer specialties.
 5. Section 31 2316: 'Excavation' for criteria for performance of excavation.
 6. Section 31 2323: 'Fill' for criteria for performance of backfill and compaction.

1.2 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. Multiple materials have been listed for Contractor's reference. Do not mix PVC and ABS on project.
 - b. Minimum size of waste piping installed under floor slab on grade shall be **2 inches (50 mm)**.
- C. Materials:
 - 1. PVC Piping And Fittings: PVC Schedule 40 cellular core plastic pipe and pipe fittings meeting requirements of ASTM F891, joined using cement primer meeting requirements of ASTM F656 and pipe cement meeting requirements of ASTM D2564.
 - a. Furnish wall cleanouts with chrome wall cover and screw.
 - 2. ABS 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.
 - 3. Metal 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.
4. Metal 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.
5. Metal 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.
6. Cleanouts for Metal Piping:
- 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) Resilient Flooring:
 - a) Josam: 56010-12.
 - b) J. R. Smith: 4140.
 - c) Mifab: C1100C-T-1.
 - d) Wade: W-6000-T.
 - e) Watts: CO-200-T.
 - f) Zurn: Z-1400.
 - 3) 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.
 - 4) Exposed Drain Lines:
 - a) Josam: 58910.
 - b) J. R. Smith: 4510.
 - c) Mifab: C1460.
 - d) Wade: W8560B.
 - e) Watts: CO-460.
 - f) Zurn: Z-1440.
 - 5) 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.
- 6) 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. Floor Drains:

- 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) Trap guard by Proset Systems. Provide model number to match floor drain.
 - b) Trap seal by Sureseal. Provide model number to match floor drain.

PART 3 - EXECUTION: Not Used

END OF SECTION

SECTION 22 3413**INSTANTANEOUS, TANKLESS, GAS DOMESTIC WATER HEATERS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install gas-fired tankless water heaters as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 22 0501: 'Common Plumbing Requirements'.
 - 2. Section 22 1116: 'Domestic Water Piping'.
 - 3. Section 23 1123: 'Facility Natural Gas Piping'.
 - 4. Section 23 5135: 'Air Piping'.

1.2 REFERENCES

- A. Reference Standards:
 - 1. ASTM International:
 - a. ASTM D1785-12, 'Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120'.
 - b. ASTM D2564-12, 'Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems'.
 - c. ASTM D2661-11, 'Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings'.
 - d. ASTM D2665-12, 'Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings'.
 - 2. NSF International Standard / American National Standards Institute:
 - a. NSF/ANSI 61-2012, 'Drinking Water System Components - Health Effects'.
 - b. NSF/ANSI 372-2011, 'Drinking Water System Components - Lead Content'.

1.3 SUBMITTALS

- A. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Operations and Maintenance Data:
 - 1) Maintenance and operational instructions.
 - b. Warranty Documentation:
 - 1) Final, executed copy of Warranty.
 - c. Record Documentation:
 - 1) Manufacturers documentation:
 - a) Manufacturer's literature or cut sheet.

1.4 QUALITY ASSURANCE

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

1.5 WARRANTY

- A. Manufacturer Warranty:
 - 1. Direct Vent Water Heater:
 - a. 10-year factory warranty on heat exchanger and 3 years on other parts.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

- A. Design Criteria:
 - 1. All (wetted) drinking water products, components, and materials used in drinking water systems must meet NSF International Standards for Lead Free.
- B. Direct Vent
 - 1. Include vent package and direct vent termination kit for complete vent installation.
 - 2. All domestic water wetted components must be Lead Free and certified to NSF Lead Free standards.
 - 3. Category Four Approved Products. See Section 01 6200 for definition of Categories:
 - a. Meetinghouse without Font:
 - 1) NPE 180A(Pb or NPE 180S by Navien , Irvine CA, www.NavienAmerica.com:
 - a) Attn: Holly Stubbs at McGregor & Associates 801-860-4997 or holly@mcgregor-assoc.com.
 - 2) Model NRC1111-DV or NRC98DV by Noritz, distributed by Franklin James Company, Sandy, UT.
 - a) Attn: Mark Evans, cell (801) 558-3142 mark@franklinjames.com.
 - 3) Model RU98i (REU-KB3237FFUD-US) by Rinnai-MJM Associates Inc, Herriman, UT:
 - a) Attn: Colin Schmidt www.foreverhotwater.com.
 - 4) Model T-H3-DV by Takagi, Irvine, CA www.takagi.com.

2.2 ACCESSORIES

- A. PVC Flue Piping (Instantaneous Tankless Water Heaters):
 - 1. Manufacturer Contact List:
 - a. Armaflex by Armacell, Mebane, NC www.armaflex.com.
 - b. Nomaco, Youngsville, NC www.nomacokflex.com.
 - 2. Flue:
 - a. Air Piping: Schedule 40 pipe and fittings meeting requirements of ASTM D1785, ASTM D2661, or ASTM D2665.
 - b. Piping Primer And Cement.
 - a) Meet requirements of ASTM D2564.
 - b) Use PVC solvent cement that has a VOC content of 510 g/L or less if local required by local AHJ.
 - c) Use adhesive primer that has a VOC content of 550 g/IL or less if local required by local AHJ.
 - c. Flexible Foamed Pipe Insulation:
 - 1) Thickness:
 - a) **1/2 inch (13 mm)** for **2 through 3 inch (50 through 75 mm)** outside diameter pipe.
 - b) **1/2 inch (13 mm)** sheet for fittings as recommended by Manufacturer.
 - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) Tubolit by Armaflex.
 - b) ImcoLock or Therma-Cel by Nomaco K-Flex.
 - d. Insulation Joint Sealer:
 - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) 520 by Armaflex.
 - b) R-320 by Nomaco K-Flex.

- B. Stainless Steel Flues (Instantaneous Tankless Water Heaters):
1. Manufacturer Contact List:
 - a. Double wall, factory-fabricated Category III type.
 - 1) Armaflex by Armacell, Mebane, NC www.armacell.com.
 - 2) Nomaco, Youngsville, NC www.nomacoflex.com.
 2. Flue:
 - a. Design Criteria:
 - 1) Double wall, factory-fabricated Category III type.
 - 2) AL-29-4C stainless steel inner conduit and Type 430 stainless steel outer jacket.
 - 3) Inspection cap, condensate drain, and roof flashing. Provide horizontal, vertical, and roof support.
 - 4) Seal joints as recommended by Flue Manufacturer.
 - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Saf-T Vent C1 by Heat-Fab.
 - 2) Fasnseal W2 by Protech Systems.
 - 3) Z-Vent III by Z-Flex (US).

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Water Heaters:
1. Water heaters shall each have relief valve sized to match heat input and set to relieve at 120 psi (827 kPa).
 2. Install temperature-pressure relief valve on hot water heater and pipe discharge directly above funnel of floor drain.
 3. Provide mixing valve at all water heater installations as specified in Section 22 1116.
- B. Vent:
1. Vent package and direct vent termination to be installed per Manufacturer's recommendations.
 2. PVC Flue Piping:
 - a. General:
 - 1) Run individual vent and individual combustion intake piping from each water heater to roof termination as recommended by Water Heater Manufacturer. Concentric roof termination kit may be used if approved by and provided by Water Heater Manufacturer. Slope lines downward toward water heater.
 - 2) Slope combustion chamber exhaust drain downward to floor drain.
 - b. Support:
 - 1) Support concentric roof termination kit at ceiling or roof line with 20 ga (0.95 mm) sheet metal straps as detailed on Drawings.
 - 2) Support horizontal sections of pipe in accordance with requirements of Section 23 0501. Anchor securely to structure, not allowing pipe to sway.
 - c. Insulation:
 - 1) General:
 - a) Install insulation in snug contact with pipe and in accordance with Manufacturer's recommendations.
 - b) Slip insulation on piping before piping sections and fittings are assembled keeping slitting of insulation to a minimum.
 - c) Joints:
 - (1) Place 'slit' joint seams of insulation exposed outside building on bottom of pipe.
 - (2) Stagger joints on layered insulation.
 - (3) Seal joints in insulation.
 - d) Paint exterior exposed insulation with two coats of finish recommended by Insulation Manufacturer, color selected by Architect.
 3. Stainless Steel Flues (Instantaneous Tankless Water Heaters):
 - a. General:

- 1) Height of flue above roof shall be as shown on Drawings unless local code requires it be higher.
- 2) Length of horizontal flues or flue connectors shall not be longer than 75 percent of height of vertical flue between point at which horizontal flue enters vertical flue to top of vertical flue. In no case shall horizontal run exceed **15 feet (4.57 m)**.
- 3) Every portion of flue connector shall have rise of **one inch (25 mm)** per **1 foot (300 mm)** minimum from appliance to vertical flue.

3.2 ADJUSTING

- A. Adjust gas input pressure to be between **6 and 7 inches (150 and 180 mm)** of water column at regulator inlet. Adjust burner manifold pressure to **4.3 inches (110 mm)** of water column on down stream side of gas regulator.

END OF SECTION

SECTION 22 4213**COMMERCIAL WATER CLOSETS AND URINALS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install plumbing fixtures as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 07 9213: 'Elastomeric Joint Sealants' for sealants used between fixtures and other substrates.
 - 2. Section 22 0501: 'Common Plumbing Requirements'.
 - 3. Section 22 1116: 'Domestic Water Piping'.

1.2 REFERENCES

- A. Definitions:
 - 1. High-Efficiency Toilet (HET): Toilets with effective flush volume of 1.28 gallons (4.8 liters) or less.
 - 2. Maximum Performance (MaP): Toilet testing that rates toilet efficiency and flush performance by measuring number of grams of solid waste (soybean paste and toilet paper) that a toilet can flush and remove completely from fixture in single flush represented as a scale or score. 1000 grams is highest score possible (www.map-testing.com).
- B. Reference Standards:
 - 1. American Society of Mechanical Engineers / CSA Group (Canadian Standards Association):
 - a. ASME A112.19.2-2013/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. Bemis Manufacturing Co, Sheboygan Falls, WI www.bemismfg.com.
 - c. Beneke by Sanderson Plumbing Products, Columbus, MS www.sppi.com.
 - d. Church Seat Co, Sheboygan Falls WI www.churchseats.com.
 - e. Gerber Plumbing Fixtures LLC, Woodridge, IL www.gerberonline.com.
 - f. Kohler Co Plumbing Div, Kohler, WI www.us.kohler.com.
 - g. McGuire Manufacturing Co, Cheshire, CT www.mcguiremfg.com.
 - h. Olsonite Corp, Newnan, GA www.olsonite.net or Olsonite Co Ltd, Tilbury, ON (519) 682-1240.

- i. Toto U.S.A., Inc., Morrow, GA www.totousa.com
 - j. Zurn Industries, LLC, Erie PA www.zurn.com. or Zurn Industries Ltd, Mississauga, ON (905) 795-8844.
- B. Performance:
1. Design Criteria:
 - a. Meet or exceed ASME A112.19.2/CSA B45.1 for Vitreous China Plumbing Fixtures.
 - b. Interior exposed pipe, valves, and fixture trim, including trim behind custom casework doors, shall be chrome plated.
 - c. All materials NOT required to be low lead compliant.
 - d. Do not use toilets with effective flush volume of less than **1.28 gallons (4.8 liters)**.
- C. Materials:
1. Water Closets:
 - a. Floor Mounted With Tank:
 - 1) HET (High-Efficiency Toilet) - Standard Fixture: **WC-1**
 - a) Water usage of **1.28 gallons (4.8 liters)** per flush.
 - b) MaP Score of 1000 grams.
 - c) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (1) American Standard: Cadet 3 Elongated 215CA.004.
 - (2) Gerber: Avalanche WS-21-812.
 - (3) Kohler: Wellworth K-3948.
 - (4) Toto: 'ECO Drake' CST744E.or CST744EG.
 - 2) HET (High-Efficiency Toilet) - Handicap Accessible Fixture: **WC-2**
 - a) Water usage of **1.28 gallons (4.8 liters)** per flush.
 - b) **18 inch (450 mm)** maximum rim height.
 - c) MaP Score of 1000 grams.
 - d) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (1) American Standard: Cadet Pro Right Height Elongated 215AA.104.
 - (2) Gerber: Avalanche WS-21-818.
 - (3) Kohler: Highline K-3949.
 - (4) Toto: 'ADA Drake' CST744EL.
 - a. Seats:
 - 1) Provide split front type with check hinge.
 - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) Standard And Handicap Accessible Fixtures:
 - (1) American Standard: 5905.100SS.
 - (2) Bemis: 1655SSC.
 - (3) Beneke: 527 SS.
 - (4) Church: 9500SSC.
 - (5) Kohler: K-4731-C.
 - (6) Olsonite: 95SSC.
 - (7) Toto SC534.
 - b. Supply Pipe And Stop:
 - 1) Provide chrome plated quarter-turn brass ball valve, **12 inch (300 mm)** braided stainless steel riser, and chrome-plated steel flange.
 - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) McGuire: BV2166CC.
 - b) Zurn: Z8804.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Install each fixture with separate vent line. Do not circuit vent.
- B. Provide each individual fixture supply with accessible chrome-plated stop valve with hand wheel.
- C. Water Closets:
 - 1. Mounting:
 - a. ADA Accessible: Install with flush actuator located on wide side of stall.
 - 2. Floor 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.

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. Chicago Faucet Co, Des Plaines, IL www.chicagofaucets.com.
- d. Dearborn Brass, Tyler, TX www.dearbornbrass.com.
- e. Delta Faucet Co, Indianapolis, IN www.deltafaucet.com or Delta Faucet Canada, London, ON (519) 659-3626.
- f. Gerber Plumbing Fixtures LLC, Woodridge, IL www.gerberonline.com.
- g. Josam Co, Michigan City, IN www.josam.com.
- h. Jay R. Smith Manufacturing Co, Montgomery, AL www.jrsmith.com.
- i. Keeney Manufacturing Co, Newington, CT www.keeneymfg.com.
- j. Kohler Co Plumbing Div, Kohler, WI www.us.kohler.com.
- k. McGuire Manufacturing Co, Cheshire, CT www.mcguiremfg.com.
- l. Mifab Manufacturing Inc, Amherst, NY www.mifab.com.
- m. Moen Incorporated, North Olmsted, OH, or Moen Canada, Oakville, ON www.moen.com.
- n. Omni Flow Controls, Harbor City, CA www.chronomite.com or www.omniflowcontrols.com.
- o. Plumberex Specialty Products, Palm Springs, CA www.plumberex.com.
- p. Speakman Company, New Castle, DE www.speakmancompany.com.
- q. T & S Brass & Bronze Works Inc, Travelers Rest, SC www.tsbrass.com.
- r. TrueBro Inc, Collierville, TN www.truebro.com.
- s. Wade Div Tyler Pipe, Tyler, TX www.wadedrains.com.
- t. Zurn Commercial Brass, Sanford, NC www.zurn.com or Zurn Industries Ltd, Mississauga, ON (905) 795-8844.
- u. 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. ADA Accessible Self Supporting Lavatories: **L-1**
 - 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 ADA Accessible Sinks:
 - a) Design Criteria:

- (1) Meet NSF International Standards for Lead Free.
- b) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (1) American Standard: Monterrey Two-Handle Centerset Lavatory Faucet with Vandal-Resistant Wrist Blade handles and grid strainer drain 5502.170.
 - (2) Chicago: 802-317CP with K7715 strainer.
 - (3) Delta: 2529HDF.
 - (4) Gerber: CO-44-412.
 - (5) Kohler: K-7404-5A with K-13885 strainer.
 - (6) Moen: 8215 with 14750 grid strainer.
 - (7) Speakman: SC 3074.
 - (8) T & S: B-0890 with B-0899 Grid Strainer.
 - (9) Zurn: Z-81104 with McGuire 155A grid strainer.
- 2) Flow Control Fitting:
 - a) Design Criteria:
 - (1) Meet NSF International Standards for Lead Free.
 - b) Accessories:
 - (1) Provide vandal-proof type in place of aerator. Flow shall be 0.5 gpm.
 - c) Category Four Approved Product. See Section 01 6200 for definitions of Categories:
 - (1) Omni L-200 Series by Chronomite 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 ADA Accessible Lavatories as per ADA height mounting requirements.

3.2 CLEANING

- A. Polish chrome finish at completion of Project.

END OF SECTION

SECTION 22 4700**DRINKING FOUNTAINS AND WATER COOLERS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install drinking water cooling system units as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 22 0501: 'Common Plumbing Requirements'.
 - 2. Section 22 1116: 'Domestic Water Piping'.

1.2 REFERENCES

- A. Reference Standard:
 - 1. American National Standards Institute / International Code Council:
 - a. ANSI/ICC A117.1-2009, 'Standard for Accessible and Usable Buildings and Facilities'.
 - 2. NSF International Standard / American National Standards Institute:
 - a. NSF/ANSI 61-2012, '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. Handicap Accessible Products to meet ANSI/ICC A117 Accessible requirements.
 - 2. Meet NSF International Standards for materials or products that come into contact with drinking water, drinking water treatment chemicals, or both for chemical contaminants and impurities that are indirectly imparted to drinking water from products, components, and materials used in drinking water systems.

PART 2 - PRODUCTS**2.1 MANUFACTURED UNITS**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Acorn Aqua, City of Industry, CA www.acornaqua.com.
 - b. Elkay Manufacturing Co, Oak Brook, IL www.elkay.com.
 - c. Halsey Taylor, Oak Brook, IL www.halseytaylor.com.
 - d. Oasis, Tri Palm International, Columbus OH www.oasiswatercoolers.com.
- B. Design Criteria:
 - 1. All drinking water products, components, and materials above and below grade used in drinking water systems must meet NSF International Standards for Lead Free.
 - 2. Interior exposed pipe, valves, and fixture trim shall be chrome plated.
 - 3. Do not use flexible water piping.
- C. Materials:
 - 1. ADA Accessible Bi-Level Fountain:

- a. Include accessory fountain. Vandal proof operating bar on front and both sides. 7.8 GPH (29.5 LPH) minimum of 50 deg F (10 deg C) water with 90 deg F (32 deg C) room temperature, 1/5 horsepower motor, 120 V, 60 Hz, single phase. Flexi-guard or chrome plated brass bubbler.
- b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) AcornAqua: AquaAccess A172408B-UBL.
 - 2) Elkay: Model EZSTL8LC.
 - 3) Halsey Taylor: HAC8FSBL-Q-ADA.
 - 4) Oasis: PG8ACSL.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install fixtures with accessible stop or control valve.
- B. Mounting:
 1. General:
 - a. Coordinate location of fountain with location and height of electrical outlet to ensure concealment of outlet by fountain.
 - b. Anchor bottom of fountain to wall.
 - c. Install 3/8 inch (9.5 mm) IPS union connection and Chicago No. 441 stop to building supply line.
 - d. Install 1-1/4 inch (32 mm) IPS slip cast brass 'P' trap. Install trap so it is concealed.
 2. ADA Drinking Fountains:
 - a. Spout outlets of wheelchair accessible drinking fountains shall be 36 inches (915 mm) maximum above floor.
 - b. Spout outlets of drinking fountains for standing persons shall be 38 inches (965 mm) and 43 inches (1090 mm) maximum above floor.

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 0553 IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT
- 23 0713 DUCT INSULATION
- 23 0933 ELECTRIC AND ELECTRONIC CONTROL SYSTEM FOR HVAC

23 1000 FACILITY FUEL SYSTEMS

- 23 1123 FACILITY NATURAL GAS PIPING

23 3000 HVAC AIR DISTRIBUTION

- 23 3001 COMMON DUCT REQUIREMENTS
- 23 3114 LOW-PRESSURE METAL DUCTS
- 23 3300 AIR DUCT ACCESSORIES
- 23 3346 FLEXIBLE DUCTS
- 23 3401 EXHAUST FANS
- 23 3713 DIFFUSERS, REGISTERS, AND GRILLES

23 5000 CENTRAL HEATING EQUIPMENT

- 23 5135 AIR PIPING

23 7000 CENTRAL HVAC EQUIPMENT

- 23 7413 PACKAGED, OUTDOOR, CENTRAL-STATION AIR HANDLING UNITS

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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 8400: 'Firestopping' for quality of Penetration Firestop Systems to be used on Project and submittal requirements.
 - 3. Section 07 9213: 'Elastometric Joint Sealant' for quality of sealants used at building exterior.
 - 4. Section 07 9219: 'Acoustical Joint Sealants' for quality of acoustical sealants.
 - 5. Sections Under 09 9000 Heading: Painting of mechanical items requiring field painting.
 - 6. Division 26: Raceway and conduit, unless specified otherwise, line voltage wiring, outlets, and disconnect switches.
 - 7. 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. Unforeseen Conditions:

1. Relocate/or remove and reinstall ducts, piping, grilles, dampers, louvers, fixtures or any other mechanical equipment or devices which are encountered during demolition which conflict with the new construction or which are to accommodate the new construction. Any equipment, piping, grilles, dampers, louvers or fixtures to remain shall be reinstalled at the completion of this work.

3.3 PREPARATION

A. Changes Due To Equipment Selection:

1. Where equipment specified or otherwise approved requires different arrangement or connections from that shown in Contract Documents, submit drawings, if requested by Architect, showing proposed installations.
2. If proposed changes are approved, install equipment to operate properly and in harmony with intent of Contract Documents. Make incidental changes in piping, ductwork, supports, installation, wiring, heaters, panelboards, and as otherwise necessary.
3. Provide any additional motors, valves, controllers, fittings, and other additional equipment required for proper operation of system resulting from selection of equipment.
4. Be responsible for the proper location of roughing-in and connections provided under other Divisions.

3.4 INSTALLATION

A. Interface With Other Work:

1. Furnish sleeves, inserts, supports, and equipment that are to be installed by others in sufficient time to be incorporated into construction as work proceeds. Locate these items and see they are properly installed.
 2. Electrical: Furnish exact location of electrical connections and complete information on motor controls to installer of electrical system.
 3. Testing And Balancing:
 - a. Put HVAC systems into full operation and continue their operation during each working day of testing and balancing.
 - b. Make changes in pulleys, belts, fan speeds, and dampers or add dampers as required for correct balance as recommended by Testing And Balancing Agency and at no additional cost to Owner.
- B. Cut carefully to minimize necessity for repairs to previously installed or existing work. Do not cut beams, columns, or trusses.
- C. Locating Equipment:
1. Arrange pipes, ducts, and equipment to permit ready access to valves, cocks, unions, traps, filters, starters, motors, control components, and to clear openings of doors and access panels.
 2. Adjust locations of pipes, ducts, switches, panels, and equipment to accommodate work to interferences anticipated and encountered.
 3. Install HVAC work to permit removal of equipment and parts of equipment requiring periodic replacement or maintenance without damage to or interference with other parts of equipment or structure.
 4. Determine exact route and location of each pipe and duct before fabrication.
 - a. Right-Of-Way:
 - 1) Lines that pitch shall have right-of-way over those that do not pitch. For example, steam, steam condensate, and drains shall normally have right-of-way.
 - 2) Lines whose elevations cannot be changed shall have right-of-way over lines whose elevations can be changed.
 - b. Offsets, Transitions, and Changes in Direction:
 - 1) Make offsets, transitions, and changes in direction in pipes and ducts as required to maintain proper head room and pitch of sloping lines whether or not indicated on Drawings.
 - 2) Furnish and install all traps, air vents, sanitary vents, and devices as required to effect these offsets, transitions, and changes in direction.
- D. Piping:
1. Furnish and install complete system of piping, valved as indicated or as necessary to completely control entire apparatus.
 - a. Pipe drawings are diagrammatic and indicate general location and connections. Piping may have to be offset, lowered, or raised as required or directed at site. This does not relieve this Division from responsibility for proper erection of systems of piping in every respect.
 - b. Arrange piping to not interfere with removal of other equipment, ducts, or devices, or block access to doors, windows, or access openings.
 - 1) Arrange so as to facilitate removal of tube bundles.
 - 2) Provide accessible flanges or ground joint unions, as applicable for type of piping specified, at connections to equipment and on bypasses.
 - a) Make connections of dissimilar metals with di-electric unions.
 - b) Install valves and unions ahead of traps and strainers. Provide unions on both sides of traps.
 - 3) Do not use reducing bushings, street elbows, bull head tees, close nipples, or running couplings.
 - 4) Install piping systems so they may be easily drained. Provide drain valves at low points and manual air vents at high points in hot water heating and cooling water piping.
 - 5) Install piping to insure noiseless circulation.
 - 6) Place valves and specialties to permit easy operation and access. Valves shall be regulated, packed, and glands adjusted at completion of work before final acceptance.
 - c. Do not install piping in shear walls.
 2. Properly make adequate provisions for expansion, contraction, slope, and anchorage.

- a. Cut piping accurately for fabrication to measurements established at site. Remove burr and cutting slag from pipes.
 - b. Work piping into place without springing or forcing. Make piping connections to pumps and other equipment without strain at piping connection. Remove bolts in flanged connections or disconnect piping to demonstrate that piping has been so connected, if requested.
 - c. Make changes in direction with proper fittings.
 - d. Expansion of Thermoplastic Pipe:
 - 1) Provide for expansion in every **30 feet (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. Minimum Instruction Periods:
 - 1) HVAC and Refrigeration: Four (4) hours.
 - 2) Temperature Control: Four (4) hours.
 - b. Conduct instruction periods after Substantial Completion inspection when systems are properly working and before final payment is made. None of these instructional periods shall overlap another.

3.10 PROTECTION

- A. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system. Cap or plug open ends of pipes and equipment to

keep dirt and other foreign materials out of system. Do not use plugs of rags, wool, cotton waste, or similar materials.

- B. Do not operate pieces of equipment used for moving supply air without proper air filters installed properly in system.
- C. After start-up, continue necessary lubrication and be responsible for damage to bearings while equipment is being operated up to Substantial Completion.

END OF SECTION

SECTION 23 0553**IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But not Installed Under This Section:
1. Identification of HVAC piping and equipment as described in Contract Documents including:
 - a. Paint identification for gas piping used in HVAC equipment.
 - b. Stencils and band colors for gas piping used in HVAC equipment.
- B. Related Requirements:
1. Section 09 9124: 'Interior Painted Metal' for providing field painting of identification of piping used with HVAC equipment.
 2. Section 22 0529: 'Hangers And Supports For Plumbing' for field installation of pipe stencils and band colors for identification for piping used with HVAC equipment.

PART 2 - PRODUCTS**2.1 SYSTEMS**

- A. Description:
1. Abbreviations for Pipe Stencils and Equipment Identification and Band Colors for Pipe Identification:
 - a. Apply stenciled symbols and continuous painting as follows:

Pipe Type	Pipe Color	Symbol
Gas	Yellow	GAS
- B. Materials:
1. Category Four Approved Products and Manufacturers. See Section 01 6200 for definitions of Categories:
 - a. Products listed in edition of MPI Approved Product List current at time of bidding and later are approved, providing they meet VOC requirements in force where Project is located.
 2. Description:
 - a. Ferrous Metal:
 - 1) New Surfaces: Use MPI(a) INT 5.1B Waterborne Light Industrial Finish system.
 - 2) Previously Finished Surfaces: Use MPI(r) RIN 5.1B Waterborne Light Industrial Finish system.
 3. Performance Requirements:
 - a. New Surfaces: MPI Premium Grade finish requirements.
 - b. Deteriorated Existing Surfaces: MPI Premium Grade finish requirements.
 - c. Sound Existing Surfaces: MPI Custom Grade finish requirements.
 - d. Maintain specified colors, shades, and contrasts.
 4. Paint (one coat):
 - a. Primer:
 - 1) Ferrous Metal:
 - a) MPI 107, 'Primer, Rust-Inhibitive, Water Based'.
 - (1) Color: white.
 - b. Finish Coat (two coats):
 - 1) Ferrous Metal:
 - a) MPI 153, 'Light Industrial Coating, Interior, Water Based, Semi-Gloss (MPI Gloss Level 5)'.
 5. Labels:

- a. Equipment Identification:
 - 1) Black formica, with white reveal when engraved.
 - 2) Lettering to be **3/16 inch (5 mm)** high minimum.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Labels:
 1. Identify following items with specified labels fastened to equipment with screws (unless noted otherwise):
 - a. Thermostats and control panels in mechanical spaces (attach label to wall directly above or below thermostats).
 - b. Rooftop Units.
 2. Engrave following data from Equipment Schedules on Drawings onto labels:
 - a. Equipment mark.
 - b. Area served.
 - c. Thermostat zone number, when different from equipment mark.
 - d. Panel and breaker from which unit is powered.
- B. Painting:
 1. New Surfaces:
 - a. Remove rust spots by sanding and immediately spot prime. If all traces of rust cannot be removed, apply rust blocker recommended by Paint Manufacturer before applying full primer coat.
 2. Existing Surfaces:
 - a. Remove deteriorated existing paint down to sound substrate by scraping and sanding. Feather edges of existing paint by sanding to be smooth with adjacent surfaces. Spot prime bare metal surfaces immediately.
 - b. Remove rust spots by sanding and immediately spot prime. If all traces of rust cannot be removed, apply rust blocker recommended by Paint Manufacturer before applying full primer coat.
 - c. Clean existing sound painted surfaces as well as scraped and sanded existing painted surfaces as recommended by Paint Manufacturer.
 - d. Apply prime coat over entire surface to be painted.
 - e. Lightly sand entire surface.
 - f. Clean surface as recommended by Paint Manufacturer.
 - g. Apply finish coats.
 3. Leave equipment in like-new appearance.
 4. Only painted legends, directional arrows, and color bands are acceptable.
 5. Locate identifying legends, directional arrows, and color bands at following points on exposed piping of each piping system:
 - a. Adjacent to each item of equipment.
 - b. At point of entry and exit where piping goes through wall.
 - c. On each riser and junction.
 - d. Every **25 feet (7.620 m)** on long continuous lines.
 - e. Stenciled symbols shall be **one inch (25 mm)** high and black.

END OF SECTION

SECTION 23 0713**DUCT INSULATION****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install thermal wrap duct insulation as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 23 3114: 'Low-Pressure Metal Ducts'.
 - 2. Section 23 3300: 'Acoustic Duct Accessories' for duct liner.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Manufacturer Contact List:
 - 1. Certainteed St Gobain, Valley Forge, PA www.certainteed.com.
 - 2. Johns-Manville, Denver, CO www.jm.com.
 - 3. Knauf Fiber Glass, Shelbyville, IN www.knauffiberglass.com or Toronto, ON (416) 593-4322.
 - 4. Manson Insulation Inc, Brossard, QB www.isolationmanson.com.
 - 5. Owens-Corning, Toledo, OH or Owens-Corning Canada Inc, Willowdale, ON www.owenscorning.com.

2.2 MATERIALS

- A. Thermal Wrap Duct Insulation:
 - 1. 1-1/2 inch (38 mm) or 3 inch (76 mm) thick fiberglass with factory-laminated, reinforced aluminum foil scrim kraft facing and density of 0.75 lb / per cu ft (12 kg / per cu m).
 - 2. Thermal Conductivity: 0.27 BTU in/HR SF deg F at 75 deg F (24 deg C) maximum.
 - 3. Type One Acceptable Products:
 - a. Type 75 standard duct insulation by Certainteed St Gobain.
 - b. Microlite FSK by Johns-Manville.
 - c. Duct Wrap FSK by Knauf Fiber Glass.
 - d. Alley Wrap FSK by Manson Insulation Inc.
 - e. FRK by Owens-Corning.
 - f. Equal as approved by Architect before bidding. See Section 01 6200.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Thermal Wrap Duct Insulation:
 - 1. Install insulation as follows:
 - a. Within Building Insulation Envelope:
 - 1) 1-1/2 inches (38 mm) thick on 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 0933**ELECTRIC AND ELECTRONIC CONTROL SYSTEM FOR HVAC****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install automatic temperature control system as described in Contract Documents.
 - 2. Furnish and install conductors and make connections to control devices, motors, and associated equipment.
 - 3. Assist in air test and balance procedure.

- B. Related Requirements:
 - 1. Section 01 4546: Duct testing, adjusting, and balancing of ductwork.
 - 2. Section 23 0501: Common HVAC Requirements.
 - 3. Section 23 3300: Furnishing and installing of temperature control dampers.
 - 4. Division 26:
 - a. Furnishing and installing of raceway, conduit, and junction boxes, including pull wires, for temperature control system except as noted above.
 - b. Power wiring to magnetic starters, disconnect switches, and motors.
 - c. Motor starters and disconnect switches, unless integral with packaged equipment.

1.2 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Installer to provide product literature or cut sheets for all products specified in Project.
 - b. Installer to provide questions of control equipment locations to Mechanical Engineer prior to installation.

- B. Informational Submittals:
 - 1. Certificates:
 - a. Installer must provide 'Certificate of Sponsorship' signed from Approved Distributor with bid confirming Installer sponsorship.

- C. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Operations and Maintenance Data:
 - 1) Leave with O&M Manual specified in Section 23 0501.
 - 2) Installer's 'Certificate of Sponsorship'.

1.3 QUALITY ASSURANCE

- A. Qualifications: Requirements of Section 01 4301 applies, but is not limited to the following:
 - 1. Installer:
 - a. Before bidding, obtain sponsorship from a local, Approved Distributor specified under PART 2 PRODUCTS of this specification. Initial requirements for sponsorship are:
 - 1) Be one of following Honeywell supported partners:
 - a) Honeywell Authorized Control Integrator (ACI).
 - b) Honeywell Building Controls Specialist (ACS).
 - c) Honeywell Building Controls Associate (BCS).
 - 2) Receive product training from Approved Distributor.
 - 3) Exhibit Webstat system skills to sponsoring Approved Distributor.

- 4) Installer to provide Distributor sponsorship by submitting 'Certificate of Sponsorship' as Informational Submittal with bid. Certificate available as Attachment in this Specification.

PART 2 - PRODUCTS

2.1 SYSTEMS

- A. Manufacturers:
 1. Manufacturer Contact List:
 - a. Air Products & Controls Ltd, Pontiac, MI www.ap-c.com.
 - b. Fire-Lite Alarms, Northford, CT www.firelite.com.
 - c. Honeywell Inc, Minneapolis, MN www.honeywell.com.
 - 1) Primary Contact: Chris Brinkerhoff, (801) 550-3344, chris.brinkerhoff@honeywell.com.
 - d. ICCA Firex, Carol Stream, IL www.icca.invensys.com.
 - e. Insul_Guard, Salt Lake City, UT:
 - 1) Primary Contact: Dan Craner, (801) 518-3733, insul_guard@comcast.net.
 - f. System Sensor, St Charles, IL www.systemsensor.com.
- B. Distributors: Obtain thermostats and other control equipment from following Approved Distributors. See Section 01 4301:
 1. Utah:
 - a. Control Equipment Co: (800) 452-1457 rhowe@controlequiputah.com Ray Howe.
 - b. Relevant Solutions LLC: (801) 214-3313 Kathy.Wright@relevantsolutions.com Kathy Wright.
- C. Performance:
 1. Design Criteria:
 - a. Automatic Temperature Control System design concept utilizes communicating thermostats located near furnace, with electronic sensors and electric / electronic actuation of dampers and with thermostats connected with Echelon approved communication cable. A WebStat Building Manager will interface with the thermostats to provide access via internet browser.
 - b. Network communications and control devices will be LonWorks compliant. System shall include HVAC control, WebStat Building Manager to provide maintenance management functions related to normal building operations.
- D. Components:
 1. Thermostats And Sensors:
 - a. Thermostat and Sensor Kit:
 - 1) Category Four Approved Product. See Section 01 6200 for definitions of Categories:
 - a) Part Number Y7335H1009 consisting of following:
 - (1) Communicating Thermostat: Low voltage type provided with automatic change-over feature for both heating and cooling stages, seven-day / 365 day program with two starts and stops per day, and provisions for damper operators. Honeywell T7350H1009.
 - (2) Push-Button Remote Room Sensor: Honeywell T7771A1005 with three push buttons, OVERRIDE, WARMER, COOLER, and with selectable ohm resistance, 10k or 20k.
 - (3) Discharge Air Sensor: Honeywell C7041B2005, 6 inch.
 - b. Plain Face Remote Room Sensor:
 - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) Honeywell TR21-A, plain face, 10k ohms.
 - b) Honeywell TR21, plain face, 20k ohms.
 2. Transformer:
 - a. 120 / 24 V, 50VA Honeywell AT150F.
 - b. 120 / 24 V, 75VA Honeywell AT175F.
 3. Conductors:
 - a. Color-coded and No. 16 and No. 12 AWG Type TWN, TFN, or THHN, stranded.

- b. Thermostat Cable: 12, 8, or 4 conductor, 18AWG solid copper wire, insulated with high-density polyethylene. Conductors parallel enclosed in brown PVC jacket (22 AWG cable not allowed).
 - c. Communicating Cable:
 - 1) Class Two Quality Standard. See Section 01 6200:
 - a) CAT 4, 22 gauge (0.025 in) (0.645 mm), twisted pair, non-plenum and non-shielded cable.
 - 4. CO₂ Return Air Sensor:
 - a. Duct mount with display.
 - b. Category Four Approved Product. See Section 01 6200 for definitions of Categories:
 - 1) Honeywell: C7232B1006.
- E. Operation Sequences:
- 1. Programmable thermostat shall control unoccupied and occupied status of fan system based on adjustable seven day program and remote room sensor / push button. Fan shall run continuously in occupied mode and cycle in unoccupied mode.
 - 2. Adjustable heating and cooling set points shall control space temperature by activating either heating or cooling equipment. Programmable thermostat provides automatic change over between heating and cooling.
 - 3. Remote room sensor provides optional override of thermostat program by allowing three hour timed override of thermostat program at any time by pushing ON / OFF button on remote room sensor cover. This shall activate thermostat to occupied mode and system shall control to occupied set point.
 - 4. Minimum outside air damper, spring return type, shall open in occupied mode and remain closed in unoccupied mode in zones using outside air.
 - 5. Two Sensor Averaging: One sensor has OVERRIDE, WARMER, COOLER buttons. Set jumper to appropriate setting necessary to average with another sensor.
 - 6. Systems Using CO₂ sensor to Control Outside Air Damper Operation:
 - a. Minimum outside air damper, spring return type, shall open in occupied mode only when CO₂ sensor setpoint of 1200 ppm is reached. Damper shall close if CO₂ level drops below 1100 ppm.
 - b. Damper shall remain closed in un-occupied mode.

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 INSTALLATION

- A. Interface With Other Work:
 - 1. Calibrate room thermostats as required during air test and balance. Insulate sensor J-box with fiberglass insulation; expandable/ foam insulation is NOT acceptable
 - 2. Instruct air test and balance personnel in proper use and setting of control system components.
 - 3. Install low voltage electrical wiring in accordance with Division 26 of these Specifications.
- B. Communication Cable:
 - 1. Network communicating thermostats and WebStat Building Manager together with specified communicating cable.
 - 2. Do not bundle communication cables with cables of other systems. Maintain 12 inches minimum distance from wires of other systems, except communication cable may cross other low-voltage wiring if done perpendicularly.
- C. Safety Controls:
 - 1. Interlock gas valves with cooling compressors and supply air fan.

2. Gas valves shall obtain their electrical control power from same circuit as supply fan motor.
3. Check high limit thermostats furnished with heating equipment for correct operation. Gas valves shall close when duct temperature exceeds high limit setting. Perform this work immediately after wiring burner controls.
4. Wire bonnet thermostatic switches to dissipate all heat in combustion chambers.
5. Fresh air dampers shall close on fan shut-down, power failure, open fan motor disconnect switch, and when thermostat is in UNOCCUPIED mode.
6. Gas burner safety controls furnished with furnace units shall be incorporated in control circuits for all modes of operation.

3.3 FIELD QUALITY CONTROL

A. Field Tests:

1. Calibrate, adjust, and set controls for proper operation, operate systems, and be prepared to prove operation of any part of control system. This work is to be completed before pre-substantial completion inspection.
2. Test each individual heating, cooling, and damper control for proper operation using control system.

3.4 SYSTEM STARTUP

A. For systems with WebStat Building Manager.

1. Contractor is responsible for a fully functioning control system accessible via internet web browser. Contractor is responsible to coordinate Network start up with assistance from local IT technician. Local IT technician shall provide Static, IP address, Network Mask, Default Gateway, Primary DNS Server, Local Host Name, Local Domain Name.
2. Contractor is responsible configuring all thermostats with proper zone names, zone scheduling, proper Church conference / holiday scheduling, all to be coordinated with local FM manager. Set proper clock setting including day/month/year. Use WebStat as network time master from "System" tab in WebStat.
3. Set remote sensor to T7771.
4. Set remote humidity to none unless using remote humidity sensor on DH systems.
5. Set Occupancy sensor to None.
6. Set Discharge Air Temp sensor to Remote.
7. Set Heating / Cooling to proper stages
8. Set heat cycle rates to 9 cph and cooling to 4 cph. Set discharge high limit to 110 degrees but do not activate (check) the high limit option. This is only to be used later by Owner if equipment experiences issues with system overshoot.
9. Set Aux relay to "Time of Day".
10. Set fan switch operation to "ON".
11. Set minimum UnOcc start time for all days. No days shall be scheduled Unconfigured.
12. Set occupied start times to match meeting start times; provided by local FM manager.
13. Place all zone over-ride durations to one (1) hour except for Bishop and Stake area which shall be set to two (2) hours.
14. Set Occupied default heating setpoints to 70 degrees, cooling setpoints to 74 degrees.
15. Set UnOccupied default heating setpoint to 60 degrees, cooling setpoints to 90 degrees.
16. Set each zone to applicable Holiday scheduling.

B. WebStat settings

1. Obtain from IT a LAN / WAN SMTP email server name for system alarming; where applicable.
2. Create alarm setpoint of 55 degrees low limit / 92 degrees high limit for all zones.
3. Create separate Administrative User level for Local FM Manager.

3.5 ADJUSTING

- #### A. Program minimum of one (1) day's operation into thermostat memory function.

3.6 CLOSEOUT ACTIVITIES

A. Instruction Of Owner:

1. Include as part of training required in Section 23 0501, following training:
 - a. Training shall be by personnel of installing company and utilize operator's manuals and as-built documentation.
 - b. Provide training in (2) two sessions including WebStat for up to four (4) hours total.
 - 1) First session will occur between system completion and Substantial Completion.
 - 2) Second session will occur within forty five (45) days of Substantial Completion when agreed upon by Owner.
 - c. Training shall include sequence of operation review, selection of displays, modification of schedules and setpoints, troubleshooting of sensors, etc, as follows:
 - 1) Control System Overview:
 - a) Show access to system through both individual thermostats and Internet browser via WebStat and how network works. Demonstrate scheduling for Stake and General Conferences.
 - 2) Thermostat Programming From Keypad: Instructions on developing setpoints and schedules and adjusting local zone temperatures.
 - 3) Thermostat Operation:
 - a) Identify and explain use of buttons on thermostat face, I.E. 'i' or information button, warmer button, and cooler button.
 - b) Identify and explain buttons under thermostat cover.
 - c) Provide training for Thermostat Palm Program.
 - 4) WebStat training with local Facilities Manager during two (2) sessions.
 - a) Review all features accessible from the Overview tab including individual zone details, setpoints and fan, show schedule, edit configuration.
 - b) Review all features accessible from schedules including multiple schedules, zone assignments, holiday scheduling/ conference scheduling.
 - c) Review alarm configurations, alarm assignments, alarm priority.
 - d) Review user levels and creating users.
 - e) Review thermostat editing and configuration. Explain each thermostat programming option. Explain download pending, download, & commissioning.
 - f) Review System backup configuration, restore configuration, reboot WebStat, Network Time Master, time and date setting and Local Weather option. No OAT is associated.
 - g) Review system User Log in and User Log Out process.

END OF SECTION

ATTACHMENTS

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CERTIFICATE OF SPONSORSHIP
Electric and Electronic Control System for HVAC Installer

PROJECT INFORMATION (To be filled out by Installer - available from project specification):

Project Name: _____
Project Number: _____
Project Address: _____

INSTALLER INFORMATION (To be filled out by Installer):

Installer Name: _____
Installer Firm: _____
Installer Address: _____

I acknowledge and confirm the above listed Installer has received training and exhibit Webstat System skills and is qualified to install the automation control system as specified for Project identified above. Our company will stand behind the Installer meeting the legal specified performance requirements.

Sponsoring Approved Honeywell Distributor Name: _____

Signature: _____ Printed Signature: _____

Date: _____

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SECTION 23 1123**FACILITY NATURAL-GAS PIPING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install gas piping and fittings within building as described in Contract Documents.
- B. Related Requirements:
 - 1. Sections Under 09 9000 Heading: 'Paints And Coatings' for painting of exterior piping.
 - 2. Section 23 0501: 'Common HVAC Requirements'.
 - 3. Section 23 0553: 'Identification for HVAC Piping and Equipment'.

1.2 REFERENCES

- A. Reference Standards:
 - 1. American National Standards Institute / CSA Group:
 - a. ANSI LC 4-2012 (2017) / CSA 6.32-2012 (R2016), 'Press-Connect Metallic Fittings for Use in Fuel Gas Distribution Systems'.
 - 2. ASTM International:
 - a. ASTM A53/A53M-12, 'Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless'.
 - b. ASTM A234/A234M-16, 'Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service'.
 - 3. International Code Council (ICC):
 - a. ICC IFGC-2015: 'International Fuel Gas Code'.

1.3 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Conform to requirements of requirements of IFGC International Fuel Gas Code.
 - 2. Viega MegaPressG fittings:
 - a. Conform to requirements of IFGC International Fuel Gas Code.

PART 2 - PRODUCTS**2.1 SYSTEM**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. BrassCraft, Novi, MI www.brasscraft.com.
 - b. Cimberio Valve Co Inc, Malvern, PA www.cimberio.com.
 - c. ConBraCo Industries, Inc, Matthews, NC www.conbraco.com or ConBraCo / Honeywell Ltd, Scarborough, ON (416) 293-8111.
 - d. Dormont Manufacturing Company, Export, PA www.dormont.com.
 - e. Jenkins-NH-Canada, Brantford, ON www.jenkins-nh-canada.com.
 - f. Jomar International, Madison Heights, MI www.jomar.com.
 - g. Viega LLC, Broomfield, CO www.viega.com.
 - h. Watts Regulator Co, North Andover, MA www.wattsreg.com or Watts Industries (Canada) Inc, Burlington, ON (888) 208-8927.

- B. Materials:
1. Above-Ground Pipe:
 - a. Black carbon steel, butt welded, Schedule 40 pipe meeting requirements of A53/A53M.
 2. Above-Ground Pipe Fittings:
 - a. Welded forged steel fittings meeting requirements of ASTM A234/A234M.
 - b. Standard weight malleable iron screwed.
 - c. Viega MegaPressG fittings.
 3. Valves:
 - a. 125 psi (862 kPa) bronze body ball valve, UL listed.
 - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) CIM 102.1 by Cimbrion Valve.
 - 2) Apollo Series 80-100 by ConBraCo.
 - 3) 'Red Cap' R602 by Jenkins NH Canada.
 - 4) Model T-204 by Jomar International.
 - 5) Model B-6000-UL by Watts Regulator.
 4. Cocks:
 - a. Gauge Cocks: Conbraco Series 50-56 bronze gauge cock.
 5. Flexible Connector:
 - a. Type 304 stainless steel corrugated tube coated for corrosion protection.
 - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Dormont Supr-Safe.
 - 2) BrassCraft Procoat.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Steel pipe installed through air plenums, in walls:
1. Pipes 2-1/2 inches (64 mm) and larger shall have welded fittings and joints.
 2. Other steel pipe may have screwed or welded fittings.
 3. Viega MegaPressG:
 - a. Install MegaPressG fittings according to Manufacture's recommendations and with Manufacture's recommended tools.
- B. On lines serving gas-fired equipment, install gas cocks adjacent to equipment outside of equipment cabinet and easily accessible.
- C. Install 6 inch (150 mm) long minimum dirt leg, with pipe cap, on vertical gas drop serving each gas-fired equipment unit.
- D. Use fittings for changes of direction in pipe and for branch runouts.
- E. Visible gas piping inside building shall be painted yellow and labeled.

3.2 FIELD QUALITY CONTROL

- A. Field tests:
1. Subject all portions of gas piping system, in sections or in entirety, to air pressure of 75 psig (0.52 MPa) and prove airtight for four (4) hours.
 2. Disconnect equipment not suitable for 75 psig (0.52 MPa) pressure from piping system during test period.

END OF SECTION

SECTION 23 3001**COMMON DUCT REQUIREMENTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. General procedures and requirements for ductwork.
 - 2. Repair leaks in ductwork, as identified by duct testing, at no additional cost to Owner.
- B. Related Requirements:
 - 1. Section 01 4546: 'Duct Testing, Adjusting, and Balancing' for ductwork.
 - 2. Section 07 9219: 'Acoustical Joint Sealants' for quality of acoustic sealant.
 - 3. Section 23 0501: 'Common HVAC Requirements'.

1.2 REFERENCES

- A. Reference Standards:
 - 1. Sheet Metal And Air Conditioning Contractors' National Association / American National Standards Institute:
 - a. SMACNA, 'HVAC Duct Construction Standards - Metal and Flexible' (Third Edition).

1.3 SUBMITTALS

- A. Informational Submittals:
 - 1. Manufacturer Instructions:
 - a. Installation manuals providing detailed instructions on assembly, joint sealing, and system pressure testing for leaks.

PART 2 - PRODUCTS**2.1 ASSEMBLIES**

- A. Performance:
 - 1. Design Criteria:
 - a. Standard Ducts: Construction details not specifically called out in Contract Documents shall conform to applicable requirements of SMACNA, 'HVAC Duct Construction Standards - Metal and Flexible'.
- B. Materials:
 - 1. Duct Hangers:
 - a. One inch (25 mm) by 18 ga (1.27 mm) galvanized steel straps or steel rods as shown on Drawings, and spaced not more than 96 inches (2 400 mm) apart. Do not use wire hangers.
 - b. 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. Secure vertical ducts passing through floors by extending bracing angles to rest firmly on floors without loose blocking or shimming. Support vertical ducts, which do not pass through floors, by using bands bolted to walls, columns, etc. Size, spacing, and method of attachment to vertical ducts shall be same as specified for hanger bands on horizontal ducts.

3.2 CLEANING

- A. Clean interior of duct systems before final completion.

END OF SECTION

SECTION 23 3114**LOW-PRESSURE METAL DUCTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install above-grade low-pressure steel ducts and related items as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 01 4546: 'Duct Testing, Adjusting, And Balancing' for duct test, balance, and adjust air duct systems services provided by Owner.
 - 2. Section 23 0713: 'Duct Insulation' for thermal insulation for ducts, plenum chambers, and casings.
 - 3. Section 23 3001: 'Common Duct Requirements'.

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 or DP 1030 by Design Polymerics, Fountain Valley, CA www.designpoly.com.
 - 3) PROseal, FIBERseal, EVERseal, or EZ-seal by Ductmate Industries, Inc., Charleroi, PA www.ductmate.com.
 - 4) SAS by Duro Dyne, Bay Shore, NY or Duro Dyne Canada, Lachine, QB www.durodyne.com.
 - 5) Iron Grip 601 by Hardcast Inc, Wylie, TX www.hardcast.com.
 - 6) MTS100 or MTS 200 by Hercules Mighty Tough, Denver CO, www.herculesindustries.com.
 - 7) 15-325 by Miracle / Kingco, Div ITW TACC, Rockland, MA www.taccint.com.
 - 8) 44-39 by Mon-Eco Industries Inc, East Brunswick, NJ www.mon-ecoindustries.com.
 - 9) Airseal Zero by Polymer Adhesive Sealant Systems Inc, Weatherford, TX www.polymeradhesives.com.
 - 10) Airseal #22 Water Base Duct Sealer by Polymer Adhesive Sealant Systems Inc, Weatherford, TX www.polymeradhesives.com.

B. Fabrication:

1. General:
 - a. Straight and smooth on inside with joints neatly finished.
 - b. Duct drops to diffusers shall be round, square, or rectangular to accommodate diffuser neck. Drops shall be same gauge as branch duct. Seal joints air tight.
2. Standard Ducts:
 - a. General:
 - 1) Ducts shall be large enough to accommodate inside acoustic duct liner. Dimensions shown on Drawings are net clear inside dimensions after duct liner has been installed.
 - b. Rectangular Duct:
 - 1) Duct panels through **48 inch (1 200 mm)** dimension having acoustic duct liner need not be cross-broken or beaded. Cross-break unlined ducts, duct panels larger than **48 inch (1 200 mm)** vertical and horizontal sheet metal barriers, duct offsets, and elbows, or bead **12 inches (300 mm)** on center.
 - a) Apply cross-breaking to sheet metal between standing seams or reinforcing angles.
 - b) Center of cross-break shall be of required height to assure surfaces being rigid.
 - c) Internally line square and rectangular drops. Externally insulate round drops.
 - c. Round Duct:

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

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 INSTALLATION

- A. Install internal ends of slip joints in direction of flow. Seal transverse and longitudinal joints air tight using specified duct sealer as per Manufacturer's written instructions.
- B. Securely anchor ducts and plenums to building structure with specified duct hangers attached with screws. Do not hang more than one duct from a duct hanger. Brace and install ducts so they shall be free of vibration under all conditions of operation.
- C. Ducts shall not bear on top of structural members.
- D. Paint ductwork visible through registers, grilles, and diffusers flat black.
- E. Under no conditions will pipes, rods, or wires be allowed to penetrate ducts.

3.3 FIELD QUALITY CONTROL

- A. Field Tests:
 1. Air Test and Balance Testing as specified in Section 01 4546: 'Duct Testing, Adjusting, and Balancing'.
- B. Non-Conforming Work:
 1. Reseal transverse joint duct leaks and seal longitudinal duct joint leaks discovered during air test and balance procedures at no additional cost to Owner.

END OF SECTION

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SECTION 23 3300**AIR DUCT ACCESSORIES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install duct accessories in specified ductwork as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 23 3001: 'Common Duct Requirements'.

1.2 REFERENCES

- A. Reference Standards:
 - 1. ASTM International:
 - a. ASTM A653/A653M-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. Locking Quadrant Damper Regulators:
 - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) Duro Dyne: KS-385.
 - b) Dyn Air: QPS-385.
 - c) Elgen: EQR-4.
 - d) Ventfabrics: Ventline 555.
 - e) Young: No. 1.
 - b. Concealed Ceiling Damper Regulators:
 - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) Cain.
 - b) Duro Dyne.
 - c) Elgen.
 - d) Metco Inc.
 - e) Ventfabrics: 666 Ventlok.
 - f) Young: 301.
 - c. Volume Dampers:
 - 1) Rectangular Duct:
 - a) Factory-manufactured 16 ga (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.
4. Air Turns:
 - a. Single thickness vanes. Double thickness vanes not acceptable.
 - b. 4-1/2 inch (115 mm) wide vane rail. Junior vane rail not acceptable.
 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.
 2. Air Turns:
 - a. Permanently install vanes arranged to permit air to make abrupt turn without appreciable turbulence, in 90 degree elbows of above ground supply and return ductwork.
 - b. Quiet and free from vibration when system is in operation.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Duct Liner:
 - 1. Furnish and install acoustic lining in following types of rectangular ducts unless noted otherwise on Contract Documents:
 - a. Supply air.
 - b. Return air.
 - c. Transfer air.
 - d. Elbows, fittings, and diffuser drops greater than 12 inches (300 mm) in length.
 - 2. Do not install acoustic lining in round ducts.
- B. Flexible Connections: Install flexible inlet and outlet duct connections to each air handler.
- C. Dampers And Damper Accessories:
 - 1. Install concealed ceiling damper regulators.
 - a. Paint cover plates to match ceiling tile.
 - b. Do not install damper regulators for dampers located directly above removable ceilings or in Mechanical Rooms.
 - 2. Provide each take-off with an adjustable volume damper to balance that branch.
 - a. Anchor dampers securely to duct.
 - b. Install dampers in main ducts within insulation.
 - c. Dampers in branch ducts shall fit against sheet metal walls, bottom and top of duct, and be securely fastened. Cut duct liner to allow damper to fit against sheet metal.
 - d. Where concealed ceiling damper regulators are installed, provide cover plate.

END OF SECTION

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SECTION 23 3346**FLEXIBLE DUCTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install supply air branch duct runouts to diffusers as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 23 3001: Common Duct Requirements.

1.2 REFERENCES

- A. Reference Standards:
 - 1. National Fire Protection Association / American National Standards Institute:
 - a. NFPA 90A: 'Standard for the Installation of Air-Conditioning and Ventilating Systems' (2012 Edition).
 - 2. Underwriters Laboratories:
 - a. UL 181, 'Factory-Made Ducts and Air Connectors' (10th Edition).
 - b. UL 181B, 'Closure Systems for Use With Flexible Air Ducts and Air Connectors' (3rd Edition).

PART 2 - PRODUCTS**2.1 SYSTEM**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. JP Lamborn Co., Fresno CA www.jpflex.com.
 - b. Flexmaster USA Inc, Houston, TX www.flexmasterusa.com or Flexmaster Canada Ltd, Richmond Hill, ON (905) 731-9411.
 - c. Thermaflex by Flexible Technologies, Abbeville, SC or Mississauga, ON www.thermaflex.net.
- B. Materials:
 - 1. Ducts:
 - a. Formable, flexible, circular duct which shall retain its cross-section, shape, rigidity, and shall not restrict airflow after bending.
 - b. Insulation:
 - 1) Nominal 1-1/2 inches (38 mm), 3/4 lb per cu ft (12 kg per cu m) density fiberglass insulation with air-tight, polyethylene or polyester core, sheathed in seamless vapor barrier jacket factory installed over flexible assembly.
 - c. Assembly, including insulation and vapor barrier, shall meet Class I requirement of NFPA 90A and be UL 181 rated, with flame spread of 25 or less and smoke developed rating of 50 or under.
 - d. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) PR-25 by JP Lambornes.
 - 2) Flex-Vent KP by Thermaflex by Flexible Technologies.
 - 3) Type 1B Insulated by Flexmaster.
 - 2. Cinch Bands: Nylon, 3/8 inch (9.5 mm) removable and reusable type.

- a. Listed and labeled in accordance with Standard UL 181B and labeled 'UL 181 B-C'.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install duct in fully extended condition free of sags and kinks, using **72 inch (1 800 mm)** maximum lengths.
- B. Make duct connections by coating exterior of duct collar for **3 inches (75 mm)** with duct sealer and securing duct in place over sheet metal collar with specified cinch bands.

END OF SECTION

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

SECTION 23 3713**DIFFUSERS, REGISTERS, AND GRILLES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install diffusers, registers, and grilles connected to ductwork as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 23 3001: 'General Duct Requirements'.

1.2 SUBMITTALS

- A. Maintenance Material Submittals:
 - 1. Tools: Leave tool for removing core of each different type of grille for building custodian.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Manufacturer Contact List:
 - 1. Carnes Co, Verona, MI www.carnes.com.
 - 2. J & J Register, Grand Rapids, MI www.jandjreg.com.
 - 3. Krueger Air System Components, Richardson, TX www.krueger-hvac.com.
 - 4. Metal*Aire by Metal Industries Inc, Clearwater, FL www.metalaire.com.
 - 5. Nailor Industries Inc, Houston, TX or Weston, ON www.nailor.com.
 - 6. Price Industries Inc, Suwanee, GA www.price-hvac.com or E H Price Ltd, Winnipeg, MB (204) 669-4220.
 - 7. Titus, Richardson, TX www.titus-hvac.com.
 - 8. Tuttle & Bailey, Richardson, TX www.tuttleandbailey.com.

2.2 MANUFACTURED UNITS

- A. Lay-In Ceiling Diffusers:
 - 1. Finish: Off-white baked enamel.
 - 2. Removable inner core assembly.
 - 3. Performance Standard: Titus TMSA Border Type 3.
 - 4. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a. Carnes.
 - b. Krueger.
 - c. Metal*Aire.
 - d. Nailor.
 - e. Price.
 - f. Titus.
 - g. Tuttle & Bailey.
- B. Lay-In Perforated Ceiling Return Grilles:
 - 1. Finish: White baked enamel.
 - 2. Hinged filter access door.

3. Performance Standard: Titus 8FF.
 4. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a. Carnes.
 - b. Krueger.
 - c. Metal*Aire.
 - d. Nailor.
 - e. Price.
 - f. Titus.
 - g. Tuttle & Bailey.
- C. Ceiling Return And Transfer Grilles:
1. Finish: Off-white baked enamel.
 2. 1/2 inch (12.7 mm) spacing.
 3. See Contract Documents for location of filter grilles.
 4. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a. Carnes: RSLA.
 - b. J & J: S90H.
 - c. Krueger: S85H.
 - d. Metal*Aire: SRH.
 - e. Nailor: 6155H.
 - f. Price: 535.
 - g. Titus: 355RL or 355 RS.
 - h. Tuttle & Bailey: T75D.
- D. Ceiling Diffusers:
1. Finish: Off-white baked enamel.
 2. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a. Carnes: SKSA.
 - b. J & J: R-1400.
 - c. Krueger: SH.
 - d. Metal*Aire: 5500S.
 - e. Nailor: 65OOB.
 - f. Price: SMD-6.
 - g. Titus: TDC-6.
 - h. Tuttle & Bailey: M.
 - i. Price: 635.
 - j. Titus: 355FL.
 - k. Tuttle & Bailey: A75D.
 - l. Titus: T-700.
 - m. Tuttle & Bailey.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Anchor securely into openings. Secure frames to ductwork by using four sheet metal screws, one per side.

END OF SECTION

SECTION 23 5135**AIR PIPING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install heating equipment exhaust piping and combustion air intake piping as described in Contract Documents.
- B. Related Requirements:
 - 1. Sections Under 09 9000 Heading: Painting.
 - 2. Section 22 3413: 'Instantaneous, Tankless, Gas Domestic Water Heaters'.
 - 3. Section 23 0501: 'Common HVAC Requirements'.

1.2 REFERENCES

- A. Reference Standards:
 - 1. ASTM International:
 - a. ASTM D1785-12, 'Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120'.
 - b. ASTM D2564-12, 'Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems'.
 - c. ASTM D2661-11, 'Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings'.
 - d. ASTM D2665-14, 'Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings'.

PART 2 - PRODUCTS**2.1 ASSEMBLIES**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Armaflex by Armacell, Mebane, NC www.armaflex.com.
 - b. Nomaco, Youngsville, NC www.nomacokflex.com.
- B. Materials:
 - 1. Air Piping: Schedule 40 pipe and fittings meeting requirements of ASTM D1785, ASTM D2661, or ASTM D2665.
 - 2. Solvent Cement and Adhesive Primer:
 - a. Use PVC solvent cement that has a VOC content of 510 g/L or less if required by local AHJ if required.
 - b. Use adhesive primer that has a VOC content of 550 g/L or less if required by local AHJ if required.
 - c. Meet requirements of ASTM F656 for cement primer and ASTM D2564 for pipe cement.
 - 3. Flexible Foamed Pipe Insulation:
 - a. Thickness:
 - 1) **1/2 inch (13 mm)** for **2 through 3 inch (50 through 75 mm)** outside diameter pipe.
 - 2) **1/2 inch (13 mm)** sheet for fittings as recommended by Manufacturer.
 - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Tubolit by Armaflex.

- 2) ImcoLock or Therma-Cel by Nomaco K-Flex.
4. Insulation Joint Sealer:
 - a. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) 520 by Armaflex.
 - 2) R-320 by Nomaco K-Flex.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation For Condensing Water Heaters:
 1. Run individual vent and individual combustion intake piping from each water heater to roof termination as recommended by Water Heater Manufacturer. Concentric roof termination kit may be used if approved by and provided by Water Heater Manufacturer. Slope lines downward toward water heater.
 2. Slope combustion chamber exhaust drain downward to floor drain.
- B. Support:
 1. Support concentric roof termination kit at ceiling or roof line with 20 ga (0.912 mm) sheet metal straps as detailed on Drawings.
 2. Support horizontal and sloping sections of pipe with 1 inch (25 mm) wide 20 ga (1.0058 mm) galvanized steel straps. Anchor securely to structure, not allowing pipe to sway.
- C. Insulation:
 1. General:
 - a. Install insulation in snug contact with pipe and in accordance with Manufacturer's recommendations.
 - b. Slip insulation on piping before piping sections and fittings are assembled keeping slitting of insulation to a minimum.
 - c. Joints:
 - 1) Place 'slit' joint seams of insulation exposed outside building on bottom of pipe.
 - 2) Stagger joints on layered insulation.
 - 3) Seal joints in insulation.
 - d. Paint exterior exposed insulation with two coats of finish recommended by Insulation Manufacturer, color selected by Architect.
 2. Install specified insulation on PVC air piping serving mechanical equipment as follows
 - a. Combustion air PVC piping in truss space and in attic.
 - b. Combustion vent PVC piping in attic, in truss space, and above roof.
 - c. Insulate fittings with sheet insulation and as recommended by Manufacturer.

END OF SECTION

SECTION 23 7413**PACKAGED, OUTDOOR, CENTRAL-STATION AIR HANDLING UNITS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install packaged air conditioning units as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 23 0501: 'Common HVAC Requirements'.

1.2 REFERENCES

- A. Definitions:
 - 1. Compressor: Pump that increases vapor (refrigerant or air) pressure from one level to a higher level of pressure.
 - 2. Condenser: Device used to condense refrigerant in a cooling system.
 - 3. Condenser Coils: In an air conditioner, the coil dissipates heat from the refrigerant, changing the refrigerant from vapor to liquid.
 - 4. Condensing Unit: Outside section of an air conditioning system which pumps vaporized refrigerant from the evaporator, compresses it, liquefies it in the condenser and returns it to the evaporator coil. The outdoor portion of a split system air conditioner contains the compressor and outdoor coil.
 - 5. EER (Energy Efficiency Rating): Rating that lists how many BTU's per hour are used for each watt of power it draws.
 - 6. Refrigerant: Absorbs heat by a change of state (evaporation) from liquid to a gas, and releases heat by a change of state (condenses) from gas back to a liquid.
 - 7. SEER (Seasonal Energy Efficiency Ratio): Measure of cooling efficiency for air conditioners and heat pumps. A ratio of total cooling in comparison to electrical energy input in watts per hour. Higher the seer, the more energy efficient the unit. Since 2006, the minimum SEER required by the Department of Energy is 13.00 and 15.00+ SEER is considered high efficiency.
- B. Reference Standards:
 - 1. American National Standards Institute / American Society of Heating, Refrigerating and Air-Conditioning Engineers:
 - a. ANSI/ASHRAE Standard 15-2010, 'Safety Standard for Refrigeration Systems'.
 - b. ANSI/ASHRAE Standard 34-2010, 'Designation and Classification of Refrigerants'.

1.3 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Each unit shall be UL / ULC or ETL labeled.
 - 2. Comply with ANSI/AHRI Standard 210/240.
 - 3. Refrigeration compressor, coils, and specialties shall be designed to operate with CFC-free refrigerants.
- B. Qualifications. Section 01 4301 applies, but is not limited to the following:
 - 1. Installer: Refrigerant piping shall be installed by refrigeration contractor licensed by State and by technicians certified in use of HFC and HCFC refrigerants.

1.4 SUBMITTALS

- A. Informational Submittals:
 - 1. Tests and Evaluation Reports:
 - a. Manufacturer Reports: Equipment check-out sheets.
- B. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Warranty Documentation:
 - 1) Final, executed copy of Manufacturer's.
 - b. Record Documentation:
 - 1) Manufacturers Documentation:
 - a) Equipment checkout sheet: Complete and sign all items for each unit.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
 - 1. Ship units with lifting angles and fully charged with refrigerant R-410a.

1.6 WARRANTY

- A. Manufacturer Warranty:
 - 1. 5 year warranty on compressors.

PART 2 - PRODUCTS

2.1 PERFORMANCE

- A. Capacities:
 - 1. SEER rating, as defined by ARI, shall be not less than 13.0 for units 5 tons and smaller.

2.2 MANUFACTURED UNITS

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Carrier Corporation:
 - 1) Carrier National: Bradley Brunner (270) 282-1241 Bradley.M.Brunner@Carrier.utc.com.
 - 2) Carrier Utah: Rich Carpenter (Contractors HVAC Supply) (801) 410-6077 e-mail rcarpent@mtncom.net.
 - b. Lennox Industries:
 - 1) For pricing and information call: Lennox National Account at 1-800-367-6285.
 - 2) Lennox National Contact: Cody Jackson (801) 736-8904 Cody.Jackson@LennoxInd.com.
 - c. Trane Company:
 - 1) Salt Lake Trane, attention: Jason Bradford (801) 486-0500 www.Jason.Bradford@trane.com.
 - d. York International:
 - 1) Brian Michael (405) 419-6230 brian.k.michael@jci.com.
- B. Air Conditioning Units:
 - 1. Units shall be completely factory assembled and tested. Units shall include following components and features:
 - a. Condenser coils.
 - b. Condenser fans and motors.

- c. Interconnected wiring.
- d. Pre-wired control panel.
- e. Filter section.
- f. Factory installed 100 percent modulating economizer cycle including motorized dampers and controls with barometric exhaust.
- g. Corrosion-resistant all-weather cabinet.
2. Air-Cooled Condensing Unit Section:
 - a. Strainer-dryer.
 - b. Time delay or cycle protection to prevent short cycling.
 - c. Condenser Coil: **1/2 inch (13 mm)** outside diameter copper tube with aluminum fins. Include condenser coil hail guard assembly.
 - d. Compressors:
 - 1) Equip with crankcase heater.
 - 2) Hermetic or semi-hermetic type mounted on vibration isolators.
 - 3) On units 3 tons and larger, mount on factory rubber-shock, internal spring vibration isolators.
 - e. Condenser Fan: Axial flow type propeller fan.
 - f. Refrigerant Coils: Constructed of copper tubes with mechanically bonded aluminum plate fins.
 - g. Refrigerant lines shall have:
 - 1) Flexible connections.
 - 2) Suction and liquid line service valves.
 - 3) Charging valves.
 - 4) Receiver valve.
3. Furnace Section:
 - a. Units 3 Tons And Larger:
 - 1) Tubular section type of **20 ga (0.95 mm)** steel minimum with **1.2 mil (0.03 mm)** nominal aluminum-silicone alloy coating.
 - 2) Factory-installed induced draft blower.
 - b. Gas shut-off valve.
 - c. High limit switches.
 - d. Fan switch safety pilot and control transformer.
 - e. Automatic electric ignition.
4. Fan Section:
 - a. Indoor Blower (evaporator fan):
 - 1) Steel with corrosion-resistant finish and dynamically balanced. Bearings shall be sealed, permanently lubricated, ball bearing type.
 - 2) Belt driven, double inlet, forward curved centrifugal type with adjustable pitch motor pulley.
 - b. Condenser fan shall be direct-driven propeller type and discharge upward. Condenser fan shall have blades riveted to corrosion-resistant steel spiders and be dynamically balanced. Condenser motor shall be totally enclosed.
 - c. Constructed and tested in accordance with AMCA requirements.
 - d. Furnish with flexible connections with weather protection on supply and return air take-offs.
 - e. Evaporator-fan cabinet interior shall be insulated with **1/2 inch (13 mm)** thick minimum fiber glass insulation coated on air side. Use Aluminum foil-faced insulation in heating compartment.
5. Controls:
 - a. Low ambient and dual pressure.
 - b. Pre-wired.
 - c. Low voltage control circuit with fuse protection on 24 V transformer side.
 - d. Solid state compressor protection for following factory-supplied safeties:
 - 1) Compressor over-temperature, over-current.
 - 2) Loss of charge / low-pressure switch.
 - 3) Freeze protection thermostat, evaporator coil.
 - 4) High-pressure switch.
 - e. Following minimum protection for heating section:
 - 1) High temperature limit switch.
 - 2) Flame rollout switch.
 - 3) Flame proving controls on units 3 tons and larger.

6. Safety Controls:
 - a. Factory Supplied Duct Smoke Detectors mounted in Supply Air Section of Roof top Cabinet:
 - 1) Description:
 - a) Intelligent low-flow photoelectric duct smoke detector with flashscan. Photo electric smoke detector mounted in systems with airflow greater than 2000 CFM.
 - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) Model FSD-751 RP by Notifier by Honeywell.
7. Cabinets:
 - a. 3 Ton And Larger Units: Galvanized and weatherproof, with baked enamel finish on externally exposed surfaces and primed interior panel surfaces. Evaporator fan, compressor, and filter panels shall be hinged.
 - b. All Other Units: Galvanized, weatherproof, and coated inside and outside with corrosion-resistant paint.
8. Type Two Acceptable Manufacturers:
 - a. Class One Quality Standard: Lennox LGH:
 - 1) Carrier.
 - 2) Lennox.
 - 3) Trane.
 - 4) York.
 - 5) Equal as approved by Architect before installation. See Section 01 6200.

2.3 ACCESSORIES

- A. Vibration Isolation Curbs:
 1. Description:
 - a. Spring type with 2 inch (50 mm) minimum deflection.
 2. Design Criteria:
 - a. Comply with latest AHJ approved edition of IBC for seismic and wind requirements.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install units on vibration isolators.
- B. Set minimum outside air set point.
- C. Install gas regulator so that it is not in direct path of power exhaust discharge.
- D. Do not install electrical disconnect so it interferes with access to power exhaust units.

3.2 FIELD QUALITY CONTROL

- A. Manufacturer Services:
 1. Equipment Manufacturer to provide factory start-up service. This includes package roof top unit and economizer with power or barometric exhaust.

END OF SECTION

DIVISION 26: ELECTRICAL

26 0000 ELECTRICAL

- 26 0501 COMMON ELECTRICAL REQUIREMENTS
- 26 0519 LINE-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
- 26 0523 CONTROL-VOLTAGE ELECTRICAL CABLES
- 26 0526 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
- 26 0533 RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS
- 26 0613 ELECTRICAL EQUIPMENT MOUNTING HEIGHT SCHEDULE

26 2000 LOW (LINE) VOLTAGE DISTRIBUTION

- 26 2726 WIRING DEVICES
- 26 2816 ENCLOSED SWITCHES AND CIRCUIT BREAKERS

26 5000 LIGHTING

- 26 5100 INTERIOR LIGHTING
- 26 5200 EMERGENCY 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.
 - 4. Furnish and install Penetration Firestop Systems at electrical system penetrations as described in Contract Documents.

- B. Products Furnished But Not Installed Under This Section:
 - 1. Anchor bolts and templates for exterior lighting equipment bases.

- C. Related Requirements:
 - 1. Section 07 8400: Quality of Penetration Firestop Systems to be used on Project and submittal requirements.
 - 2. Section 31 2316: Criteria for performance of excavating.
 - 3. Section 31 2323: Criteria for performance of backfilling.

1.2 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) Sections 26 2417 / 8: Panelboards.
 - 2) Section 26 2726: Wiring devices / Lighting control / Dimming equipment.
 - 3) Section 26 2816: Enclosed switches and circuit breakers.
 - 4) Section 26 5100: Interior lighting fixtures.
 - 5) Section 26 5200: Emergency battery units.
 - c. Do not purchase equipment before approval of product data.
 - 2. Shop Drawings:
 - a. Submit on following equipment:
 - 1) Panelboards.
 - b. Indicate precise equipment to be used, including all options specified. Indicate wording and format of nameplates where applicable. Submit in three-ring binder with hard cover.

- B. Informational Submittals:
 - 1. Test And Evaluation Reports: Report of site tests, before Substantial Completion.

- C. Closeout Submittals:
 - 1. Operations And Maintenance Manual Data:

- a. Modify and add to requirements of Section 01 7000 as follows:
 - 1) Provide operating and maintenance instructions for each item of equipment submitted under Product Data.
 - 2) Provide in addition to product data required for Section 26 5100 interior lighting fixtures, tabulation for each tritium exit sign installed on Project including following:
 - a) Serial number.
 - b) Expiration date.
 - c) Installed building location (example – chapel north rear exit, north corridor east end, main west foyer, etc.).
 - 3) Include copy of approved shop drawings.

1.3 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies:
 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.

1.4 OWNER'S INSTRUCTIONS

- A. Provide competent instructor for three days to train 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.

1.5 SCHEDULING

- A. Include detailed sequence of individual electrical demolition operations on Construction Schedule specified in Section 01 3200.
- B. Coordinate with Owner for equipment and materials to be removed by Owner.

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.
 - 3) Section 26 2913: Enclosed Controllers.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. All relocations, reconnections, and removals are not necessarily indicated on Drawings. Include such work without additional cost to Owner.
- B. Confirm dimensions, ratings, and specifications of equipment to be installed and coordinate these with site dimensions and with other Sections.

3.2 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.

3.3 INSTALLATION

- A. General:
 - 1. Locations of electrical equipment shown on Drawings are approximate only. Field verify actual locations for proper installation.
 - 2. Coordinate electrical equipment locations and conduit runs with those providing equipment to be served before installation or rough-in.
 - a. Notify Architect of conflicts before beginning work.
 - b. Coordinate locations of power and lighting outlets in mechanical rooms and other areas with mechanical equipment, piping, ductwork, cabinets, etc, so they will be readily accessible and functional.
 - 3. Work related to other trades which is required under this Division, such as cutting and patching, trenching, and backfilling, shall be performed according to standards specified in applicable Sections.
- B. Install Penetration Firestop System appropriate for penetration at electrical system penetrations through walls, ceilings, and top plates of walls.

3.4 FIELD QUALITY CONTROL

- A. Field Tests:
 - 1. Test systems and demonstrate equipment as working and operating properly. Notify Architect before test. Rectify defects at no additional cost to Owner.
 - 2. Measure current for each phase of each motor under actual final load operation, i.e. after air balance is completed for fan units, etc. Record this information along with full-load nameplate current rating and size of thermal overload unit installed for each motor.

3.5 CLEANING

- A. Remove obsolete raceways, conductors, apparatus, and lighting fixtures promptly from site and dispose of legally.

END OF SECTION

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SECTION 26 0519**LINE-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Quality of conductors used on Project except as excluded below.
- B. Related Requirements:
 - 1. Section 23 0933: Conductors and cables for temperature control system.
 - 2. Section 26 0501: Common Electrical Requirements.

1.2 REFERENCES

- A. Definitions:
 - 1. Line Voltage: Over 70 Volts.

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 C).
 - b. Standard Conductor Size No. 8 And Larger: 600V Type THW, THWN, or XHHW (75 deg C).
 - c. Higher temperature insulation as required by NEC or local codes.
 - 3. Colors:
 - a. 240Y / 120 V System:
 - 1) Black: Phase A.
 - 2) Orange: Phase B.
 - 3) Blue: Phase C.
 - 4) Green: Ground.
 - 5) White: Neutral.
 - b. Conductors size No. 10 and smaller shall be colored full length. Tagging or other methods for coding of conductors size No. 10 and smaller not allowed.
 - c. For feeder conductors larger than No. 10 at pull boxes, gutters, and panels, use painted or taped band or color tag color-coded as specified above.
- B. Line Voltage Cables:
 - 1. Metal Clad Cable (MC) may be used as restricted below:
 - a. Copper conductors
 - b. Sizes #12 through #8
 - c. Use only in indoor dry locations where:
 - 1) Not subject to damage.
 - 2) Not in contact with earth.
 - 3) Not in concrete.

- C. Cord Sets For Ranges: Three pole, 4 wire grounding, 125/250V, NEMA 14-50P plug, 48 inch 1 200 mm cord length minimum.
- D. Standard Connectors:
 - 1. Conductors No. 8 And Smaller: Steel spring wire connectors.
 - 2. Conductors Larger Than No. 8: Pressure type terminal lugs.
 - 3. Connections Outside Building: Watertight steel spring wire connections with waterproof, non-hardening sealant.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General:
 - 1. Conductors and cables shall be continuous from outlet to outlet.
 - 2. Do not use direct burial cable.
- B. Line Voltage Conductors:
 - 1. Install conductors in raceway where indicated on 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 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 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 so neutral conductors will carry only unbalanced current. 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 of bearing points. Do not bore holes in vertical framing members outside center 1/3 of member width. Holes shall be one inch diameter maximum.
 - 4. Conceal cables within ceilings and walls of finished areas. Cables may be exposed in unfinished areas but not run on floors of mechanical equipment spaces or in such a way that they obstruct access to, operation of, or servicing of equipment.
 - 5. Install exposed cables parallel to or at right angles to building structure lines.
 - 6. Keep cables 6 inches 150 mm minimum from hot water pipes.
 - 7. Do not support cables from mechanical ducts or duct supports without Architect's written approval.
 - 8. Prohibited procedures:
 - a. Boring holes for installation of cables in vertical truss members.
 - b. Notching of structural members for installation of cables.

END OF SECTION

SECTION 26 0523**CONTROL-VOLTAGE ELECTRICAL CABLES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install control-voltage electrical cables as described in Contract Documents.
 - 2. Furnish and install building telephone / data system cables as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 01 1000: Owner will terminate building telephone cables at terminal board.
 - 2. Section 23 0933: Cables for Temperature Control System.
 - 3. Section 26 0501: Common Electrical Requirements.
 - 4. Section 28 3101: Cables for Fire Detection System.

1.2 REFERENCES

- A. Definitions:
 - 1. Control Voltage: 70 Volts and under.

PART 2 - PRODUCTS**2.1 SYSTEM**

- A. Manufacturers:
 - 1. Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories.
 - a. Alpha Wire Co, Elizabeth, NJ www.alphawire.com.
 - b. Belden Wire & Cable Co, Richmond, IN www.belden.com.
 - c. Liberty Wire & Cable, Colorado Springs, CO www.libertycable.com.
 - d. West Penn Wire Corp, Washington, PA www.westpenn-cdt.com.
- B. Components:
 - 1. Building Telephone / Data System Cables.
 - a. CAT 6-PLENUM RATED, 24 AWG, solid bare copper, four pair, UTP.
 - b. Sheath Colors:
 - 1) Telephone: White.
 - 2) Data: Blue.
 - c. Meet requirements of EIA / TIA 568 Standard.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. General:
 - 1. Cables shall be continuous and without splices from source to outlet.
 - 2. Conceal cables within ceilings and walls of finished areas. Cables may be exposed in unfinished areas but not run on floors of mechanical equipment spaces or in such a way that they obstruct access to, operation of, or servicing of equipment.

3. Run exposed cables parallel to or at right angles to building structure lines.
 4. Keep cables 6 inches 150 mm minimum from hot water pipes.
 5. Support cables using approved staples, cable ties, straps, hangers, or similar fittings spaced every 3 feet.
 6. Where installing in framing, do not bore holes in joists or beams outside center 1/3 of member depth or within 24 inches of bearing points. Do not bore holes in vertical framing members outside center 1/3 of member width. Holes shall be one half inch diameter maximum.
 7. Bundle only cables of same systems together.
- B. Telephone / Data System Cables:
1. Unless indicated otherwise on drawings, install cable from terminal board to telephone outlets and make connections to telephone jacks. Leave six feet of slack cable at telephone terminal board and label cables to identify location served.
 2. Unless indicated otherwise on drawings, install data cables from patch panel to data outlets and make connections to data jacks. Make connections at patch panel and install label on patch panel for each termination to identify location served.
- C. Sound And Video Systems Cables:
1. Label cables at each end with cable markers for use of sound system and video system installers.
 2. Run separate insulated No. 6 grounding conductor from each equipment cabinet to electrical panel. Do not use intermediate connections or splices.
 3. Extend cables 18 inches 450 mm from wall or ceiling at all outlets and speaker locations. Extend cables and grounding conductors to twice vertical length of cabinet at each cabinet location.
 4. For cables not installed in raceway, do not run cables within 10 inches of line voltage conductors / raceways. Also, maintain 10 inches minimum between following exposed cable groups:
 - a. Microphone cables.
 - b. CAT-6, sound system control, telephone, video, or ATC cables.
 - c. Loudspeaker cables.

END OF SECTION

SECTION 26 0526**GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install grounding for electrical installation as described in Contract Documents except as excluded below.
- B. Related Requirements:
 - 1. Section 26 0501: Common Electrical Requirements.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference: Participate in pre-installation conference specified in Section 03 3111.

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: Size materials as shown on Drawings and in accordance with applicable codes.
- C. Materials:
 - 1. Grounding And Bonding Jumper Conductors: Bare copper or with green insulation.
 - 2. Make grounding conductor connections to ground rods and water pipes using approved bolted clamps listed for such use.
 - 3. Service Grounding Connections And Cable Splices: Make by exothermic process.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Interface With Other Work: Coordinate with Section 03 3111 in installing grounding conductor and placing concrete. Do not allow placement of concrete before Architect's inspection of grounding conductor installation.
- B. Grounding conductors and bonding jumper conductors shall be continuous from terminal to terminal without splice. Provide grounding for following.
 - 1. Conduits and other conductor enclosures.
 - 2. Neutral or identified conductor of interior wiring system.
 - 3. Main panelboard, power and lighting panelboards.

4. Non-current-carrying metal parts of fixed equipment such as motors, starter and controller cabinets, instrument cases, and lighting fixtures.
- C. Pull grounding conductors in non-metallic raceways, in flexible steel conduit exceeding **72 inches** **1800 mm** in length, and in flexible conduit connecting to mechanical equipment.
- D. Provide grounding bushings on all feeder conduit entrances into panelboards and equipment enclosures.
- E. Bond conduit grounding bushings to enclosures with minimum #10 AWG conductor.
- F. Connect equipment grounds to building system ground.
 1. Use same size equipment grounding conductors as phase conductors up through #10 AWG.
 2. Use NEC Table 250-95 for others unless noted otherwise in Drawings.
- G. Run separate insulated grounding cable from each equipment cabinet to electrical panel. Do not use intermediate connections or splices. Affix directly to cabinet.
- H. On motors, connect ground conductors to conduit with approved grounding bushing and to metal frame with bolted solderless lug.
- I. Ground cabinet of transformers to conduit and ground wires, if installed. Bond transformer secondary neutral conductor to cabinet.

3.2 FIELD QUALITY CONTROL

- A. Field Inspections: Notify Architect for inspection two days minimum before placing concrete over grounding conductor.

END OF SECTION

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

- A. Includes But Not Limited To:
1. Quality of material and installation procedures for raceway, boxes, and fittings used on Project but furnished under other Divisions.
 2. Furnish and install raceway, conduit, and boxes used on Project not specified to be installed under other Divisions.
 3. Furnish and install main telephone service raceway as described in Contract Documents and to comply with telephone company requirements.
 4. Furnish and install main electrical service raceway to comply with electrical utility company requirements.
- B. Related Requirements:
1. Section 26 0501: General Electrical Requirements.
 2. Section 26 0503: Local electrical utility company shall furnish and install primary underground service.
 3. Section 27 4117: Furnishing and installing of satellite dish and TV distribution systems by Church approved installer and not to be included as part of work of this Section.
 4. Section 28 3100: Furnishing and installing of raceway and conduit for fire detection and alarm system.

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. Steel City, Div Thomas & Betts, Memphis, TN www.tnb.com or Thomas & Betts Ltd, Iberville, PQ (450) 347-5318.
 - e. Thomas & Betts, Memphis, TN www.tnb.com.
 - f. Walker Systems Inc, Williamstown, WV (800) 240-2601 or Walker Systems Inc / Wiremold Canada Inc, Fergus, ON (519) 843-4332.
 - g. Wiremold Co, West Hartford, CT www.wiremold.com.
- B. Performance:
1. Design Criteria: All aspects of design of sound system have been included as requirements of Owner. Do not make changes to any aspects of installation, design, or equipment pertaining to sound system without Owner's approval through Architect and Sound Consultant.
- C. 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 10 mm** Flexible Fixture Whips: Allowed only for connection to recessed lighting fixtures, lengths not to exceed **72 inches 1 800 mm**.
- c. Prohibited Raceway Materials:
 - 1) Aluminum conduit.
 - 2) Armored cable type AC (BX) cable.
2. Raceway And Conduit Fittings:
 - a. Rigid Steel Conduit And IMC: Threaded and designed for conduit use.
 - b. EMT:
 - 1) Compression type.
 - 2) Steel set screw housing type.
 - c. PVC Conduit:
 - 1) PVC type. Use PVC adapters at all boxes.
 - 2) PVC components, (conduit, fittings, cement) shall be from same Manufacturer.
 - d. Flexible Steel Conduit: Screw-in type.
 - e. Liquid-tight Flexible Metal Conduit: Sealite type.
 - f. Expansion fittings shall be equal to OZ Type AX sized to raceway and including bonding jumper.
 - g. Prohibited Fitting Materials:
 - 1) Crimp-on, tap-on, indenter type fittings.
 - 2) Cast set-screw fittings for EMT.
 - 3) Spray (aerosol) PVC cement.
3. Seal Devices: OZ Type WSK.
4. Outlet Boxes:
 - a. Galvanized steel of proper size and shape are acceptable for all systems. Where metal boxes are used, provide following:
 - 1) Provide metal supports and other accessories for installation of each box.
 - 2) Equip ceiling and bracket fixture boxes with fixture studs where required.
 - 3) Equip outlets in plastered, paneled, and furred finishes with plaster rings and extensions to bring box flush with finish surface.
 - b. Non-metallic boxes may be used only for control voltage wiring systems.
 - c. Telephone / data outlet boxes shall be single device outlet boxes.
 - d. HVAC Instrumentation And Control:
 - 1) Junction boxes in mechanical equipment areas shall be **4 inches 100 mm** square.
 - 2) Boxes for remote temperature sensor devices shall be recessed single device.
 - 3) Boxes for thermostats shall be **4 inches 100 mm** square with raised single device cover.
5. Floor Boxes:
 - a. Acceptable Products:
 - 1) HBLCFB401BASE cast iron box with HBLTCGNTBKSX duplex cover plate for carpet by Hubbell.
 - 2) Equal as approved by Architect before installation. See Section 01 6200.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Confirm dimensions, ratings, and specifications of materials to be installed and coordinate these with site dimensions and with other Sections.

3.2 INSTALLATION

- A. Interface With Other Work:
 - 1. Coordinate with Divisions 22 and 23 for installation of raceway for control of plumbing and HVAC equipment.
 - 2. Before rough-in, verify locations of boxes with work of other trades to insure that they are properly located for purpose intended.
 - a. Coordinate location of outlet for water cooler with Division 22.
 - b. Coordinate location of outlets adjacent to or in millwork with Division 06 before rough-in. Refer conflicts to Architect and locate outlet under his direction.
 - 3. Coordinate installation of floor boxes in carpeted areas with carpet installer to obtain carpet for box doors.
 - 4. Install pull wires in raceways installed under this Section where conductors or cables are to be installed under other Divisions.
- B. General:
 - 1. Sound and video system electrical components furnished and installed under this Section include following items:
 - a. Metal equipment cabinet and control cabinets.
 - b. Factory-fabricated speaker enclosures.
 - c. Fittings.
- C. Conduit And Raceway:
 - 1. Conceal raceways within ceilings, walls, and floors, except at Contractor's option, conduit may be exposed on walls or ceilings of mechanical equipment areas and above acoustical panel suspension ceiling systems. Install exposed raceway runs parallel to or at right angles to building structure lines.
 - 2. Keep raceway runs **6 inches 150 mm** minimum from hot water pipes.
 - 3. 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 NEC.
 - 4. 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.
 - 5. 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.
 - 6. Run two spare conduits from each new panelboard to ceiling access area or other acceptable accessible area and cap for future use.
 - 7. Bend PVC conduit by hot box bender and, for PVC **2 inches 50 mm** in diameter and larger, expanding plugs. Apply PVC adhesive only by brush.
 - 8. Installation in Concrete:
 - a. Install no conduit in concrete unless outside diameter is less than 1/3 of slab, wall, or beam thickness in which it is embedded.
 - b. Position conduits in center of concrete below reinforcing steel, and separated by minimum lateral spacing of three diameters.
 - c. Elbows embedded in concrete shall be rigid steel or IMC and stubouts from concrete slabs shall extend **3 inches 75 mm** minimum before making connection to EMT.

- d. Separate conduits penetrating structural slabs in buildings by **2 inches 50 mm** minimum.
 - e. Install seal device where underground raceways penetrate concrete building wall.
9. Installation In Framing:
- a. Do not bore holes in joists or beams outside center 1/3 of member depth or within **24 inches 600 mm** of bearing points. Do not bore holes in vertical framing members outside center 1/3 of member width.
 - b. Holes shall be **one inch 25 mm** diameter maximum.
10. Underground Raceway And Conduit:
- a. Bury underground raceway installed outside building **24 inches 600 mm** deep minimum.
 - b. Bury underground conduit in planting areas **18 inches 450 mm** deep minimum. It is permissible to install conduit directly below concrete sidewalks, however, conduit must be buried **18 inches 450 mm** deep at point of exit from planting areas.
11. 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.
12. Prohibited Procedures:
- a. Use of wooden plugs inserted in concrete or masonry units for mounting raceway, supports, boxes, cabinets, or other equipment.
 - b. Installation of raceway that has been crushed or deformed.
 - c. Use of torches for bending PVC.
 - d. Spray applied PVC cement.
 - e. Boring holes in truss members.
 - f. Notching of structural members.
 - g. Supporting raceway from ceiling system support wires.
 - h. Nail drive straps or tie wire for supporting raceway.
- D. Telephone / Data Systems:
- 1. Install main service raceway as directed by Telephone Company. Leave pull wire in raceway.
 - 2. Install raceway from terminal board to each telephone and data outlet as indicated on Drawings.
- E. Boxes:
- 1. Boxes shall be accessible and installed with approved cover.
 - 2. Do not locate device boxes that are on opposite sides of framed walls in the same stud space. In other wall construction, do not install boxes back to back.
 - 3. Locate boxes so pipes, ducts, or other items do not obstruct outlets.
 - 4. Install outlets flush with finished surface and level and plumb.
 - 5. Support switch boxes larger than two-gang with side brackets and steel bar hangers in framed walls.
 - 6. At time of substantial completion, install blank plates on uncovered outlet boxes that are for future use.
- F. Support factory-fabricated speaker enclosures from structure or ceiling suspension system.

END OF SECTION

SECTION 26 0613**ELECTRICAL EQUIPMENT MOUNTING HEIGHT SCHEDULE****PART 1 - GENERAL: Not Used****PART 2 - PRODUCTS: Not Used****PART 3 - EXECUTION****3.1 INSTALLATION**

- A. Unless otherwise indicated, mount center of outlets or boxes at following heights above finish floor. Refer special conditions to Architect before rough-in and locate outlet under his direction.
- B. Mounting Heights:
1. HVAC:
 - a. Temperature Control Junction Boxes: As indicated on Drawings.
 - b. Thermostats: As indicated on Drawings.
 - c. Remote Temperature Sensors:
 - 1) Wall-Mounted 50 inches 1 250 mm to top.
 - d. Other Motor Disconnects: 60 inches 1 500 mm.
 - e. Motor Controls: 60 inches 1 500 mm.
 2. Plumbing:
 - a. Electric Water Cooler Outlets: Mount so outlet and cord are hidden by water cooler.
 3. Electrical:
 - a. Distribution Panels: 72 inches 1 800 mm to top.
 - b. Receptacles: 18 inches 450 mm.
 - c. Wall Switches: 42 inches 1 050 mm.
 - d. Wall-Mounted Exit Lights: 90 inches 2 250 mm.
 - e. Emergency Lighting Units: 60 inches 1 500 mm.
 4. Communications
 - a. Sound Distribution System Components: As indicated on Drawings.
 - b. Satellite Distribution System Components: As indicated on Drawings.
 - c. TV Distribution System Components: As indicated on Drawings.
 - d. Computer and TV: 18 inches 450 mm.
 - e. Telephone / Data Terminal Boards: 72 inches 1 800 mm to top.
 - f. Telephones (wall type): 60 inches 1 500 mm.
 - g. Telephones (desk type): 18 inches 450 mm.

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. 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.
 - h. Lightolier Controls, Dallas, TX www.lolcontrols.com or Lightolier CFI, Lachine, QB (800) 565-5486 or (514) 636-0670.
 - i. Lutron Electronics Co Inc, Coopersburg, PA www.lutron.com.
 - j. Novitas Inc, Peachtree City, GA www.novitas.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. Red Dot div of Thomas & Betts, Memphis, TN www.tnbcom.
 - o. Siemon Company, Watertown, CT www.siemon.com.
 - p. Square D Co, Palatine, IL www.squared.com.
 - q. Suttle, Hector, MN www.suttleonline.com.
 - r. Tork Inc, Mount Vernon, NY www.tork.com.
 - s. 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 and brown on dark walls.
- B. Switches:
 - 1. Rectangular Face Designer Style:
 - a. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - 1) 20 AMP, single pole:
 - a) Cooper: DECB120W.

- b) Hubbell: HBL2121WA.
- c) Leviton: 5621-2W.
- d) Pass & Seymour: 2621-W.
- 2) Two Pole:
 - a) Cooper: DECB220W.
 - b) Hubbell: HBL2122WA.
 - c) Leviton: 5622-2W.
 - d) Pass & Seymour: 2622-W.
- 3) Three Way:
 - a) Cooper: DECB320W.
 - b) Hubbell: HBL2123WA.
 - c) Leviton: 5623-2W.
 - d) Pass & Seymour: 2623-W.
- 4) Four Way:
 - a) Cooper: DECB420W.
 - b) Hubbell: HBL2124WA.
 - c) Leviton: 5624-2W.
 - d) Pass & Seymour: 2624-W.
- 5) Pilot Switch:
 - a) Single Pole:
 - (1) Cooper: 2221PL.
 - (2) Hubbell: HBL1221PL.
 - (3) Pass & Seymour: PS20AC1-RPL.
 - (4) Leviton: 1221-PLR.
 - b) Double Pole:
 - (1) Cooper: 2222PL.
 - (2) Hubbell: HBL1222PL.
 - (3) Pass & Seymour: PS20AC2-RPL.
 - (4) Leviton: 1222-PL.
- 6) Lighted Toggle Switch:
 - a) Single Pole:
 - (1) Cooper: DECB120LW.
 - (2) Hubbell: HBL2121ILWA.
 - (3) Leviton: 5631-2W.
 - (4) Pass & Seymour: 2625-W.
 - b) Three Way:
 - (1) Cooper: DECB320LW.
 - (2) Hubbell: HBL2123IWA.
 - (3) Leviton: 5633-2W.
 - (4) Pass & Seymour: 26266-W.
- 2. Exhaust Fan Timer Switches:
 - a. Rest Rooms and Mother's Room:
 - 1) 0-15 minute, no hold position.
 - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a) Intermatic: FD15MWC.
 - b) Paragon: SWD15M-W.
 - c) Tork: A515MW.
 - b. Serving Area:
 - 1) 0-60 minute, no hold position.
 - 2) Approved Products:
 - a) Intermatic: FD60MWC.
 - b) Paragon: SWPD60M-W.
 - c) Tork: A560MW.
 - c. Font:
 - 1) 0-4 Hour, no hold position.
 - 2) Approved Products:
 - a) Intermatic: FDHW.
 - b) Tork: A504HW.
 - d. Custodian Room:
 - 1) 24 hour, in-wall, multiple automatic ON-OFF settings.

- 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a) Intermatic: E1020.
 - b) Tork: 701A.
 3. Dimmer Switches:
 - a. Vertical slide control with faceplate.
 - b. Preset, ON-OFF switch, 1000VA.
 - c. Approved Products:
 - 1) Hubbell: AS101/AS1I.
 - 2) Hunt: DAP-10-IV.
 - 3) Leviton: IPI10-I.
 - 4) Lightolier: MP1000-I.
 - 5) Lutron: N-1003P-IV.
 - 6) Pass & Seymour: 91180-I.
- C. Receptacles:
1. Rectangular Face Designer Style:
 - a. 15 AMP, specification grade, back and side wired, self grounding.
 - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - 1) Cooper: 6262W.
 - 2) Hubbell: HBL2152WA.
 - 3) Leviton: 16252-W.
 - 4) Pass & Seymour: 26252-W.
 2. Range Receptacle:
 - a. Three pole, four wire grounding, 125 / 250 V, NEMA 14-50R, 50 AMP complete with plate.
 - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - 1) Cooper: 1258.
 - 2) Hubbell: HBL9450A.
 - 3) Leviton: 279.
 - 4) Pass & Seymour: 3894.
 3. Ground Fault Circuit Interrupter (GFCI):
 - a. 15 AMP, specification grade.
 - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - 1) Cooper: GF15W.
 - 2) Hubbell: GF5252WA.
 - 3) Leviton: 8599-W.
 - 4) Pass & Seymour: 1594-W.
- D. Telephone Jacks:
1. Desk Type:
 - a. 4 conductor, screw terminals, voice grade.
 - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - 1) Cooper: 3532-4W.
 - 2) Leviton: 40249-W.
 - 3) Pass & Seymour: TPTE1-W.
 - 4) Suttle: 625B4-4-85.
 2. Wall Type:
 - a. 4 conductor, screw terminals, voice grade.
 - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - 1) Cooper: 3521-4W.
 - 2) Leviton: 40257-W.
 - 3) Pass & Seymour: WMTE14-W.
 - 4) Suttle: 630AC4-85.
 3. Module Type:
 - a. For use in data faceplates.
 - b. 8 conductor, punch-down, voice grade.
 - c. Type Two Acceptable Products:
 - 1) Siemon: MX3-F-U3-02
 - 2) Equal as approved by Architect before use. See Section 01 6200.

E. Data Jacks:

1. For use in data faceplates.
 2. 8 conductor, punch-down T568B wiring configuration, CAT 6.
 3. Type Two Acceptable Products:
 - a. Flat Jack: Siemon MX6-F02
 - b. Angled Jack: Siemon MX6-02
 - c. Equal as approved by Architect before use. See Section 01 6200.
- F. 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: Stainless Steel.
 - c. Ganged switches shall have gang plates.
 - d. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - 1) Cooper.
 - 2) Hubbell.
 - 3) Leviton.
 - 4) Pass & Seymour.
 2. Data Faceplates:
 - a. Type Two Acceptable Products:
 - 1) Single Module: Siemon MX-FP-S-01-02.
 - 2) Two Modules: Siemon MX-FP-S-02-02.
 - 3) Equal as approved by Architect before use. See Section 01 6200.
 3. Weatherproof In-Use Receptacle Covers:
 - a. NEMA 3R rated.
 - b. Cast aluminum.
 - c. Compatible with GFCI receptacles.
 - d. Complete with weather resistant gaskets and stainless steel screws.
 - e. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - 1) Hubbell: WP26MH, horizontal; WP26M, vertical.
 - 2) Intermatic: WP1010HMC, horizontal; WP1010MC, vertical.
 - 3) Red Dot: CKMG, horizontal; CKMGV, vertical.
- G. 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) Leviton:
 - a) Sensor: OSC10-U
 - b) Relay / Transformer: OSP20-OD)
 - 2) Hubbell:
 - a) Sensor: OMNI-US500.
 - b) Relay / Transformer: 120 V: MP 120 A.
 - 3) Novitas:
 - a) Sensor: 01-083.
 - b) Relay / Transformer: 120 / 277 V, 13-0511.
 - 4) Pass & Seymour: 120 V.
 - a) Sensor: US1001.
 - b) Relay / Transformer: PWP120.
 - 5) Tork:
 - a) Sensor: SC20.
 - b) Relay / Transformer: 120 V: TRP1.
 - 6) Watt Stopper:
 - a) Sensor: W-500A.
 - Relay / Transformer: 120 V: B120E-P.
- H. Data Patch Panel:
1. Panel:
 - a. Meet requirements of TIA / EIA 568 Standard.

- b. CAT 6, 48 ports groups in eight 6-port modules, T568B wiring configuration, 19 inch 475 mm width.
- c. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - 1) Leviton: 69586-U48.
 - 2) Ortronics: OR-PHD66U48.
 - 3) Suttle: STAR19110C6-48.
2. Mounting Bracket:
 - a. Hinged, wall mounted, 19 inches wide by 5 inches deep.
 - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - 1) Leviton: 49251-W62.
 - 2) Ortronics: OR-604004068.
 - 3) Suttle: 103B1.
- I. Surge Protective Devices:
 1. Type 3 as defined in UL 1449 and approved for exterior application.
 2. Parallel metal oxide varistors, MOV, from each line to ground. 120 / 240 VAC. UV resistant construction with epoxy encapsulation of electrical connections.
 3. Include 1/2 inch mounting nipple and locknut.
 4. Category Four approved Products. See Section 01 6200 for definitions of Categories.
 - a. ASZ175B2 by Cooper Power Systems.
 - b. 9L15FCB001 by General Electric.
 - c. AG2401C by Intermatic.
 - d. 54175-SSA by Leviton.
 - e. SDSA1175 by Square D.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install devices flush with walls, straight, and solid to box.
- B. Label dimmer switch groupings with 1/16 inch (1.6 mm) thick laminated plastic composition material with contrasting color core. Engraved letter shall be 1/4 inch (6 mm) high.
- C. Install surge protective device in knock-out of junction box installed on bottom of automatic sprinkler controller.

END OF SECTION

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SECTION 26 2816**ENCLOSED SWITCHES AND CIRCUIT BREAKERS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install disconnects as described in Contract Documents, except those provided integral with equipment.
- B. Related Requirements:
 - 1. Section 26 0501: Common Electrical Requirements.

PART 2 - PRODUCTS**2.1 ASSEMBLIES**

- A. Manufacturers:
 - 1. Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories.
 - a. Disconnects: Same as Manufacturer of Project's main panelboard.
 - b. Fuses.
 - 1) Cooper Bussmann, Ellisville, IL www.cooperbussmann.com.
 - 2) Edison Fuse, Ellisville, IL (314) 391-3443.
 - 3) Ferraz Shawmut, Newburyport, MA www.ferrazshawmut.com.
 - 4) Littelfuse Inc, Des Plaines, IL www.littelfuse.com.
- B. Disconnects:
 - 1. Heavy-duty quick-make, quick-break type, non-fused unless indicated otherwise.
 - 2. Provide interlock to prevent opening of door when switch is in ON position.
 - 3. Provide means to lock switch in OFF position with padlock.
 - 4. Disconnects for motor circuits shall be horsepower rated.
 - 5. Disconnects For Furnace Units And Unit Heaters: Provide manual starter with thermal overload relay. Provide overload relay to match motor full load amps.
 - 6. Enclosures:
 - a. Interior: NEMA / CEMA Type 1.
 - b. Exterior: NEMA / CEMA Type 3R.
 - 7. Fuses:
 - a. Fuse fused disconnects with dual-element time delay fuses and equip with rejection type fuse holders.
 - b. Fuses on Project shall be from single manufacturer.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Label disconnects to indicate equipment served, such as Condensing Unit CU-1. Use **1/16 inch 1.5 mm** thick laminated plastic composition material with contrasting color core. Engraved letters shall be **1/4 inch 6 mm** high. Attach labels with screws.

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.

PART 2 - PRODUCTS**2.1 ASSEMBLIES**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Advance Transformer Co, Rosemont, IL www.advancetransformer.com.
 - b. General Electric Lighting, Hendersonville, NC or General Electric Lighting Canada Inc, Mississauga, ON www.gelighting.com/na.
 - c. Howard Lighting Products, Laurel, MS www.howard-ind.com.
 - d. Novitas Inc, Peachtree City, GA www.novitas.com.
 - e. Osram Sylvania, Danvers, MA www.sylvania.com or Osram Sylvania Ltd, Mississauga, ON (905) 673-6171.
 - f. Philips Lighting Co, Somerset, NJ www.lighting.philips.com/nam or Philips Lighting Canada, Scarborough, ON (416) 292-3000.
 - g. Universal Lighting Technologies, Nashville, TN www.universalballast.com.
 - h. Venture Lighting International, Solon, OH www.venturelighting.com.
 - i. Watt Stopper Inc, Santa Clara, CA www.wattstopper.com.
 - j. Westinghouse Lighting Corp, Philadelphia, PA www.westinghouselightbulbs.com.
 - 2. Product Options: When several lighting fixtures are specified by name for one use on Drawings, select any one of those specified. Do not mix fixtures from different manufacturers specified for one use.
- B. Materials
 - 1. Lighting Fixtures:
 - a. Type One Acceptable Products:
 - 1) See Fixture Schedule on Drawings for acceptable manufacturers and models.
 - 2) Equals as approved by Architect before bidding. See Section 01 6200.
 - 2. Fluorescent Ballasts:
 - a. Energy saving electronic for T8 lamps.
 - 1) Instant start.
 - 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 for T8 lamps.
 - 7) Class A sound rating.
 - 8) Transient protection in accordance with IEEE / ANSI C62.41-1984, Category A.
 - 9) Comply with FCC 47CFR 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 Manufacturers. See Section 01 6200 for definitions of Categories.
 - a) ROP-LWSC or VOP-LWSC by Advance.
 - b) GE-MAX-L/ULTRA by General Electric.
 - c) B-IUNVEL-A by Universal Lighting Technologies.
 - d) QHE-UNV-ISL-SC by Osram / Sylvania.
3. Lamps:
- a. T8 Fluorescent Lamps:
 - 1) Minimum initial output of 3100 Lumens.
 - 2) Rated life of 24,000 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) North American Philips.
 - c) Osram / Sylvania.
 - d) Westinghouse
 - b. Other Lamps:
 - 1) Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories.
 - a) General Electric.
 - b) North American Philips.
 - c) Osram / Sylvania.
 - d) Westinghouse
- C. 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.
 2. Coordinate with Sections under 09 9000 heading to ensure that light coves are properly painted before installation of light fixtures.
 3. In mechanical equipment rooms, coordinate locations of light fixtures with equipment locations to provide proper room illumination without obstruction. Suspend fixtures that must be mounted below pipes, ducts, etc, with chains or other Architect approved method.
- B. Securely mount fixtures. Support fixtures weighing 50 lbs 23 kg or more from building framing or structural members.
- C. Where fluorescent fixtures are shown installed end to end, provide suitable connectors or collars to connect adjoining units to appear as a continuous unit.
- D. Where recessed fixtures are to be installed, provide openings, plaster rings, etc, of exact dimensions for such fixtures to be properly installed. Coordinate fixture installation with ceiling type and thickness. Terminate circuits for recessed fixtures in an extension outlet box near fixture and connect with specified flexible conduit.

- E. Verify operation of track lighting system in Cultural Center, then remove and store track lighting fixtures as directed.
- F. Do not locate incandescent fixtures in closet or storage areas within 18 inches 450 mm and fluorescent fixtures within 6 inches 150 mm of shelves.

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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SECTION 26 5200**EMERGENCY LIGHTING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install emergency battery units as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 26 0501: Common Electrical Requirements.

PART 2 - PRODUCTS**2.1 SYSTEMS**

- A. Manufacturers:
 - 1. Manufacturer List:
 - a. Bodine Emergency Lighting, Collierville, TN www.bodine.com
 - b. Dual-Lite, Cheshire, CT www.dual-lite.com.
 - c. Iota Engineering Co, Tucson, AZ www.iotaengineering.com
 - d. Lightolier, Fall River, MA www.lightolier.com.
 - e. Lithonia Lighting, Conyers, GA www.lithonia.com.
 - f. McPhilbin / Day-Brite Lighting, Tupelo, MS www.mcphilben.com.
 - g. Sure-Lites / Cooper Lighting, Elk Grove, IL www.cooperlighting.com.
- B. Materials:
 - 1. Battery Packs:
 - a. General:
 - 1) Batteries shall be long life nickel cadmium type.
 - 2) Complete with charging indicator light and test switch.
 - 3) Factory-installed in lighting fixture, or capable of being field-installed to same standards.
 - b. Standard Linear Fluorescent Fixtures:
 - 1) Shall operate one lamp of fluorescent lighting fixture at approximately 600 lumens initially and 60 percent minimum of initial lumens after 90 minutes.
 - 2) Charger shall be capable of full recharge in 24 hours.
 - c. Recessed Downlight Fluorescent Fixtures:
 - 1) Shall operate lamp(s) of lighting fixture for 90 minutes minimum.
 - 2) Components shall be easily accessible for maintenance.
 - 2. Emergency Lighting Units And Remote Lighting Heads:
 - a. Shall operate indicated number of lamps for 90 minutes of emergency operation.
 - b. Sealed, maintenance free, lead calcium type battery.
 - c. Painted steel housing and complete with power indicator light and test switch.
 - d. Lamps shall be 12 Watt, 12 Volts in metal housing designed for wet locations and with mounting plate that allows full vertical and horizontal adjustment of lamps.
 - e. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - 1) Sure-Lites / Cooper Lighting:
 - a) No Lamp Unit: XR12208-0-SD.
 - b) Remote Two Lamp Lighting Head: 12T-12-DWMHWH.
 - 2) Dual-Lite:
 - a) No Lamp Unit: LM66-12V-0.
 - b) Remote Two Lamp Lighting Head: OMSDW1212.
 - 3) Lightolier:

- a) No Lamp Unit: E4250LW.
- b) Remote Two Lamp Lighting Head: MP2(2)CH1212.
- 4) Lithonia Lighting:
 - a) No Lamp Unit: ELT50WRO.
 - b) Remote Two Lamp Lighting Head: ELAWTMTH1212.
- 5) McPhilbin / Day-Brite Lighting:

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Battery Packs:
 - 1. General:
 - a. Wire so unit can be tested with lights on.
 - b. Wire so lamps in normal mode are switched off with other lighting in area. Connect unit to unswitched conductor of normal lighting circuit.
 - 2. Recessed Downlight Fluorescent Fixtures: If indicator light and test switch cannot be installed within fixture, install on plate adjacent to fixture.
 - 3. Other Fluorescent Fixtures: Install in ballast channel of fixture with charging indicator light and test switch mounted on fixture end, or visible and accessible through lens.

END OF SECTION

DIVISION 27: COMMUNICATIONS

27 1000 STRUCTURED CABLING

27 1501 COMMUNICATIONS HORIZONTAL CABLING

27 5000 DISTRIBUTED COMMUNICATIONS AND MONITORING SYSTEMS

27 5117 AUDIO SYSTEMS

END OF TABLE OF CONTENTS

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SECTION 27 1501**COMMUNICATIONS HORIZONTAL CABLING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish, install, and test communications horizontal cabling as described in Contract Documents including following:
 - a. Cables and related terminations.
 - b. Patch cords and modular connectors.
 - c. Surface raceway and outlet poles.
 - d. Support and grounding hardware.
 - e. UTP Cable.
 - f. UTP Patch cords.
 - g. UTP Connector Modules.
 - h. Installation and testing of Owner Furnished Network Equipment.
- B. Related Requirements:
 - 1. Division 26: Raceways and surface boxes.
 - 2. Section 07 8400: 'Firestopping' for furnishing and installation of firestopping.
 - 3. Section 26 0526: 'Grounding And Bonding For Electrical Systems' for installation and termination.
 - 4. Section 27 5117: 'Audio Systems'.
- C. Products Installed But Not Furnished Under This Section:
 - 1. Owner Furnished Network Equipment as specified on Drawings as shown in Contract Documents including:
 - a. Internet Firewall.
 - b. Network Switch.
- D. Related Requirements:
 - 1. Section 01 6400: Owner will provide Network Equipment as specified on ET Drawings as shown in Contract Documents. Contract Documents establishes quality of materials and installation for information of Contractor, Architect, and Owner's Representatives. .

1.2 REFERENCES

- A. Association Publications:
 - 1. Building Industry Consulting Service International (BISCI):
 - a. *Information Transport Systems Installation Methods Manual (ITSIMM)* (5th Edition).
 - b. *Telecommunications Distribution Methods Manual (TDMM)* (12th Edition).
 - 2. Institute of Electrical and Electronics Engineers:
 - a. IEEE 802.3-2012, '*Standard for Ethernet*'.
 - b. IEEE 1100-2005, '*Recommended Practice for Powering and Grounding Electric Equipment*'.
 - 3. Telecommunications Industry Association:
 - a. TSB-162, '*Telecommunication Cabling Guidelines for Wireless Access Points*' (March 2006).
- B. Reference Standards:
 - 1. International Electrotechnical Commission:
 - a. IEC 60603-7:2011, '*Connectors for electronic equipment – Part 7 'Detail specification for 8-way, unshielded, free and fixed connectors*'.
 - 2. International Organization for Standardization / International Electrotechnical Commission:
 - a. ISO/IEC 11801:2002/Amd 2:2010, '*Information Technology-Generic Cabling for Customer Premises*'.

3. National Fire Protection Association:
 - a. NFPA 70–2014, 'National Electrical Code'.
4. Telecommunications Industry Association:
 - a. TIA-568-C.2, 'Balanced Twisted-Pair Telecommunications Cabling and Components Standards' (Revision C, 2009).
 - b. TIA-569, 'Telecommunications Pathways And Spaces' (Revision D, 2015).
 - c. TIA-606, 'Administration Standard for Telecommunications Infrastructure' (Revision B, 2012).
 - d. TIA-607, 'Telecommunications Bonding and Grounding (Earthling) for Customer Premises' (Revision C, 2015).
 - e. TIA-758, 'Customer-Owned Outside Plant Telecommunication Infrastructure Standard' (Revision B, 2012).
 - f. TIA-942, 'Telecommunications Infrastructure Standard for Data Centers' (Revision A, 2014).
 - g. TIA-1152, 'Requirements for Field Test Instruments and Measurements for Balanced Twisted-Pair Cabling' (2009 Edition).
5. Underwriters Laboratories:
 - a. UL 94: The Standard for Safety of Flammability of Plastic Materials for Parts in Devices and Appliances Testing (March 2013 6th Edition).
 - 1) 94HB, 'Horizontal Burn Test'.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 1. Coordinate with Project Manager and/or Facility Manager well in advance of Substantial Completion for installation of all Owner Furnished Network Equipment.

1.4 SUBMITTALS

- A. Action Submittals:
 1. Product Data:
 - a. Provide Manufacturer's documentation, installation instructions, and descriptive information on each piece of equipment to be used.
 2. Shop Drawings:
 - a. Provide three (3) copies of labeling system reflecting approved label scheme for cable installation for racks, cables, panels, and outlets.
- B. Informational Submittals:
 1. Certificates:
 - a. Provide Installer certificates of qualifications required.
 2. Design Data:
 - a. Identification and labeling:
 - 1) Provide labeling system for cable installation to be approved by Owner.
 - a) Clearly identify all components of system: racks, cables, panels and outlets.
 - b) Designate cables origin and destination and unique identifier for cable within facility by room number and port count.
 - c) Racks and patch panels shall be labeled to identify location within cable system infrastructure.
 - b. After system installation, provide three (3) full documentation sets to Consulting Engineer/Architect for approval.
 3. Tests And Evaluation Reports:
 - a. Submit documentation within ten (10) working days of completion of each testing phase. This is inclusive of all test results and record drawings.
 - b. Draft drawings may include annotations done by hand. Final copies of all drawings shall be submitted within thirty (30) working days of completion of each testing phase.
 - c. At request of Consulting Engineer, provide copies of original test results.
 4. Field Quality Control Submittals:
 - a. Architect will provide floor plans in paper and electronic formats on which record documentation information can be recorded.
 5. Qualification Statements:

- a. Letter from Manufacturer certifying level of training and experience of Installer.
- C. Closeout Submittals:
1. Include following information in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Operations and Maintenance Data:
 - 1) Provide operating and maintenance instructions for each item of equipment submitted under Product Data.
 - b. Warranty Documentation:
 - 1) Final, executed copy of Warranty.
 - c. Record Documentation:
 - 1) Manufacturers documentation:
 - a) Manufacturer's literature or cut sheet.
 - 2) Tests and evaluation reports.
 - 3) As-built Documentation:
 - a) Provide record document to include cable routes and outlet locations.
 - (1) Sequential number shall identify outlet locations.
 - (2) Numbering, icons, and drawing conventions used shall be consistent throughout all documentation.
 - (3) Provide labeling system information.

1.5 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
1. System shall meet approval of authority having jurisdiction (AHJ). NEC and State and/or local ordinances and regulations shall govern unless more stringent requirements are specified.
 2. Meet all TIA/EIA commercial building wiring standards.
 3. Meet Telecommunications Distribution Methods Manual (TDMM) (12th Edition) requirements for installation and testing.
 4. All Networks shall be installed per applicable standards and manufacturer's guidelines.
 5. Cable assemblies shall be UL / CE Listed and CSA Certified. Cables shall be a distinctive green or green/yellow in color, and all jackets shall be UL, VW-1 flame rated.
 6. Grounding shall conform to all required Commercial Building Grounding and Bonding Requirements for Telecommunications, Electrical Codes, and Manufacturer's grounding requirements.
- B. Qualifications: Requirements of Section 01 4301 applies, but is not limited to following:
1. Manufacturer Qualifications:
 - a. Provide single source for all products of system:
 - 1) KeyConnect by Belden.
 - 2) Netkey by Panduit.
 - 3) System 6 by Siemon.
 - 4) Uniprise Media 6 by CommScope.
 2. Installers Qualifications:
 - a. Approved and Certified by Manufacturer (installation and maintenance trained):
 - 1) Belden Certified System Vendor (CSV).
 - a) Belden Certified LDS Partner.
 - 2) CommScope Certified Business Partner.
 - a) CommScope Certified LDS Partner.
 - 3) Panduit Certified Installer (PCI).
 - 4) Siemon Certified Installers (CI).
 - b. Three (3) year experience with similar projects. Provide documentation.

1.6 WARRANTY

- A. Special Warranty:
1. Cabling System:

- a. Provide warranty for permanent link cabling system to meet Category 6 standard requirements for structured cabling system for twenty (20) years.
2. Installer Warranty:
 - a. Installer guarantees that all work is in accordance with all express and implied requirements of Contract Documents, that all work is of good quality, and further warrants work and material for period of (1) year from date of substantial completion of project, unless longer period of time is specified in Contract. All work not conforming to these requirements, may be considered defective:
 - 1) If, within one (1) year after substantial completion of work, or within such longer period of time as may be prescribed by law or by terms of any warranty in Contract, any of work is found to be defective or not in accordance with Contract, Installer shall at Installer cost correct it promptly after receipt of written notice from Owner.
 - 2) Installer's obligation shall survive termination of Contract.
 - 3) Owner shall give such notice within reasonable time after discovery of condition.
 - b. Installer warrants to Owner that all materials and equipment furnished under this Contract shall be new unless otherwise specified, free from faults and defects and in conformance with Contract Documents:
 - 1) Contractor shall secure manufacturer's warranties and deliver copies thereof to Owner upon completion of work.
 - 2) All such warranties shall commence from date of substantial completion, and will not in any way reduce Installer's responsibilities under his Contract.
 - 3) Whenever guarantees or warranties are required by specifications for longer period than one year, such longer period shall govern.
 - c. Installer will provide twenty (20) year minimum end to end manufacturer warranty.

PART 2 - PRODUCTS

2.1 OWNER-FURNISHED PRODUCTS

- A. Category Four Products. See Section 01 6200 for definitions of Categories:
 1. LDS Network Equipment as specified ET Drawings as shown in Contract Documents including:
 - a. ISP Modem.
 - b. Network Switch.
 2. Coordination:
 - a. Coordinate installation of all Owner Furnished Network Equipment including but limited to:
 - 1) Installation and configure devices in accordance with LDS requirements.
 - 2) Proper set-up of network equipment.
 - 3) Owner Furnished internet service to building prior to final installation of AV and Voice Data Equipment.
 - 4) Testing of network equipment.

2.2 SYSTEMS

- A. Manufacturers:
 1. Category Four Approved Manufacturers and Products. See Section 01 6200 for definitions of Categories:
 - a. Belden, St. Louis, MO www.belden.com.
 - b. Panduit Corporation, Tinley Park IL www.panduit.com.
 - c. Systemax Solutions, a CommScope Company, Hickory, NC www.systemax.com.
 - d. The Siemon Company, Watertown, CT www.siemon.com.
- B. Design Criteria:
 1. Must install single manufacture as complete permanent link.
 - a. Category 6 minimum compliance margin on all parameters beyond category 6 and Power Sum ACR out to 250 MHz.
 2. Entire Category 6 system to be provided by single approved Manufacturer throughout.

3. Install structured cabling system that will be able to support interconnections to active telecommunications equipment for voice and data applications in multi vendor, multi product environment. Structured cabling system should adhere to TIA-568, TIA-606; TIA-607, and TIA-942 standards with respect to pathways, distribution, administration, and grounding of the system.
 4. Each room drop will consist of two drops each consisting of two terminations can be interoperable to accommodate either voice or data applications. Provide convenience phone drops that will consist of single termination that will be installed in proper faceplate for each location's phone.
 5. Install, terminate, test, and guarantee each drop according to customer all applicable standards and customer preferences.
 6. Horizontal cables will be rated Category 6 (250 MHz) in performance and rated to comply with TIA-568 to connector outlets at Work Area. Horizontal cables will home run back to Technology Room (Entrance Facility / Main Cross Connect) and will terminate on individual Category 6 rated jacks to populate modular 48 port angled patch panel on open or flat patch panel inside enclosures. All cables will be patched at cutover as interconnection into floor serving active equipment using RJ45 modular equipment cables rated to Category 6.
 7. Match additions to horizontal raceway to complete system according to TIA-568 where suspension and protection gaps exist.
- C. Components – Work Area Subsystem:
1. Provide connectivity equipment used to connect horizontal cabling subsystem and equipment in work area. Both copper and fiber media shall be supported. Connectivity equipment shall include following options:
 - a. Patch (equipment) cords and modular connectors.
 - b. Outlets and surface mount boxes.
 - c. Surface raceway and outlet poles.
 - d. Consolidation point / MUIO.
 2. Patch Cords and Modular Connectors:
 - a. Match horizontal cabling medium and rating. Same Manufacturer shall provide modular connectors and patch cords. Total patch cord length at work area is not to exceed **10 feet (3.0 m)**.
 - b. Copper Connectivity:
 - 1) Network Cabling System:
 - a) Provide for Work Area subsystem, including all modular connectors.
 - b) Modular connectors shall support of high-speed networks and applications designed for implementation on copper cabling.
 - c) Outlets shall utilize fully interchangeable and individual connector modules that mount side-by-side to facilitate quick and easy moves, adds and changes.
 - 2) Modular Connections:
 - a) Data Modules shall be Category 6:
 - (1) Eight position modules required in all work areas and shall exceed connector requirements of TIA Category 6 standard.
 - (2) Prove termination cap with strain relief on cable jacket, ensure cable twists are maintained to within **1/8 inch (3 mm)** and include wiring scheme label. Wiring scheme label shall be available with TIA-568 wiring schemes.
 - b) Terminations shall use for TIA-568 wiring scheme.
 - c) Modules shall terminate 4 pair 23 100-ohm solid unshielded twisted pair cable.
 - d) Modules shall meet ISO 11801 standard including complying with intermateability standard IEC 60603-7 for backward compatibility.
 - e) Category 6 modules shall have UL and CSA approval.
 - f) Modules shall have ETL verified Category 6 performance and ISO 11801 Class E performance in both basic and channel links.
 - g) Modules shall be universal in design, accepting 2, 3, or 4 pair modular plugs without damage to outer jack contacts.
 - h) Modules shall be able to be re-terminated minimum of 10 times and be available in 11 standard colors for color-coding purposes.
 - i) Jack shall snap into all outlets and patch panels.
 - j) Module shall include black base to signify Category 6 400 MHz performance.
 - 3) Patch Cords:

- a) Category 6 patch cords shall be factory terminated with modular plugs featuring one-piece, tangle-free latch design and strain-relief boots to support easy moves, adds, and changes.
 - b) Constructed with Category 6 23-AWG stranded UTP cable.
 - c) Each patch cord shall be one hundred (100) percent performance tested at factory in channel test to TIA Category 6 standard.
 - d) Patch cords shall come in standard lengths of 3, 5, 7, 9, 14 and 20 feet (0.90, 1.50, 2.15, 2.75, 4.20 and 6.1 meters) and 6 standard colors of Blue or White.
 - e) Provide one (1) each 8 feet (2.45 m) patch cord for 50 percent of terminated work station ports.
3. Outlets and Surface Mount Boxes:
- a. Outlets and surface mount boxes shall support network system by providing high-density in-wall, surface mount cabling applications.
 - b. Provide faceplates for flush mount:
 - 1) Outlets faceplates shall be manufactured from high-impact thermoplastic material with UL 94 flammability rating of 94 HB or better.
4. Copper Cable:
- a. Design Criteria:
 - 1) Performance exceeds all TIA-568 Category 6 and ISO 11801 for Class E cable requirements.
 - 2) ETL tested and verified for Category 6 component performance.
 - 3) Conductors are twisted in pairs with four pairs contained in flame retardant PVC jacket separated by a spline.
 - 4) Performance tested to 650 MHz.
 - 5) Plenum (CMP) and non-plenum/riser (CMR) flame rated.
 - 6) Maximum installation tension of 25 lbs (110 N).
 - 7) Installation temperature range: 32 deg F (0 deg C) to 140 deg F (60 deg C).
 - 8) Operating temperature range: 14 deg F (minus 10 deg C) to 140 deg F (60 deg C).
 - 9) Cable diameter: Riser – 0.26 inch (6.604 mm) 0.260"; Plenum – 0.25 inch (6.35 mm).
 - 10) Easy payout, reel-in-a-box and descending length markings on cable speed installation.
 - 11) Supports following applications: Ethernet 10BASE-T, 100BASE-T (Fast Ethernet) and 1000BASE-T (Gigabit Ethernet); 1.2Gb/s ATM; Token Ring 4/16; digital video; and broadband/baseband analog video.
 - 12) Color shall be blue.
- D. Horizontal Distribution Cabling:
1. General:
 - a. Horizontal distribution cabling system is portion of telecommunications cabling system that extends from work area telecommunications outlet/connector to horizontal cross-connect in Technology Room (Entrance Facility / Main Cross Connect).
 - 1) Horizontal cabling in office should terminate in Technology Room (Entrance Facility / Main Cross Connect) located on same floor as Work Area being served.
 - 2) Horizontal cabling is installed in star topology (home run).
 - 3) Bridged taps and splices are not permitted as part of copper horizontal cabling.
- E. Components – Technology Room (Entrance Facility / Main Cross Connect):
1. General:
 - a. Connect networking equipment to horizontal and backbone cabling subsystems:
 - 1) Termination hardware (connectors and patch cords), racks, cable management products and cable routing products.
 - 2) Cable termination hardware.
 - b. Terminate each horizontal or backbone cabling run using appropriate connectors or connecting blocks depending upon cable type:
 - 1) Matching patch cords will be used to perform cross-connect activities or to connect into the networking/voice hardware:
 - a) Category 6 Enhanced Unshielded Twisted Pair (UTP).
 - c. Four-pair Category 6 UTP cabling shall be terminated onto four-pair Category 6 module:
 - 1) All modules shall be terminated using 568-B wiring scheme.
 - 2) Eight position module shall exceed connector requirements of TIA Category 6 standard.

- 3) Jack termination to 4-pair, 100 ohm solid unshielded twisted pair cable shall be by use of forward motion termination cap and shall not require use of punchdown or insertion tool.
2. Rack, Cabinet, and Cabling Management Enclosure:
 - a. Cable Management:
 - 1) Cable Management System shall be used to provide neat and efficient means for routing and protecting fiber and copper cables and patch cords on telecommunication racks and enclosures.
 - 2) Provide complete cable management system comprised of vertical and horizontal cable managers to manage cables on both front and rear of rack.
 - 3) System shall protect network investment by maintaining system performance, controlling cable bend radius and providing cable strain relief.
 - b. Vertical Cable Management:
 - 1) General:
 - a) Vertical cable managers include components that aid in routing, managing and organizing cable to and from equipment.
 - b) Panels shall protect network equipment by controlling cable bend radius and providing cable strain relief.
 - 2) Provide panels with universal design mounting to 19 inches (480 mm) rack and constructed of steel bases with PVC duct attached.
 - 3) Covers shall be able to hinge from either side yet still be easily removed to allow for quick moves, adds, and changes.
 - c. Horizontal Cable Management:
 - 1) General:
 - a) Horizontal cable managers include components that aid in routing managing and organizing cable to and from equipment.
 - b) Panels shall protect network equipment by controlling cable bend radius and providing cable strain relief.
 - 2) Provide panels with universal design mounting to 19 inches (480 mm) rack and constructed of steel bases with PVC duct attached.
 - 3) Duct fingers shall include retaining tabs to retain cables in place during cover removal.
 - 4) Covers shall be able to hinge from either side yet still be easily removed to allow for quick moves, adds, and changes.
3. Patch Cords:
 - a. Provide patch cords between modular patch panels configured as cross-connect or between patch panel and networking hardware when patch is used as interconnect. Provide one (1) each 3 feet (0.90 m) patch cord for each terminated patch panel port.
 - b. Provide patch cords as indicated on Drawings and Specifications as shown in Contract Documents. Ensure all devices are fully connected to network equipment.
 - c. Provide additional patch cords with appropriate length to connect all Owner provided internet enabled appliances (IEA) as specified on TT (Technology Telecommunication) and TA (Technology Audiovisual) Drawings as shown in Contract Documents.
 - d. Patch cords shall be factory terminated with modular plugs featuring one-piece, tangle-free latch design and black strain-relief boots to support easy moves, adds and changes.
 - e. Construct patch cords with Category 6 24-AWG stranded UTP cable.
 - f. Patch cords shall be one hundred (100) percent performance tested at factory in channel test to Category 6 standard.
4. Patch Panels:
 - a. Four-pair Category 6 UTP cabling shall be terminated onto four-pair-punch-down style connecting hardware mounted to rear of integral patch panels and routed to Category 6 modules on front face of patch panel.
 - b. Patch panels shall be universal for TIA-568 wiring configurations.
 - c. Patch panels shall have removable 6-port design that allows 6-port module to be removed without disrupting other ports.
 - d. Integral cable tie mounts shall be included in panel for cable management on back of panel.
 - e. Port and panels shall be easy to identify with write-on areas and optional label holder for color-coded labels.
 - f. Rack mountable patch panels shall mount to standard 19 inches (480 mm) rack.
5. Grounding and Bonding:
 - a. Provide Telecommunications Bonding Backbone:

- 1) Ground all telecommunications cable shields, equipment, racks, cabinets, raceways, and other associated hardware that has potential to act as current carrying conductor.
- 2) Install telecommunication Bonding Backbone independent of building's electrical and building ground.
- 3) Designed in accordance with recommendations contained in TIA-607 Telecommunications Bonding and Grounding Standard.
- b. All wires used for telecommunications grounding purposes shall be identified with green insulation:
 - 1) Non-insulated wires shall be identified at each termination point with wrap of green tape.
 - 2) All cables and bus bars shall be identified and labeled as required.
6. Firestopping: Furnish and install firestopping as per Section 07 8400.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Install communications system in accordance with Manufacturer's written instructions, and complying with applicable portions of NEC 'Standard of Installation'.

B. Work Area Outlets:

1. Cables shall be coiled in in-wall or surface-mount boxes if adequate space is present to house cable coil without exceeding Manufacturers bend radius.
 - a. No more than **12 inches (300 mm)** of UTP slack shall be stored in in-wall box, modular furniture raceway, or insulated walls.
 - b. Excess slack shall be loosely configured and stored in ceiling above each drop location when there is not enough space present in outlet box to store slack cable.
2. Cables shall be dressed and terminated in accordance with TIA-568, Manufacturer's recommendations, and best industry practices.
3. Cables shall be bundled using Velcro straps at least **0.25 inch (6.35 mm)** wide. Use of plastic wire ties or zip ties is not allowed on project.
4. Pair untwist at termination shall not exceed **0.125 inch (3.175 mm)**.
5. Bend radius of cable in termination area shall not be less than 4 times outside diameter of cable.
6. Cable jacket shall be maintained to within **one inch (25 mm)** of termination point.
7. Data / voice jacks, unless otherwise noted in Contract Documents, shall be located on each faceplate.
8. Horizontal Cabling:
 - a. Data jacks in horizontally oriented faceplates shall occupy rightmost position(s).
 - b. Voice jacks shall occupy the top position(s) on the faceplate. Voice jacks in horizontally oriented faceplates shall occupy the left-most position(s).

C. Horizontal Cross Connect:

1. Cables shall be dressed and terminated in accordance with TIA-568, Manufacturer's recommendations, and best industry practices.
2. Pair untwist at termination shall not exceed **0.125 inch (3.175 mm)**.
 - a. Bend radius of cable in termination area shall not be less than 4 times outside diameter of cable.
3. Cables shall be neatly bundled and dressed to their respective panels or blocks.
 - a. Each panel or block shall be fed by individual bundle separated and dressed back to point of cable entrance into rack or frame.
 - b. Cables shall be bundled using Velcro straps at least **0.25 inch (6.35 mm)** wide. Use of plastic wire ties or zip ties is not allowed on project.
4. Cable jacket shall be maintained as close as possible to termination point.
5. Each cable shall be clearly labeled on cable jacket behind patch panel at location that can be viewed without removing bundle support ties.
 - a. Cables labeled within bundle, where label is obscured from view shall not be acceptable.
6. Horizontal Cabling:

- a. A pull cord (nylon; **1/8 inch (3 mm)** minimum) shall be co-installed with all cable installed in any conduit.
 - b. Cable raceways shall not be filled greater than required by TIA-569 maximum fill for particular raceway type.
 - c. Cables shall be installed in continuous lengths from origin to destination (no splices) except for transition points, or consolidation points.
 - d. Where transition points or consolidation points are allowed, they shall be located in accessible locations and housed in enclosure intended and suitable for purpose.
 - e. Cable's minimum bend radius and maximum pulling tension shall not be exceeded.
 - f. If J-hook or trapeze system is used to support cable bundles, all horizontal cables shall be supported at **48 inch (1 200 mm)** to **60 inches (1 500 mm)** maximum intervals. At no point shall cable(s) rest on acoustic ceiling grids or panels.
 - g. Horizontal distribution cables shall be bundled in groups of no more than 25 cables. Cable bundle quantities in excess of 25 cables may cause deformation of bottom cables within bundle and degrade cable performance.
 - h. Cables shall be bundled using Velcro straps at least **0.25 inch (6.35 mm)** wide. Use of plastic wire ties or zip ties is not allowed on project.
 - i. Cable shall be installed above fire-sprinkler systems and shall not be attached to system or any ancillary equipment or hardware. Cable system and support hardware shall be installed so that it does not obscure any valves, fire alarm conduit, boxes, or other control devices.
 - j. Cables shall not be attached to ceiling grid or lighting fixture wires. Where support for horizontal cable is required, install appropriate carriers to support cabling.
 - k. Cables shall be identified by self-adhesive label and meet requirements of TIA-606. Cable label shall be applied to cable behind faceplate on section of cable that can be accessed by removing cover plate.
 - l. Unshielded twisted pair cable shall be installed so that there are no bends smaller than four times the cable outside diameter at any point in run and at termination field.
 - m. Pulling tension on 4-pair UTP cables shall not exceed **25 lbf (111 N)** for a four-pair UTP cable.
- D. Vertical Outlet Pole And Surface Raceway:
1. Horizontal Cabling:
 - a. General:
 - 1) Vertical outlet poles and Surface Raceway refers to surface raceway system used for branch circuit wiring and/or data network, voice, video and other low-voltage cabling. Surface raceway shall be used in solid wall applications or for applications where moves, additions and changes are very typical to workflow.
 - b. Raceway system shall consist of raceway, appropriate fittings and accessories to complete installation per electrical Contract Documents. Non-metallic surface raceway is to be utilized in dry interior locations only as covered in Article 352, part B of the NEC, as adopted by the NFPA and as approved by the ANSI.
- E. Copper Termination Hardware:
1. Cables shall be dressed and terminated in accordance with TIA-568, Manufacturer's recommendations, and best industry practices.
 2. Pair untwist at termination shall not exceed **0.125 inch (3.175 mm)**.
 - a. Bend radius of cable in termination area shall not be less than 4 times outside diameter of cable.
 3. Cables shall be neatly bundled and dressed to their respective panels or blocks.
 - a. Each panel or block shall be fed by individual bundle separated and dressed back to point of cable entrance into rack or frame.
 - b. Cables shall be bundled using Velcro straps at least **0.25 inch (6.35 mm)** wide. Use of plastic wire ties or zip ties is not allowed on project.
 4. Cable jacket shall be maintained as close as possible to termination point.
 5. Each cable shall be clearly labeled on cable jacket behind patch panel at location that can be viewed without removing bundle Velcro support straps.
 - a. Cables labeled within bundle, where label is obscured from view shall not be acceptable.
- F. Grounding System:

1. Where required, Telecommunications Bonding Backbone shall be designed and/or approved by qualified Installer.
 2. Follow requirements of TIA-607.
- G. Seismic Bracing:
1. Comply with IBC and local seismic requirements for all equipment and conduit pathways.
- H. Identification and Labeling:
1. Apply machine generated approved labeling for racks, cables, panels and outlets:
 - a. Designate cables origin and destination and unique identifier for cable by room name and/or number and port count.
 - b. Racks and patch panels shall be labeled to identify location within cable system infrastructure.
 2. Place labeling within view at termination point on each end.
 3. Outlet, patch panel and wiring block labels shall be installed on, or in, space provided on device.
 4. See Contract Drawings for labeling scheme.
 5. Conform to IP addressing assignments as listed in Attachment 'FACILITIES ZONE IP ADDRESS ASSIGNMENT TABLE'.
 - a. See Attachment 'FACILITIES ZONE IP ADDRESS ASSIGNMENT TABLE' for 'IP Address Assignments.

3.2 FIELD QUALITY CONTROL

- A. Field Tests:
1. Provide testing upon completion of installation.
 - a. General:
 - 1) Testing to be in accordance with TIA standards and Manufacturer's system warranty guidelines and best industry practice.
 - a) If any of these are in conflict, discrepancies shall be brought to attention of Architect/Consulting Engineer for clarification and resolution.
 - b. Cables and termination hardware:
 - 1) Test complete system for defects in installation.
 - 2) Verify cabling system performance under installed conditions according to requirements of TIA-568:
 - a) All pairs of each installed cable shall be verified prior to system acceptance.
 - b) Any defect in cabling system installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks shall be repaired or replaced in order to ensure one hundred (100) percent useable conductors in all cables installed.
 - c. Copper channel testing:
 - 1) All twisted-pair copper cable links shall be tested for compliance to requirements of TIA-568 for appropriate Category of cabling installed.
 - 2) Backbone multimode fiber cabling shall be tested at both 850 nm and 1300 nm.
 - d. UTP Cables and Links testing:
 - 1) UTP cabling channel must be tested at swept frequencies up to 250 MHz for internal channel performance parameters as defined in IEEE 802.3 and TIA-568. Certifications shall include following parameters for each pair of each cable installed:
 - a) Wire map (pin to pin connectivity).
 - b) Length (in feet or millimeters).
 - c) Near End Crosstalk (NEXT).
 - d) Far End Crosstalk (FEXT).
 - e) ELFEXT.
 - f) Attenuation/Crosstalk Ration (ACR).
 - g) Return Loss.
 - h) Propagation Delay.
 - i) Delay Skew.
 - j) Test equipment shall provide electronic and printed record of these tests.
 - 2) Test each pair of cable for opens, shorts, grounds, and pair reversal.

- a) Correct short or grounded and reversed pairs.
 - b) Examine open and shorted pairs to determine if problem is caused by improper termination.
 - c) If termination is proper, tag bad pairs at both ends and note on termination sheets.
 - d) If horizontal cable contains bad conductors, remove and replace cable.
 - e. Testing Equipment:
 - 1) Comply with requirements of TIA-568.
 - a) Appropriate level III tester shall be used to verify Category 6 cabling systems.
 - 2) UTP Cables and Links test equipment:
 - a) Category Four Approved Testing Equipment. See Section 01 6200 for definitions of Categories:
 - (1) Fluke Networks DTX-1800 with firmware version 2.04 or later.
 - (a) Test lead to be P/N DTX-PLA001 or PLA002 universal permanent link interface adapter.
 - (2) Agilent Wireshcope Pro N2640A with firmware version 2.1.9 or later.
 - (a) Test lead to be P/N N2644A-101 universal CAT6A link smart probes.
 - f. Re-Testing:
 - 1) Consulting Engineer may request ten (10) percent random field re-test to be conducted on cable system, at no additional cost to Owner, to verify documented findings.
 - a) Tests shall be repeat of those defined above.
 - b) If findings contradict documentation submitted, additional testing can be requested to extent determined necessary by Consulting Engineer, including one hundred (100) percent re-test at no additional cost to Owner.
 - g. Tests And Evaluation Reports:
 - 1) Printouts generated for each cable by wire test instrument shall be submitted as part of documentation package. Installer may furnish this information in electronic form.
 - a) Media shall contain electronic equivalent of test results as defined by the Section along with software necessary to view and evaluate test reports.
 - 2) Submit documentation within ten (10) working days of completion of each testing phase. This is inclusive of all test results and record drawings.
 - 3) Draft drawings may include annotations done by hand. Final copies of all drawings shall be submitted within thirty (30) working days of completion of each testing phase.
 - 4) If requested by Consulting Engineer, provide copies of original test results.
 - h. Test Documentation:
 - 1) Provide electronic format documentation within three (3) weeks after completion of project.
 - 2) Documentation shall be clearly marked on outside front cover with following:
 - a) "Project Test Documentation".
 - b) Project name.
 - c) Date of completion (month and year).
 - 3) Test results shall include following:
 - a) Record of test frequencies.
 - b) Cable type.
 - c) Conductor pair and cable (or outlet) I.D.
 - d) Measurement direction.
 - e) Reference setup.
 - f) Crew member name(s).
 - g) Test equipment name, manufacturer, model number, serial number, software version.
 - h) Last calibration date:
 - (1) Unless Manufacturer specifies more frequent calibration cycle, annual calibration cycle is required on all test equipment used on project.
 - (2) Document shall detail test method used and specific settings of equipment during test as well as software version being used in field test equipment.
- B. Non-Conforming Work: Non-conforming work as covered in General Conditions applies, but is not limited to following:
- 1. Any cable damaged or exceeding recommended installation parameters during installation shall be replaced at no additional cost to Owner.

2. Any defect in cabling system installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks shall be repaired or replaced in order to ensure one hundred (100) percent useable conductors in all cables installed at no additional cost to Owner.
3. Correct deviation and repeat applicable testing at no additional cost to Owner.
4. Correct any work found defective or not complying with Association Publications and TDMM requirements at no additional cost to Owner.
 - a. Document all problems found and corrective action taken.
 - b. Include both failed and passed test data.

END OF SECTION

SECTION 27 5117**AUDIO SYSTEMS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
1. Furnish and install complete and operational sound system as described in Contract Documents including:
 - a. Complete systems for amplifying sound signals from media source equipment and distributing them to loudspeakers at various locations.
 2. Assist Audiovisual Consultant with final inspection and equalization of system and provide necessary test equipment for audio system and partition noise isolation tests if applicable. Correct problems found at time of final inspection of system.
- B. Related Requirements:
1. Division 26 'Electrical':
 - a. Raceway, boxes, and installation of speaker enclosures and mounting rings furnished by Division 27.
 - b. Power to equipment location and power relay wiring if applicable.
 2. Section 27 1501: 'Communications Horizontal Cabling'.
 3. Audiovisual Consultant will perform final inspection, system balance and equalization. Installer shall instruct users in operation of system.

1.2 REFERENCES

- A. Association Publications:
1. Building Industry Consulting Service International (BISCI):
 - a. *Information Transport Systems Installation Methods Manual (ITSIMM)* (5th Edition).
 - b. *Telecommunications Distribution Methods Manual (TDMM)* (12th Edition).
 2. InfoComm International Association:
 - a. *Audiovisual Best Practices: The Design & Integration Process for the AV and Construction Industries*.
 - b. *AV Design Reference Manual* (1st Edition, 2006).
 - c. *Basics of Audio and Visual Systems Design* (2003).
 3. Institute of Electrical and Electronics Engineers:
 - a. IEEE 1100-2005, '*Recommended Practice for Powering and Grounding Electric Equipment*'.
- B. Reference Standards:
1. American National Standards Institute/InfoComm International Association:
 - a. ANSI/INFOCOMM 1M:2009, 'Audio Coverage Uniformity in Enclosed Listener Areas'.
 - b. ANSI/INFOCOMM 2M:2010, 'Standard Guide for Audiovisual Systems Design and Coordination Processes'.
 - c. ANSI/INFOCOMM 4:2012, 'Audiovisual Systems Energy Management'.
 2. National Fire Protection Association:
 - a. NFPA 70: 'National Electrical Code (NEC)' (2014 Edition).
 - b. NFPA 72: 'National Fire Alarm and Signaling Code' (2016 Edition).
 3. Telecommunications Industry Association:
 - a. TIA-568-C.2, 'Balanced Twisted-Pair Telecommunications Cabling and Components Standards' (Revision C, 2009).

- b. TIA-569, 'Telecommunications Pathways And Spaces' (Revision D, 2015).
 - c. TIA-606, 'Administration Standard for Telecommunications Infrastructure' (Revision B, 2012).
 - d. TIA-607, 'Telecommunications Bonding and Grounding (Earthling) for Customer Premises' (Revision C, 2015).
 - e. TIA-758, 'Customer-Owned Outside Plant Telecommunication Infrastructure Standard' (Revision B, 2012).
4. Underwriters Laboratories (UL):
 - a. UL 486A-486B, 'Wire Connectors' (January 2013).

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 1. Coordinate final inspection schedule of audio system before Audio Consultant's final inspection.
- B. Schedule:
 1. After completion of audio system installation of this section, Installer to perform Field Testing before Audio Consultant Final Inspection of audio system.
 2. Notify Audio Consultant two (2) weeks minimum before Audiovisual Consultant's final inspection as specified in Field Quality Control in Part 3 of this specification.

1.4 SUBMITTALS

- A. Informational Submittals:
 1. Special Procedure Submittals:
 - a. Provide itemized list of equipment to be supplied.
 - b. Provide proposed labeling for system components.
 2. Qualification Statement:
 - a. Installer:
 - 1) Provide Qualification documentation as requested by Engineer/Architect including:
 - a) List of Projects requested.
 - b) List of certified technician(s) with dates of training courses completed.
- B. Closeout Submittals:
 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Operations and Maintenance Data:
 - 1) Equipment Manufacture's manual:
 - a) Audio system operation and maintenance instructions.
 - b) List of equipment provided, including portable equipment, showing make, model, and serial number.
 - b. Warranty Documentation:
 - 1) Include copy of final, executed warranty.
 - c. Record Documentation:
 - 1) Software and Programming: Copies of all manufacturers' software used for programming various components and functions of the system shall be furnished to the Owner:
 - a) Original audio processor program files, source codes and compiled codes used for system control, audio setup and any other computerized functions of system including screen layout generation, configuration and layouts and any other related computer files shall also be furnished to Owner.
 - b) In each and every case, all programming, code generation, configuration files, layout files and any other software and/or code written and generated of setup and operation of this system are property of Owner of system and not of Audiovisual Consultant, Contractor or Integrator.

1.5 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. System shall be installed in accordance with applicable standards, requirements, and recommendations of International Building Code, National Electrical Code and all local authorities having jurisdiction.

- B. Qualifications:
 - 1. Installer. Requirements of Section 01 4301 applies, but not limited to following:
 - a. Approved Installers:
 - 1) Installers are to furnish and install components of audio system and meet qualification requirements.
 - 2) Approval subject to agreement process for Pre-Approval Installers.
 - b. Alternate Installer(s):
 - 1) Firm specializing in performing work of this section:
 - a) Minimum three (3) years of successful installation experience of AV system projects of comparable size, and complexity required for this project. Audio systems must have included complete installation and setup work and must have been completed by factory trained and certified technician.
 - b) Firm successfully completed minimum of three (3) projects in past two (2) years before bidding.
 - c) Firms must have certified technician that has successfully completed all relevant training courses recommended by manufacturers and proficient of all specified equipment of this section.
 - d) Comply with specifications and Contract Documents.
 - 2) Submit documentation of compliance of qualifications before bid to Architect or Owner's Representative.
 - c. Same Approved Installer shall furnish and install components of Section 27 1116 'Communications Cabinets, Racks, Frames and Enclosures' and Section 27 4117 'Video Systems'.

1.6 DELIVERY, STORAGE, AND HANDLING

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

- B. Storage And Handling Requirements:
 - 1. Provide secure location protected from weather in cool, dry location, out of direct sunlight in compliance with Manufacturer's instructions and recommendations.
 - 2. Keep materials free from dirt and foreign matter.

1.7 WARRANTY

- A. Special Warranty:
 - 1. Provide complete warranty repair or replacement for one (1) year at no cost to Owner, except in case of obvious abuse.
 - 2. If failure causes audio system to be inoperative or unusable for its intended purpose, Installer, when notified of problem before Wednesday, shall repair system so it will be operational and usable by following Monday. If defective components cannot be repaired in time, furnish and install temporary loaner equipment as required.
 - 3. Honor component warranties for term established by Manufacturer, if greater than one (1) year.

PART 2 - PRODUCTS

2.1 SYSTEM

A. Manufacturers Contact List:

1. Category Four components as shown on Drawings from following Manufacturers. See Section 01 6200 for definition of Categories.
 - a. Atlas Sound, Phoenix, AZ www.atlassound.com.
 - b. Audio-Technica US Inc, Stow, OH www.audio-technica.com.
 - c. Belden Wire & Cable Co, Richmond, IN www.belden.com.
 - d. Electro-Voice Inc, Burnsville, MN www.electro-voice.com.
 - e. Emtech Electronics Inc, Orem, UT www.emtechelectronics.com.
 - f. HellermannTyton, Milwaukee, WI www.hellermann.tyton.com.
 - g. Hubbell Inc, Orange, CT www.hubbell-wiring.com.
 - h. JBL Professional, Northridge, CA www.jblpro.com.
 - i. Leviton Manufacturing Co, Little Neck, NY www.leviton.com.
 - j. Liberty AV Solutions, Colorado Springs, CO www.libertycable.com.
 - k. Lowell Manufacturing Co, Pacific, MO www.lowellmfg.com.
 - l. Middle Atlantic Products, Fairfield, NJ www.middleatlantic.com.
 - m. Neutrik USA Inc, Lakewood, NJ (732) 901-9488. www.neutrikusa.com.
 - n. QSC Audio Products, Costa Mesa, CA www.qscaudio.com.
 - o. Radio Design Labs, Carpenteria, CA www.rdl.net.
 - p. Shure Brothers, Evanston, IL www.shure.com.
 - q. Soundtube Entertainment, Park City, UT www.soundtube.com.
 - r. Surgex, Knightdale, NC www.surgex.com.
 - s. Switchcraft, Chicago, IL www.switchcraft.com.
 - t. TOA Electronics, South San Francisco, CA www.toaelectronics.com.
 - u. Whirlwind Music Distributors, Inc., Rochester, NY www.whirlwindusa.com.
 - v. Wireworks Corp, Hillside, NJ www.wireworks.com.

B. Performance:

1. Capabilities:
 - a. No noise, hum, RFI pickup or distortion shall be audible under normal operating conditions.
 - b. Audio systems shall reproduce program material at level of 80 to 85 dBA without audible distortion.
 - c. Sound masking system:
 - 1) Sound masking system shall provide adequate speech privacy in Corridor when set between 42 dBA and 46 dBA at ear-height under speaker so conversation in Office at slightly raised voice levels cannot be understood in Corridor.

C. System Requirements:

1. General:
 - a. Provide complete and fully functional audio systems using materials and equipment of types, sizes, ratings, and performances as indicated in equipment list in accompanying drawings:
 - 1) Use materials and equipment that comply with referenced standards and manufacturers' standard design and construction in accordance with published product information.
 - 2) Coordinate features of materials and equipment so they form integrated system with components and interconnections matched for optimum performance of specified functions.
2. Provide all wire, cable, and connectors as required to complete installation of all systems as designed and specified.

D. Equipment And Materials:

1. General:

- a. Provide equipment selected from equipment list on drawings, or as substituted following proscribed substitution process, using all solid state components fully rated for continuous duty at ratings indicated or specified.
- b. Select equipment for normal operation on input power supplied at 105 130 V, 60 Hz.

PART 3 - EXECUTION

3.1 INSTALLERS

- A. Approved Installers:
 1. Category Four Approved Installers. See Section 01 6200 for definitions of Categories:
 - a. Qualifications:
 - 1) Meet qualification requirements as specified in Quality Assurance in Part 1 of this specification.
 - b. General Communications: (801) 266-5731.
 - c. Marshall Industries: (801) 266-2428.
 - d. Poll Sound: (801) 261-2500.
 - e. Professional Systems Technology: (801) 649-6696.

3.2 EXAMINATION

- A. Verification Of Conditions:
 1. Verify compliance with following items before beginning work of this Section:
 - a. No cables spliced.
 - b. Isolated ground run back to electrical panel from all equipment cabinets.
 - c. Specified conduit, cables, speaker enclosures and equipment cabinets are properly installed.
 - d. Location and angle of speaker cabinets.
 2. Ensure that no solid structural or decorative member impedes sound propagation from speakers and that no member with cross section greater than **3/4 inch (19 mm)** is placed in front of speakers.
 3. Verify installation of fiberglass insulation in field-fabricated speaker enclosures.

3.3 INSTALLATION

- A. General:
 1. Install system in accordance with NFPA 70 'National Electrical Code', NFPA 72 'National Fire Alarm and Signaling', and other applicable codes. Install equipment in accordance with manufacturer's written instructions.
- B. Mounting And Securing Equipment:
 1. Equipment shall be firmly secured in place unless requirements of portability dictate otherwise.
 2. Fastenings and supports shall be adequate to support their loads with safety factor of at least three (3) times weight of equipment being installed.
 3. Any structural mounting that is not able to meet this requirement due to specific nature of equipment, manufacturer's requirements or limitations of facility, shall not be installed without prior approval of Engineer.
 4. Install all boxes, equipment, hardware, and other materials plumb, level, and square.
- C. Millwork:
 1. Install technology equipment and support equipment in millwork in neat and cosmetically dressed out manner.

2. Install technology equipment and support equipment in podium and other millwork in neat and cosmetically dressed out manner.
 3. Saw cuts, holes and recesses into laminates and woodwork shall be straight.
 4. Radius and circular cuts shall be consistent, and all uneven surfaces shall be corrected. This shall include use of moldings, grommets, bushings, laminates, and wood products as required to dress out installation of equipment.
 5. Install equipment and panels in technology racks and podiums using matching screws, hardware and grommets.
- D. Speakers:
1. Maintain uniform polarity in speakers and wiring.
 2. Employ no positive stop in rotation of speaker volume controls. Controls shall be capable of continuous rotations in either direction.
 3. Mount transformers with screws securely to speaker brackets or enclosures. Adjust torsion springs as necessary to securely support speaker assembly.
 4. Neatly mount speaker grilles, panels, connector plates, control panels, etc., tight, plumb, and square unless indicated otherwise on drawings.
 5. Provide brackets, screws, adapters, springs, rack mounting kits, etc, recommended by manufacturer for correct assembly and installation of speaker assemblies and electronic components.
 6. Line factory-fabricated speaker back boxes with **one inch (25 mm)** minimum fiberglass if not done by Back box Manufacturer.
 7. Speaker Back Boxes shall be secured to structure using **12 ga (2.7 mm)** minimum seismic safety cables.
- E. Technology:
1. Provide sufficient ventilation for adequate cooling of equipment.
 2. Install vent rack panels in unused spaces. Install vent panels at top and bottom and above each power amplifier.
 3. Securely fasten equipment plumb and square in place. Where equipment is installed in rack cabinets, utilize all fastening holes and cove open spaces with perforated panels.
 4. Securely fasten relays and small components. Do not use sticky-back tape for fasteners.
 5. Install balancing transformer on each unbalanced input or output that connects to devices outside equipment cabinet, or that connects to balanced input or output within equipment cabinet.
 6. Connect powered components to 120 VAC outlets on transient voltage surge suppressors. Do not connect to outlets on other components.
 7. Leave sufficient service loops to uniform length on cables to allow operation of system with chassis outside cabinet.
 8. Equipment shall be held firmly in place with proper types of mounting hardware as recommended and/or supplied by manufacturer:
 - a. Mounting hardware provided with equipment shall be used when practical. This shall include, but not be limited to, front and rear rack rails, angle brackets and rack mount kits.
 - b. Equipment shall be installed so as to provide reasonable safety to operator.
- F. Cables, Wires, And Connectors:
1. Cables:
 - a. Cable and wire shall be new and unspliced.
 - b. Splicing:
 - 1) Splicing of cables and conductors is expressly prohibited in any location other than equipment racks.
 - 2) Splicing of control and speaker level conductors shall be accomplished via punch block or terminal strip connections only.
 - c. Additional cable length shall be provided at all connector locations. Duplex box, junction box, and floor box locations shall be installed with sufficient cable length behind cover plates to permit wiring maintenance and connector replacement in the future.

- d. When cable runs utilize vertical cable raceways located within walls, acoustic integrity of walls shall be maintained:
 - 1) Cables that pass-through cover plates of junction boxes and raceways, through slab-to-slab walls, and through conduit lines shall be properly gasketed and sealed. Acoustic material shall be restored or replaced.
 - e. Separation between system cables and other services shall be maximized to prevent and/or minimize potential for electro-magnetic interference (EMI):
 - 1) Provide at least **12 inches (305 mm)** separation from electrical lines whenever feasible.
 - 2) Where separation is unavoidable, distribution cables shall cross other services at right angles whenever practical to minimize EMI.
 - f. Do not install signal cables on top of light fixtures, ceiling speakers, projection screens, HVAC controls or sensing devices, fire safety and sprinkler system detection technology, or any other technology or mechanical equipment.
 - g. Do not lay cables directly on top of T-bar grid ceiling tiles:
 - 1) Support cables installed outside of conduit at **4 feet (1.20 m)** maximum intervals from building structure.
 - 2) Do not utilize support wires from other trades or systems.
 - h. Install system cables shall not block access to other equipment or services, across removable service panels and/or in any other manner to prohibit routine maintenance of HVAC systems, fire safety equipment and building mechanical control systems.
 - i. Inter-rack cabling:
 - 1) Inter-rack cabling shall be neatly laced, dressed, strain relieved and adequately supported.
 - 2) Inter-rack cables shall be grouped according to signals being carried to reduce signal contamination. Separate groups shall be formed for following:
 - a) Power.
 - b) Control.
 - c) Video.
 - d) Audio cables carrying signals less than -20 dBm.
 - e) Audio cables carrying signals between -20 dBm and +20 dBm.
 - f) Audio cables carrying signals over +20 dBm.
 - j. Power cables, control cables, and high-level cables shall be run on left side of equipment racks as viewed from rear. All other cables shall be run on right side of all equipment racks as viewed from rear.
 - k. Cables, except video cables which must be cut to electrical length, shall be cut to length dictated by cable run.
 - l. Terminal blocks, boards, strips or connectors, shall be furnished by installer for all cables which interface with racks, cabinets, consoles, or equipment modules. Affix terminal blocks, boards, strips or connectors to equipment racks using screws only. Double sided tape will not be accepted.
 - m. Shields for audio cables shall be grounded at input end only of various equipment items on system to prevent potential for ground loops.
 - n. Shields for microphone cables shall be grounded at both ends to allow Phantom Power to pass.
2. Wiring and Cabling:
- a. Comply with industry standard circuit polarity and loudspeaker wiring polarity. No cables shall be terminated with polarity reversal between connectors at either end.
 - b. System wire, after being cut and stripped, shall have wire strands twisted back to their original lay and be terminated by approved soldered or mechanical means. No bare wire ends shall be accepted.
 - c. Do not place any wires and cables for this system in any conduit, raceway, wire way or cable tray that is used for mechanical systems of building.
 - d. Route all cable and wiring within equipment racks, cabinets and millwork according to function, separating wires of different signal levels (microphone, line level, amplifier output, AV, control, etc.) by as much distance as possible. Neatly arrange, harness and bundle all cable with velcro straps.

- e. After completion of wiring and cable installation, all trough and box covers shall be notched out and grommetted for clearance of various cable bundles, (i.e., separate audio, video, and control). Panel covers shall be screwed back in place and all gaskets shall be restored or replaced.
3. Connectors:
- a. Provide connectors of type and quality as detailed in Contract Drawings and/or as required to meet minimum bandwidth requirements of equipment to which connectors are terminated. Overall quantity of connectors shall not be limited by quantities indicated in Contract Drawings and shall be provided as required.
 - b. No connectors shall be installed in non-accessible locations or used for splicing cables. Connectors shall be new.
 - c. Connectors shall incorporate strain relief mechanisms which firmly grip the jacket of connected cables.
 - d. Connectors shall be properly polarized to prevent improper seating.
 - e. Connectors shall provide appropriate electrical characteristics for circuitry to which they are attached.
 - f. Exposed conductors inside of equipment racks shall be dressed with heavy duty neoprene heat-shrink tubing.
 - g. Heat-shrink type tubing shall be used to insulate and dress ends of all wire and cables including separate tube for ground or drain wire.
 - h. Solder connections shall be made with rosin-core solder. Temperature controlled soldering irons rated at least 60 watts shall be used for all soldering work. No soldering guns, gas or butane, or temperature unregulated irons shall be used on job site.
 - i. Mechanical connections shall be made with approved crimp lugs of correct size and type for connection. Wire nuts shall not be permitted except inside speaker enclosures. Each connector shall be attached with proper size controlled-duty-cycle ratcheting crimp tool approved by manufacturer.
 - j. Conventional non-ratcheting type crimping tools are unacceptable, and shall not be used on job site. Presence of such tools on job site shall constitute evidence of mechanical connections made with unauthorized tools and shall provide sufficient grounds for rejection of all mechanical connections in system, and will be considered non-conforming work.
- G. Equipment Cabinet:
- 1. Install vent panels at top and bottom of equipment cabinets and between components where possible for maximum ventilation. Locate amplifiers at top of cabinet. Locate equalizers below amplifiers, separated by several vent panels.
 - 2. Securely fasten equipment plumb and square in place. Utilize all fastening holes in front of cabinet.
 - 3. Securely fasten in place equipment that is not rack mounted, including relays and other small components. Do not use sticky-back tape.
 - 4. Install balancing / isolation transformer when balanced and unbalanced components are connected.
 - 5. Wire XLR-type connections with pin 2 hot, pin 1 shield.
 - 6. Connect powered components to 120 VAC outlets on voltage suppressor power bars. Do not connect to outlets on other components.
 - 7. Identification:
 - a. Legibly identify user-operated system controls and system input / output jacks using engraved, permanently attached laminated plastic plates or imprinted Lexan labels. Label equipment and controls within equipment cabinets using similar labels or printed labels from a label maker or laser printer.
 - b. Affix label to rack panel inside cabinet listing name and telephone number of installer. Appropriate warranty instructions may be included.
- H. Identification And Labeling:
- 1. Cables, regardless of length, shall be identified with machine-printed wrap-around labeling system at both ends:

- a. These labels shall be self-laminating to ensure durability.
 - b. Label format used shall be equal, or better than, system detailed.
 2. There shall be no unmarked cables any place in system.
 3. Marking codes used on cables shall correspond to codes provided with submittals, and/or written documentation of 'Record Drawings'.
 4. Connectors, controls, equipment components, terminal blocks and equipment racks are to be permanently labeled in format approved during submittal process.
 5. Equipment labels are to be permanently engraved in metal. Alternative method shall be approved during submittal process only.
 6. Clearly and permanently label all jacks, controls, connections, and so forth. Embossed or printed label tape shall not be used and is considered unacceptable for this system. Attach labels with double stick tape as required.
 7. Labeling shall be completed prior to acceptance of final system.
- I. Grounding:
1. Provide equipment grounding connections for audio system as indicated. Tighten connections to comply with tightening torques specified in UL Standard 486A-486B to assure permanent and effective grounds.
 2. Ground equipment, conductor, and cable shields to eliminate shock hazard and to eliminate ground loops, common mode returns, noise pickup, cross talk, and other impairments. Provide 5 ohm ground at main equipment location. Measure, record, and report ground resistance.
 3. Provide grounding conductor with green insulation between as indicated on Contract Drawings. Comply with IEEE and TIA standards.
- J. Seismic Bracing:
1. Comply with IBC and local seismic requirements for all equipment and conduit pathways.

3.4 FIELD QUALITY CONTROL

- A. Field Tests:
1. Installer Testing:
 - a. After completion of installation but before inspection by Audiovisual Consultant, perform following:
 - 1) Conduct system tests and make necessary corrections for proper system operation including, but not limited to, following:
 - a) Output level uniformity.
 - b) Polarity.
 - c) Shock, strain excited hum, and oscillation.
 - d) Clipping, hum, noise, and RFI in all system configurations.
 - e) Speaker line impedances.
 - f) Loose parts and poor workmanship or soldering.
 - 2) Sweep speaker systems with high-level sine wave or 1/3 octave pink noise source. Correct causes of buzzes or rattles related to speakers or enclosures. Notify Contractor and Audiovisual Consultant of external causes of buzzes or rattles.
 - 3) Rough Balance: Balance system well enough that it can be used for meetings before final inspection.
 - b. Complete documentation required by Audiovisual Consultant and submit to consultant within five (5) days of Substantial Completion.
- B. Field Inspections:
1. Audiovisual Consultant Inspection And Equalization:
 - a. Coordinate final inspection schedule with Audiovisual Consultant two (2) weeks minimum before Consultant's final inspection.
 - b. Have copy of Installer redlined documents sent to Audiovisual Consultant two (2) weeks minimum to before field inspection.

- c. Assist Audio Consultant in final inspection of completed system.
 - d. Assist Audio Consultant in noise isolation testing of folding partitions and office doors.
 - e. Correct minor items so Audiovisual Consultant may certify satisfactory completion during his visit.
- C. Non-Conforming Work:
- 1. Correct any work found defective or not complying with contract document requirements at no additional cost to the Owner.
- D. Manufacturer Services:
- 1. Provide services of factory authorized service representative to supervise field assembly and connection of components and pretesting, testing, and adjustment of system.

3.5 CLEANING

- A. Waste Management:
- 1. All work areas are to be kept clean, clear and free of debris at all times.
 - 2. Disposal of rubbish, debris, and packaging materials to Contractor provided Dumpster.

END OF SECTION