

project manual

THE CHURCH OF
JESUS CHRIST
OF LATTER-DAY SAINTS

Harrisville UT Transitional Branch
Great Salt Lake Utah District
435 North Wall Ave. – Harrisville, UT
Project Number: 500021625010106



bradley gygi architect & associates, pllc

po box 521048 • salt lake city, utah 84152
801-747-2451

mechanical engineer

David L. Jensen & Associates
547 West 500 South, #140
Bountiful, Utah 84010
801.294.8299

electrical engineer

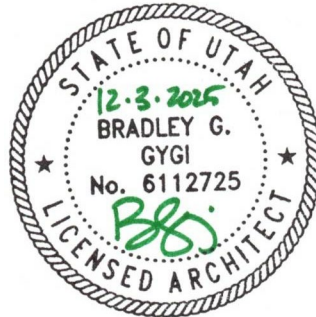
Envision Engineering
240 East Morris Ave., Suite 200
Salt Lake City, Utah 84115
801.534.1130

av consultant

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240 East Morris Ave., Suite 200
Salt Lake City, Utah 84115
801.534.1130

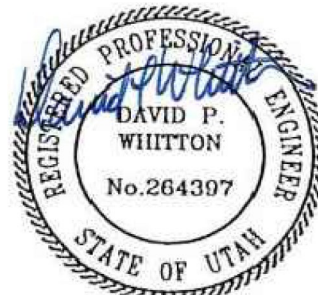
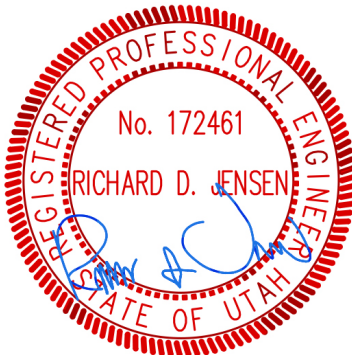
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Professional Consultants



bradley gygi architect & associates, pllc

po box 521048 • salt lake city, utah 84152
801-747-2451



2025/12/04

mechanical engineer
David L. Jensen & Associates
547 West 500 South, #140
Bountiful, Utah 84010
801.294.9299

electrical engineer
Envision Engineering
240 East Morris Ave., Suite 200
Salt Lake City, Utah 84115
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BIDDING REQUIREMENTS

FOR SMALL PROJECTS (U.S.)

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INVITATION TO BID (U.S.)

1. CONTRACTORS INVITED TO BID THE PROJECT:

To Be Announced

2. PROJECT:

Harrisville UT Transitional Branch
Great Salt Lake Utah District
Project Number: 500021625010106

3. LOCATION:

435 North Wall Ave.
Harrisville, UT

4. OWNER:

The Church of Jesus Christ of Latter-day Saints, a Utah corporation sole
c/o
Craig Homer, Project Manager
Utah South PM Office
110 E Main St.
American Fork, UT 84003

5. CONSULTANT:

Bradley Gygi Architect & Associates, PLLC
PO Box 521048, Salt Lake City, UT 84152

6. DESCRIPTION OF PROJECT:

- A. Interior tenant improvement to provide new meetinghouse space, including chapel, serving area, restrooms, classrooms, and other spaces.
- B. Products or systems may be provided through relationships the Owner has negotiated with suppliers as indicated in the Specifications.

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

8. TIME OF SUBSTANTIAL COMPLETION: The time limit for substantial completion of this work will be ninety (90) calendar days and will be as noted in the Agreement.

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

10. BIDDING DOCUMENTS:

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

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

Steps for downloading from McGraw-Hill Dodge:

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

- Access the web-page <http://dodgeprojects.construction.com/>
- Search the Dodge Database by state (required) using the Dodge Report Number or Project Name for a single project report. To see a listing of all of the LDS projects in a particular state, enter the State name from the drop down box and then enter LDS in the second search box. Click Search.
- Select the project from the results list. By clicking on the blue project description, a more descriptive title will help to make sure you are purchasing the correct 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)

- B. Bidding Documents may be obtained from the Architect.
 - C. Bidding Documents may be obtained from Owner's electronic bidding tool.
11. **BIDDER'S QUALIFICATIONS:** Bidding by the Contractors will be by invitation only.
12. **OWNER'S RIGHT TO REJECT BIDS:** Owner reserves the right to reject any or all bids and to waive any irregularity therein.

END OF DOCUMENT

INSTRUCTIONS TO BIDDERS (U.S.)

1. DOCUMENTS:

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

2. BIDDER'S REPRESENTATIONS:

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

3. BIDDING DOCUMENTS:

- A. Copies
 - 1) Owner will provide the Bidding Documents as set forth in the Invitation to Bid.
 - 2) Partial sets of Bidding Documents will not be issued.
- B. Interpretation or Correction of Bidding Documents
 - 1) Bidders will request interpretation or correction of any apparent errors, discrepancies, and omissions in the Bidding Documents.
 - 2) Corrections or changes to Bidding Documents will be made by written Addenda.
- C. Substitutions and Equal Products
 - 1) Generally speaking, substitutions for specified products and systems, as defined in the Uniform Commercial Code, are not acceptable. However, equal products may be approved upon compliance with Contract Document requirements.
 - 2) 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 2 business days prior to bid opening.

4. BIDDING PROCEDURES:

- A. Form and Style of Bids

- 1) Use Owner's online bidding tool.
 - 2) Fill in all blanks on online bidding tool. Signatures will be executed by representative of bidder duly authorized to make contracts.
 - 3) Bids will bear no information other than that requested on bid form. Do not delete from or add to the information requested on the bid form.
- B. Submission of Bids
- 1) Follow the instructions in the Owner's bidding tool when submitting your bid.
 - 2) It is bidder's sole responsibility to see that its bid is received at specified time.
 - 3) No oral, facsimile transmitted, telegraphic, or telephonic bids, modifications, or cancellations will be considered.
- 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 from Owner's bidding tool.

5. CONSIDERATION OF BIDS:

- A. Opening Of Bids - See Invitation to Bid.
- B. Rejection of Bids - Owner reserves right to reject any or all bids and to waive any irregularity therein.
- C. Acceptance Of Bid
- 1) No bidder will consider itself under contract after opening and reading of bids until Agreement between Owner and Contractor is fully executed.
 - 2) Bidder's past performance, organization, subcontractor selection, equipment, and ability to perform and complete its contract in manner and within time specified, together with amount of bid, will be elements considered in award of contract.

6. FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR:

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

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) Coordinate with FM Manager for access to the building during bidding.

END OF DOCUMENT

INFORMATION AVAILABLE TO BIDDERS (U.S.)

1. GEOTECHNICAL DATA

- A. No Geotechnical Data provided for this scope of work.

2. ASBESTOS-CONTAINING MATERIAL (ACM)

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

END OF DOCUMENT

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CONSTRUCTION MATERIAL ASBESTOS STATEMENT (U.S.)

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

Building Name: Harrisville UT Transitional Branch

Building Plan Type: Welfare

Building Address: 435 North Wall Ave. - Harrisville, UT

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

Project Number: 500021625010106

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

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

1. **Property/Project.**

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

2. **Scope of Work.** Contractor will furnish all labor, materials, tools, and equipment necessary to complete the Work in accordance with the Contract Documents. The Work is all labor, materials, tools, equipment, construction, and services required by the Contract Documents (the "Work").

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

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

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

5. **Payment.**

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

6. **Extras and Change Orders.** Owner may order changes in the Work by altering, adding to, or deducting from the Work. In the event of such a change, the Contract Sum and/or the time of completion will be adjusted to reflect the change by means of a written Change Order signed by Contractor and Owner. Contractor will not commence work on any change until either: (a) Contractor and Owner have executed a Change Order; or (b) Owner has issued a written order for the change acknowledging that there is a dispute regarding the compensation adjustment relating to the change. If Contractor proceeds with a change in the Work without complying with the preceding sentence, Contractor agrees that it will not be entitled to any additional compensation for such change.
7. **Warranty and Correction of Work.** For all Work, services, labor, materials, products, and equipment provided under the Contract Documents, Contractor provides and extends to Owner all statutory, common law, and standard industry warranties as well as those warranties set forth in Owner's Contract Documents. Unless a longer period is specified by Owner's Contract Documents or otherwise, Contractor, at a minimum and in addition to all other warranties, warrants all Work under the Contract Documents for at least one year. Specifically, and without limitation, Contractor will promptly correct at its own expense:
- any portion of the Work which
 - fails to conform to the requirements of the Contract Documents, or
 - 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.
 - any defects due to faulty materials, equipment, or workmanship which appear within a period of one year from the date of completion of the Work or within such longer period of time as may be prescribed by law or the terms of any applicable special warranty required by the Contract Documents.
8. **Time of Completion.** Contractor will complete the Work and have it ready for Owner's inspection within _____ (_____) calendar days from Notice to Proceed issued by Owner. Time is of the essence. If Contractor is delayed at any time in the progress of the Work by any act or neglect of Owner, or by changes in the Work, or by strikes, lockouts, unusual delay in transportation, unavoidable casualties, or acts of nature beyond Contractor's control, then the time for completion will be extended by the time that completion of the Work is delayed. However, Contractor expressly waives any damages for any such delays.
9. **Owner Provided Items.** Owner may provide furnishings, equipment, and/or other items for the Project. Contractor will install items furnished by Owner and/or receive, store, and protect such items on site until the date Owner accepts the Project.
10. **Product Requirements.** Contractor will provide products that comply with Contract Documents, are undamaged, and, unless otherwise indicated, are new and unused at time of installation. Contractor will provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for complete installation and intended use and effect.
11. **Permits, Surveys, and Taxes.** Contractor will obtain and pay for all permits and licenses, and also pay any applicable taxes. Contractor will also obtain and pay for any surveys it needs to perform the Work.
12. **Independent Contractor Relationship.** Contractor is not an agent or employee of Owner but is an independent contractor.
13. **Comply with Laws.** Contractor will comply, and ensure that all subcontractors comply, with all applicable laws, ordinances, rules, regulations, covenants, and restrictions.
14. **Indemnity and Hold Harmless.**
- Contractor will indemnify and hold harmless Owner and Owner's representatives, employees, agents, architects, and consultants from and against any and all claims, liens, damages, liability, demands, costs, judgments, awards, settlements, causes of action, losses and expenses (collectively "Claims" or "Claim"), including but not limited to attorney fees, consultant fees, expert fees, copy costs, and other expenses, arising out of or resulting from performance of or failure to perform the Work, attributable to bodily injury,

sickness, disease, or death, or to injury to or destruction of real or personal property, including loss of use resulting therefrom, except to the extent that such liability arises out of the negligence of Owner, its representatives, agents, and employees. This indemnity includes, without limitation, indemnification of Owner from all losses or injury to Owner's property, except to the extent that such loss or injury arises out of the negligence of Owner, its representatives, agents, and employees. This indemnity applies, without limitation, to include Claims occurring both during performance of the Work and/or subsequent to completion of the Work. In the event that any Claim is caused in part by a party indemnified hereunder, that party will bear the cost of such Claim to the extent it was the cause thereof. In the event that a claimant asserts a Claim for recovery against any party indemnified hereunder, the party indemnified hereunder may tender the defense of such Claim to Contractor. If Contractor rejects such tender of defense and it is later determined that the negligence of the party indemnified hereunder did not cause all of the Claim, Contractor will reimburse the party indemnified hereunder for all costs and expenses incurred by that party in defending against the Claim. Contractor will not be liable hereunder to indemnify any party for damages resulting from the sole negligence of that party.

- b. In addition to the foregoing, Contractor will be liable to defend Owner in any lawsuit filed by any Subcontractor relating to the Project. Where liens have been filed against Owner's property, Contractor (and/or its bonding company which has issued bonds for the Project) will obtain lien releases and record them in the appropriate county and/or local jurisdiction and provide Owner with 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, non-performance 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 any subcontractor under workers compensation acts, disability benefit acts, or other employee benefit acts.
15. **Work Restrictions.** Contractor will ensure that Contractor, its agents, employees, and subcontractors:
- a. Do not use or consume alcohol or cannabis, or illegally use drugs, on the Project Site or enter on or perform any Work on the Project Site while under their influence.
 - b. Do not smoke or vape anything on the Project Site. Do not use tobacco in any form on the Project Site.
 - c. Do not perform Work on the Project Site on any days except for emergency work.
 - d. Refrain from using profanity or being discourteous or uncivil to others on the Project Site or while performing Work under this Agreement.
 - e. Do not view or allow pornographic or other indecent materials on the Project Site.
 - f. Do not play loud music and/or loud music on the Project Site. Do not play any music within existing facilities.
 - g. Refrain from wearing immodest, offensive, or obnoxious clothing, while on the Project Site.
 - h. Do not bring weapons on the Project Site.
16. **Safety Hazards.** Contractor will ensure that no work or services will be performed that may pose an undue safety hazard to Contractor, Contractor's employees, or any other person.
17. **Contractor Insurance.** Prior to performing any work, Contractor will obtain and maintain during the term of this Agreement the following insurance:
- a. Workers Compensation Insurance or evidence of exemption.
 - b. Employers Liability Insurance with minimum limits of the greater of \$500,000 E.L. each accident, \$500,000 E. L. disease-each employee, \$500,000 E.L. disease-policy limit or as required by the law of the state in which the Project is located.
 - c. Commercial General Liability Insurance – ISO Form CG 00 01 (12/07) or equivalent Occurrence policy which will provide primary coverage to the additional insureds (the Owner and the Architect) in the event of any Occurrence, Claim, or Suit with:
 - 1) Limits of the greater of: Contractor's actual coverage amounts or the following:

- a) \$2,000,000 General Aggregate;
 - b) \$2,000,000 Products - Comp/Ops Aggregate;
 - c) \$1,000,000 Personal and Advertising Liability;
 - d) \$1,000,000 Each Occurrence; and
 - e) \$50,000 Fire Damage to Rented Premises (Each Occurrence)
- 2) Endorsements attached to the General Liability policy including the following or their equivalent:
- a) ISO Form CG-25-03 (05/09), Amendment of Limits of Insurance (Designated Project or Premises) describing the Agreement and specifying limits as shown above.
 - b) ISO Form CG 20 10 (07/04), Additional Insured – Owners, Lessees, Or Contractors (Form B), naming Owner and Architect as additional insureds.
- d. Automobile Liability Insurance, with:
- 1) Combined Single Limit each accident in the amount of no less than \$500,000, and
 - 2) Coverage applying to "Any Auto" or its equivalent.

Contractor will provide evidence of these insurance coverages to Owner by providing an AIA RD 201 (2010/05) Form or its equivalent: (1) listing Owner as the Certificate Holder and Additional Insured on the general liability and any excess liability policies, (2) listing the insurance companies providing coverage (all companies listed must be rated in A.M. Best Company Key Rating Guide-Property-Casualty and each company must have a rating of B+ Class VII or higher), (3) attaching the endorsements set forth above for the Certificate of Liability Insurance, and (4) bearing the name, address and telephone number of the producer and signed by an authorized representative of the producer. (The signature may be original, stamped, or electronic.) Notwithstanding the foregoing, Owner may, in writing and at its sole discretion, modify these insurance requirements.

18. **Resolution of Disputes.** In the event there is any dispute arising under the Contract Documents which cannot be resolved by agreement between the parties, either party may submit the dispute with all documentation upon which it relies to Director of Architecture, Engineering, and Construction, 50 East North Temple, Salt Lake City, Utah 84150, who will convene a dispute resolution conference within thirty (30) days. The dispute resolution conference will constitute settlement negotiations and any settlement proposal made pursuant to the conference will 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, attorney fees incurred by that party in obtaining the dismissal, including without limitation copy costs, and expert and consultant fees and expenses. Pending final resolution of a dispute hereunder, Contractor will proceed diligently with the performance of its obligations pursuant to this Agreement.

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

20. **Termination by Owner for Cause.** Should Contractor fail to timely provide Owner with the certificates of insurance, make a general assignment for the benefit of its creditors, fail to apply enough properly skilled workmen or specified materials to properly prosecute the Work in accordance with Contractor's schedule, or otherwise materially breach any provision of the Contract Documents, then Owner may, without any prejudice to any other right or remedy, give Contractor Written Notice thereof. If Contractor fails to cure its default within ten (10) days, Owner may terminate this Agreement by giving Written Notice to Contractor. In such case, Owner may, in Owner's sole discretion, take legal assignment of subcontracts and other contractual rights of Contractor and/or take possession of the premises and all materials, tools, equipment, and appliances thereon, and finish the Work by whatever method Owner deems expedient. Contractor will not be entitled to receive any further payment until the Work is finished. If the unpaid balance of the Contract Sum exceeds the expense of finishing the Work, including compensation for additional administrative, architectural, consultant, and legal services (including without limitation attorney fees, expert fees, copy costs, and other expenses), such excess will be paid to Contractor, less any offsets. If such expense exceeds the unpaid balance, Contractor will pay the difference to Owner. Contractor will provide to Owner all warranty, as built, inspection, and other close out documents as well as materials that Contractor has in its possession or control at the time of termination. Without limitation, Contractor's indemnities and obligations as well as all warranties relative to Work provided through the date of termination survive a termination hereunder.
21. **Termination by Owner for Convenience.** Notwithstanding any other provision contained in the Contract Documents, Owner may, without cause and in its absolute discretion, terminate this Agreement at any time. In the event of such termination, Contractor will be entitled to recover from Owner the percentage of the Contract Sum equal to the percentage of the Work which Owner and/or its architect determines has been completed on the Project site as of the date of termination, together with any out of pocket loss Contractor has sustained with respect to materials and equipment as a result of the termination prior to completion of the Work, less any offsets. Contractor will not be entitled to unrecovered profit or any other compensation as a result of the termination and hereby waives any claim therefor. Contractor will provide to Owner all warranty, as built, inspection, and other close out documents as well as materials that Contractor has in its possession or control at the time of termination. Owner may, in Owner's sole discretion, take legal assignment of subcontracts and other contractual rights of Contractor. Without limitation, Contractor's indemnities and obligations as well as all warranties relative to Work provided through the date of termination survive a termination hereunder.
22. **Enforcement.** In the event either party commences legal action to enforce or rescind any term of this Agreement, the prevailing party will be entitled to recover its attorney fees, costs and legal expenses, including without limitation all copy costs and expert and consultant fees and expenses, incurred in that action and on all appeals from the other party.
23. **Ownership of Materials, Documents, and Intellectual Property Rights.** Owner will retain ownership and intellectual property rights in all plans, designs, drawings, documents, concepts, and materials provided by or on behalf of Owner to Contractor and to all work products of Contractor and its subcontractors for products, services, and Work provided under this Agreement, such products, services, and Work of Contractor and its subcontractors constituting works made for hire. Neither Contractor nor its subcontractors will reuse any portion of such items provided by Owner or work products developed by Contractor or its subcontractors for Owner pursuant to this Agreement or disclose any such items to any third party without the prior written consent of Owner. Owner may withhold its consent in its absolute discretion. Contractor shall obtain the written agreement of each of its subcontractors to the terms of this section prior to permitting the subcontractor to perform any services contemplated by this Agreement.
24. **Comply with Intellectual Property Rights of Others.** Contractor represents and warrants that no Work or services (with its means, methods, goods, and services attendant thereto), provided to Owner will infringe or violate any right of any third party and that Owner may use and exploit such Work, means, methods, goods, and services without liability or obligation to any person or entity (specifically and without limitation, such Work, means, methods, goods, and services will not violate rights under any patent, copyright, trademark, or other intellectual property right or application for the same).

25. **Ownership and Use of Renderings and Photographs.** Renderings, photographs, and/or other images of or representing the services, Work, or any improvement on or relative to the Project Site, whether created before, during, or at completion of construction (and whether created by Owner, Contractor, or Contractor's subcontractors), are the property of the Owner. Contractor hereby transfers and assigns to Owner all ownership and intellectual property rights that Contractor and/or its subcontractors may have in and to all such renderings, photographs, and other images. The Owner reserves all rights including copyrights and other intellectual property rights to such renderings, photographs, and other images. No such renderings, photographs, or other images shall be used or distributed without written consent of the Owner.
26. **Public Statements.** Contractor will not make any statements or provide any information to the media about the Project or Work without the prior written consent of Owner. If Contractor receives any requests for information from media, Contractor will refer such requests to Owner.
27. **Confidentiality.** Contractor shall ensure that Contractor and its subcontractors, and the employees, agents and representatives of Contractor and its subcontractors, maintain in strict confidence, and shall use and disclose only as authorized by Owner all Confidential Information of Owner that Contractor receives in connection with the performance of this Agreement. Notwithstanding the foregoing, Contractor may use and disclose any information to the extent required by an order of any court or governmental authority, but only after it has notified Owner and Owner has had an opportunity to obtain reasonable protection for such information in connection with such disclosure. For purposes of this Agreement, "Confidential Information" means:
- a. The name or address of any affiliate, customer or contractor of Owner or any information concerning the transactions of any such person with Owner;
 - b. Any contracts, agreements, business plans, budgets or other financial information, renderings, photographs, and materials provided by Owner relating to the Work or any improvement on the Project Site to the extent such has not been made available to the public by the Owner;
 - c. Any other information that is marked or noted as confidential at the time of its disclosure.
28. **No Commercial Use of Transactions or Relationships.** Without the prior written consent of Owner, which Owner may grant or withhold in its sole discretion, neither Contractor nor Contractor's affiliates, officers, directors, agents, representatives, shareholders, members, Subcontractors, or employees shall make any private commercial use of their relationship to Owner or the Project, including, without limitation:
- a. By referring to the Owner or Project verbally or in any sales, marketing or other literature, letters, client lists, press releases, brochures or other written materials except as may be necessary for Contractor to perform Contractor's obligations under the terms of this Agreement;
 - b. By using or allowing use of any photographs of the Work or Project or any part thereof, or of any service marks, trademarks or trade names or other intellectual property now or which may hereafter be associated with, owned by or licensed by Owner, in connection with any work, service or product; or
 - c. By contracting with or receiving money or anything of value from any person or commercial entity to facilitate such person or entity obtaining any type of commercial identification, advertising or visibility in connection with the Owner or Project.
- Notwithstanding the foregoing, Contractor may include a reference to Owner or the Project in a professional résumé or other similar listing of Contractor's references without seeking Owner's written consent in each instance, provided that such reference to Owner or the Project is included with at least several other similar references to projects of different owners and is given no more prominence than such other references.
29. **Entire Agreement.** This Agreement contains the entire and integrated agreement between the parties hereto and supersedes all prior negotiations, representations, or agreements, either written or oral, relating to the Project. This Agreement may be amended only by a writing signed by both parties. This Agreement will not be construed to create a contractual relationship of any kind between any persons or entities other than Owner and Contractor.

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

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

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

OWNER:

The Church of Jesus Christ of Latter-day Saints,
a Utah corporation sole

CONTRACTOR:

Signature:

Signature:

Print Name:

Print Name:

Title:

Address:

Address:

Telephone No:

Telephone No:

Facsimile No:

Facsimile No:

Email:

Email:

Effective Date:

Fed. I.D. or SSN:

License No:

Reviewed By:

Date Signed:

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SUPPLEMENTARY CONDITIONS

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

ITEM 1 - GENERAL

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

ITEM 2 - LIQUIDATED DAMAGES PAYABLE TO OWNER

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

Delay in Completion of the Work. For each day after the expiration of the designated Time of Completion that Contractor has not completed the Work, Contractor will pay Owner the amount of Two Hundred Fifty dollars (\$250.00) 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

1. Owner will pay the costs of permits, fees, impact 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 Small Project Agreement Between Owner and Contractor (U.S.):

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

UTAH NOTICE OF INTENT TO OBTAIN FINAL COMPLETION:

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

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

UTAH NOTICE OF COMPLETION:

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

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

UTAH STATE PROGRESS PAYMENTS AND FINAL PAYMENT:

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

5. Payment

- a. If the Contractor's Bid Proposal Amount is over \$100,000, Contractor will submit to Owner a schedule of values which allocates the Contractor's Bid Proposal Amount to various portions of the Work. This schedule, when accepted by Owner, will be used as a basis for reviewing Contractor's payment requests.
- b. Progress Payments: Not more than once each month, Contractor will submit a payment request to Owner. Owner will pay Contractor progress payments for work completed within fifteen (15) days after Owner receives:
 - 1. Contractor's progress payment request for work to date;
 - 2. A certification by Contractor that Contractor has paid for all labor, materials, and equipment relating to the Work covered by prior payment requests and that Contractor will pay for all labor, materials, and equipment relating to the Work covered by the current payment request; and
 - 3. Conditional Waiver and Release Upon Progress Payment documents submitted by Contractor (in content complying with Utah Code § 38-1a-802) executed by each of the subcontractors performing work and/or providing materials covered by the Contractor's progress payment request.
- c. Final Payment: Owner will make full and final payment of the Contract Sum due within thirty (30) days of the completion of all of the following requirements:
 - 1. Contractor has submitted its final payment request;
 - 2. Contractor has submitted a certification that Contractor has paid for all labor, materials, and equipment relating to the Work covered by prior payment requests and that Contractor will pay for all labor, materials, and equipment relating to the Work covered by the final payment request; and
 - 3. Contractor has submitted Waiver and Release Upon Final Payment documents (in content complying with Utah Code § 38-1a-802) executed by each of the subcontractors performing work and/or providing materials covered by the Contractor's final payment request.

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

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

- d. Owner may modify or reject any payment request if, in Owner's opinion, the Work for which payment is requested is not acceptable or is less complete than represented on the payment request.
- e. Upon receipt of any payment from Owner, Contractor will pay to each Subcontractor the amount paid to Contractor on account of such Subcontractor's portion of the Work.
- f. Contractor will maintain a copy of each payment request at the Project site for review by the Subcontractors.
- g. No payment made, either in whole or in part, by Owner will be construed to be an acceptance of defective or improper materials or workmanship.

END OF DOCUMENT

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DIVISION 01
SECTION 01 0000
GENERAL REQUIREMENTS

01 1000 SUMMARY**01 2000 PRICE AND PAYMENT PROCEDURES****01 3000 ADMINISTRATIVE REQUIREMENTS****01 4000 QUALITY REQUIREMENTS****01 4129 REFERENCE STANDARDS****01 4523 TESTING AND INSPECTING SERVICES****01 5000 TEMPORARY FACILITIES AND CONTROLS****01 5100 TEMPORARY UTILITIES****01 6000 PRODUCT REQUIREMENTS****01 7000 EXECUTION AND CLOSEOUT REQUIREMENTS****01 7419 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL****01 7800 CLOSEOUT SUBMITTALS****SECTION 01 1000 SUMMARY****A. Summary**

1. Project Name: Rose Park Pavilion
2. Owner's Name: The Church of Jesus Christ of Latter-day Saints
3. Architect's Name: Bradley Gygi Architect & Associates, PLLC
4. The Project consists of the construction of new pavilion structure and related foundations and site work.

B. Work Covered by Contract Documents:

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

C. 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.

D. Contract Description

1. Contract Type: A single prime contract based on a Stipulated Price unless directed differently by owners representative.

E. Owner Occupancy

1. Owner intends to occupy the Project Site and adjacent facilities during the construction work.
2. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
3. Schedule the Work to accommodate Owner occupancy.

F. Contractor Use of Site and Premises

1. Construction Operations:

- a. Locate and conduct construction activities in ways that will limit disturbance to site.
 2. Contractor will ensure that Contractor, its employees, subcontractors, and their employees comply with following requirements:
 - a. Do not use or consume alcohol or cannabis, or illegal use drugs, on the Project Site or enter on or perform any Work on the Project Site while under their influence.
 - b. Do not smoke or vape anything on the Project Site. Do not use tobacco in any form on the Project Site.
 - c. Do not perform Work on the Project Site on Sundays except for emergency work.
 - d. Refrain from using profanity or being discourteous or uncivil to others on the Project Site or while performing Work under this Agreement.
 - e. Do not view or allow pornographic or other indecent materials on the Project Site.
 - f. Do not play obnoxious and/or loud music on the Project Site. Do not play any music within existing facilities.
 - g. Refrain from wearing immodest, offensive, or obnoxious clothing, while on the Project Site.
 - h. Do not bring weapons on the Project Site.
 3. Existing building spaces may not be used for storage.
 4. Do not load or permit any part of the structure to be loaded with a weight that will endanger its safety. Questions of structural loading as part of construction means and methods shall be addressed by a licensed structural engineer engaged by Contractor, subject to the review by Architect.
- G. Multiple Contract Summary and Coordination
1. Owner may issue separate contracts for operations scheduled to precede and be substantially completed before beginning of The Work under this Contract.
 2. Owner has issued or will issue separate contracts for operations scheduled to be completed between Notice to Proceed and Substantial Completion.
 - a. Schedule performance of work covered by such separate contracts in Contractor's Construction Schedule so as to avoid delays in Substantial Completion.
 - b. Complete work necessary to accommodate items provided under such separate contracts before scheduled date for performance of such work. Contractor will be back charged for actual expenses incurred by Owner for failure to timely complete such work including, but not limited to, cost of crews during downtime or for call backs and costs to correct substrate deficiencies.
 - c. Store and protect completed work provided under separate contracts until date of Substantial Completion.
 3. Separate contracts issued by Owner
 - a. Testing and Inspection. See Section 01 4000 "Quality Requirements" for testing and inspection, and testing laboratory services for materials, products, and construction methods.
 4. Contractor shall be responsible for accurately maintaining and reporting schedule of The Work from Notice to Proceed to date of Substantial Completion.
 - a. Contractor shall be responsible for providing Temporary Facilities And Controls for those who perform work on Project from Notice to Proceed to date of Substantial Completion.
 - b. Contractor shall be responsible for Final Cleaning for entire Project.

SECTION 01 2000 PRICE AND PAYMENT PROCEDURES

- A. Schedule Of Values
1. Submit schedule of values as directed by Owner's representative within 24 hours of project bid using Owner's online bidding and construction management system.
- B. Applications For Progress Payments
1. Payment Period: Submit at intervals stipulated in the Agreement.
 2. Use Payment Request process on Owner's online construction management system.
 3. Provide following submittals before or with submittal of Initial Payment Request:
 - a. List of Subcontractors.

- b. Initial progress report.
 - c. Contractor's Construction Schedule.
 - d. Submittal Schedule.
- 4. Each Payment Request will be consistent with previous requests and payments certified by Architect and paid for by Owner.
- a. Authorized change orders will be included in subsequent payment requests in Owner's online construction management system.
- 5. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.
- C. Application For Final Payment
 - 1. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due using Owner's online construction management system.

SECTION 01 3000 ADMINISTRATIVE REQUIREMENTS

- A. General Administrative Requirements
 - 1. Comply with requirements of Section 01 7000 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.
 - 2. Project designation for this Project is **Rose Park Pavilion 507635825020101**. This Project designation will be included on documents generated for Project by Contractor and Subcontractors, or be present on a cover letter accompanying such documents.
- B. Project Meetings and Conferences
 - 1. Preconstruction Meeting:
 - a. Architect or Owner will schedule preconstruction conference at the project site or other convenient location prior to start of the work.
 - b. Discuss items of significance that could affect progress, including such topics as 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.
 - c. Architect will record minutes and distribute copies.
 - 2. Progress Meetings
 - a. Architect and Owner will schedule construction progress meetings, and prepare agendas with copies for participants.
 - b. Additional participants may be invited by Owner, Architect, or Contractor as necessary.
 - c. Architect will record minutes and distribute copies.
 - 3. Pre-Installation Conferences
 - a. Contractor will schedule and attend pre-installation conferences specified in Contract Documents. If possible, schedule these conferences on same day as regularly scheduled Progress Meetings or other on site visits by the Architect.
 - b. See individual specification sections for information to include in Pre-Installation Conferences.
 - c. Architect will record minutes and distribute copies.
- C. Submittal Procedures
 - 1. Coordination and Scheduling:
 - a. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates. Allow sufficient review time so installation will not be delayed by time required to process submittals.
 - b. For assemblies, equipment, systems comprised of multiple components and/or requiring detailed coordination with other work, allow for additional time to make corrections or revisions to initial submittals, and time for their review.
 - 1) For each submittal for review, allow 21 days excluding delivery time to and from the Contractor.

- 2) For sequential reviews involving Architect's consultants, Owner, or another affected party, allow an additional 10 days
 - 3) For sequential reviews involving approval from authorities having jurisdiction (AHJ), in addition to Architect's approval, allow an additional 30 days.
 - 4) No extension of Contract Time will be authorized because of failure to transmit submittals to Architect in sufficient time before work is to be performed to allow processing.
2. Transmittal:
- a. All submittals are to be submitted, reviewed, and processed using the Owner's online construction management system.
 - 1) Transmit each submittal from Contractor to Architect using transmittal letter.
 - 2) 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.
 - b. Electronic Submittals:
 - 1) Required method of transmittal for most submittals is via Owner's online construction management system with attachment(s) in .pdf format.
 - 2) Contractor shall submit each submittal item / discipline in a separate Action Item in Owner's online construction management system, not multiple submittals in a single action item.
 - 3) Maintain original size of .pdf files submitted from subcontractors (24"x36" drawings shall remain original size in electronic format, for example).
 - 4) Electronic submittals shall be submitted as a single file (.pdf) per submittal item / discipline, including contractor's transmittal letter / cover sheet. Do not submit multiple files, cut sheets, product information, etc.
 - c. Physical Submittals:
 - 1) Submittals requiring hard copies or including physical product samples shall be delivered or shipped to Architect's office, or kept at the project site for review by Architect as coordinated. Package each submittal appropriately for transmittal and handling. On transmittal, record relevant information and requests for data.
 - 2) Where Samples are for selection of color, pattern, texture, or similar characteristics from a range of standard choices, submit full set of choices for material or product. Preliminary submittals will be reviewed and returned with Architect's mark indicating selection and other action.
 - (a) Except for Samples illustrating assembly details, workmanship, fabrication techniques, connections, operation, and similar characteristics, submit three sets. One will be returned marked with action taken.
 - (b) Samples, as accepted and returned by Architect, will be used for quality comparisons throughout course of construction.
 - (c) Sample sets may be used to obtain final acceptance of construction associated with each set.
3. Submittals for Review:
- a. When the following are specified in individual sections, submit them for review:
 - 1) Product data.
 - 2) Shop drawings.
 - 3) Samples for selection.
 - 4) Samples for verification.
 - b. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.
 - c. Samples will be reviewed for aesthetic, color, or finish selection.
 - d. After review, provide copies and distribute for construction and for record documents purposes described in Section 01 7800 - Closeout Submittals.
4. Submittals for Information:

- a. When the following are specified in individual sections, submit them for information to Architect for Architect's knowledge as contract administrator or for Owner.
 - 1) Design data.
 - 2) Certificates.
 - 3) Test reports.
 - 4) Inspection reports.
 - 5) Manufacturer's instructions.
 - 6) Manufacturer's field reports.
 - 7) Field engineering daily reports.
 - 8) Special Procedure Submittals: Describe submittals intended to document special procedures. An example would be construction staging or phasing for remodeling an existing facility while keeping it in operation. While the Contractor would normally be responsible for managing this, submittal of his plan as documentation could be specified.
 - 9) Qualification Statements: Describe submittals intended to document qualification of entities employed by Contractor.
- D. Submittals For Project Closeout:
 1. See Section 01 7800 Closeout Submittals.
- E. Maintenance Material Submittals
 1. See Section 01 7800 Closeout Submittals.
- F. Construction Progress Schedule
 1. Submittals:
 - a. Within 10 days after date of Agreement, submit preliminary schedule defining planned operations for the first 60 days of Work, with a general outline for remainder of Work.
 - b. Include written certification that major contractors have reviewed and accepted proposed schedule.
 - c. Within 10 days after joint review, submit complete schedule.
 - d. Submit updated schedule with each Application for Payment.
 2. Schedule Format
 - a. Provide separate time bar for each construction activity listed on Owner's payment request form.
 - b. Listings: In chronological order according to the start date for each activity. Identify each activity with the applicable specification section number.
 - c. Sheet Size: Multiples of 8-1/2 x 11 inches.
 - d. Scale and Spacing: To allow for notations and revisions.
 3. Content
 - a. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.
 - b. Provide separate time bar for each construction activity listed on Owner's payment request form.
 - c. Identify work of separate stages and other logically grouped activities.
 - d. Provide sub-schedules to define critical portions of the entire schedule.
 - e. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.
 - f. Indicate delivery dates for owner-furnished products.
 4. Updating Schedule
 - a. Update schedule monthly.
 - b. Maintain schedules to record actual start and finish dates of completed activities.
 - c. Indicate progress of each activity to date of revision, with projected completion date of each activity.
 - d. Annotate diagrams to graphically depict current status of Work.
 - e. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.

- f. Indicate changes required to maintain Date of Substantial Completion.
- g. Provide narrative report to define problem areas, anticipated delays, and impact on the schedule. Report corrective action taken or proposed and its effect.
- 5. Daily Construction Reports
 - a. Prepare and submit daily reports utilizing Owner's online construction management system or import reports prepared by other means into the system.
 - b. Prepare daily reports of operations at Project including at least the following information:
 - 1) Approximate count of personnel at site.
 - 2) High and low temperatures, general weather conditions.
 - 3) Materials, equipment, or Owner-furnished items arriving at or leaving site.
 - 4) Accidents and unusual events.
 - 5) Site or structure damage by water, frost, wind, or other causes.
 - 6) Stoppages, delays, shortages, losses.
 - 7) Any tests made and their result if known.
 - 8) Meter readings and similar recordings.
 - 9) Emergency procedures.
 - 10) Orders and requests of governing authorities.
 - 11) Services connected, disconnected.
 - 12) Equipment or system tests and start-ups.
 - 13) Brief summary of work accomplished that day.
 - 14) Signature of person preparing report.

SECTION 01 4000 QUALITY REQUIREMENTS

- A. Reference Standards
 - 1. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection 2021.
- B. Contractor's Construction-Related Professional Design Services
 - 1. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.
 - 2. Provide such engineering design services as may be necessary to plan and safely conduct certain construction operations, pertaining to, but not limited to the following:
 - a. Temporary sheeting, shoring, or supports.
 - b. Temporary scaffolding.
 - c. Temporary bracing.
 - d. Temporary foundation underpinning.
 - e. Temporary stairs or steps required for construction access only.
 - f. Temporary hoist(s) and rigging.
 - g. Investigation of soil conditions and design of temporary foundations to support construction equipment.
- C. Contractor's Design-Related Professional Design Services
 - 1. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.
 - 2. Base design on performance and/or design criteria indicated in individual specification sections.
 - a. Submit a Request for Interpretation to Architect if the criteria indicated are not sufficient to perform required design services.
- D. Quality Assurance Services
 - 1. Owner or Owner's designated representative(s) will perform quality assurance to verify compliance with Contract Documents.
 - 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.

- a. These services do not relieve Contractor of responsibility for compliance with Contract Document requirements.
3. Notify Owner immediately if asbestos-containing materials or other hazardous materials are encountered while performing the Work.
4. See Section 01 4523 Testing and Inspection Services.
- E. Quality Control Services
 1. Quality Control Services will be sole responsibility of Contractor.
 2. Quality Control Services: 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, Owner, 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.
 3. Where services are indicated as Contractor's responsibility, engage a qualified Testing Agency to perform these quality control services.
 - a. Contractor shall not employ same testing entity engaged by Owner, without Owner's written approval.
- F. Tolerances
 1. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- G. Manufacturers' Field Services
 1. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance equipment as applicable, and to initiate instructions when necessary.
 2. Submit qualifications of observer to Architect 30 days in advance of required observations.
 - a. Observer subject to approval of Architect.
 - b. Observer subject to approval of Owner.
 3. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.
- H. Mock-Ups
 1. Before installing portions of the Work where mock-ups are required, construct mock-ups in location and size indicated for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects and workmanship.
 2. Accepted mock-ups establish the standard of quality the Architect will use to judge the Work.
 3. Demonstrate proposed range of aesthetic effects and workmanship.
 4. Notify Architect seven (7) working days in advance of dates and times when mock-ups will be constructed.
 5. Provide supervisory personnel who will oversee mock-up construction. Provide workers that will be employed during the construction at Project.
 6. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
 7. Obtain Architect's approval of mock-ups before starting work, fabrication, or construction.
 - a. Architect will issue written comments within seven (7) working days of initial review and each subsequent follow up review of each mock-up.
 - b. Make corrections as necessary until Architect's approval is issued.
 8. Architect will use accepted mock-ups as a comparison standard for the remaining Work.
 9. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock-up and clear area when directed to do so by Architect.

I. Defect Assessment

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

J. Quality Assurance Qualifications

1. Qualifications paragraphs in this Article establish minimum qualification levels required; individual Specification Sections specify additional requirements:
2. Fabricator / Supplier / Installer Qualifications: Firm experienced in producing products similar to those indicated for this Project and with record of successful in-service performance, as well as sufficient production capacity to produce required units.
 - a. Approved:
 - 1) Where heading 'Approved Suppliers / Distributors / Installers / Applicators / Fabricators' is used to identify list of specified suppliers / distributors / installers / applicators / fabricators, use only listed suppliers / installers / fabricators.
 - 2) No substitutions will be allowed.
 - b. Acceptable Suppliers / Installers:
 - 1) Where heading 'Acceptable Suppliers / Installers / Fabricators' is used, qualifications as specified in Quality Assurance in Part 1 of individual sections will be used to determine requirements of those that will be acceptable to be used on Project. Lists for acceptable installers can include additional installers that may be approved before bidding or by addendum.
3. 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.
4. Installer Qualifications:
 - a. Firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
5. Manufacturer Qualifications:
 - a. Firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
6. Manufacturer's Field Services Qualifications:
 - a. Experienced authorized representative of manufacturer to inspect field-assembled components and equipment installation, including service connections.
7. Professional Engineer Qualifications:
 - a. Professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of kind indicated. Engineering services are defined as those performed for installations of system, assembly, or products that are similar to those indicated for this Project in material, design, and extent.
8. Specialists:
 - a. Certain sections of Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations.

- b. Specialists shall satisfy qualification requirements indicated and shall be engaged for activities indicated.
- c. Requirement for specialists shall not supersede building codes and regulations governing the Work.

SECTION 01 4219 REFERENCE STANDARDS

A. Quality Assurance

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

B. Industry Standards

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

C. Governing Regulations

- 1. Governing Regulations / Authorities:
 - a. Contact authorities having jurisdiction directly for information and decisions having a bearing on the Work.

- b. Obtain copies of regulations required to be retained at Project Site, available for reference by parties who have a reasonable need for such reference.
- D. ABMA -- American Bearing Manufacturers Association, Inc.
 - 1. ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings 2015 (Reaffirmed 2020).
- E. AHRI -- Air-Conditioning, Heating, And Refrigeration Institute
 - 1. AHRI 410 - Forced-Circulation Air-Cooling and Air-Heating Coils 2001, with Addenda (2011).
 - 2. AHRI 430 (I-P) - Performance Rating of Central Station Air-handling Unit Supply Fans 2020.
 - 3. AHRI 610 (I-P) - Standard for Performance Rating of Central System Humidifiers for Residential Applications 2014.
 - 4. AHRI 851 (SI) - Performance Rating of Commercial and Industrial Air Filter Equipment 2013.
- F. AISC -- American Institute Of Steel Construction, Inc.
- G. AITC -- American Institute Of Timber Construction
- H. ALI -- American Ladder Institute
 - 1. ALI A14.3 - Ladders - Fixed - Safety Requirements 2008.
- I. AMCA -- Air Movement And Control Association International, Inc.
 - 1. AMCA (DIR) - (Directory of) Products Licensed Under AMCA International Certified Ratings Program 2015.
 - 2. AMCA 99 - Standards Handbook 2016.
 - 3. AMCA 204 - Balance Quality and Vibration Levels for Fans 2020.
 - 4. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating 2016.
 - 5. AMCA 300 - Reverberant Room Method for Sound Testing of Fans 2014.
 - 6. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data 2014.
 - 7. AMCA 500-D - Laboratory Methods of Testing Dampers for Rating 2018.
 - 8. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating 2012 (Reapproved 2015).
- J. ASHRAE -- American Society Of Heating, Refrigerating And Air-Conditioning Engineers, Inc.
 - 1. ASHRAE Std 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size 2017, with Addendum (2022).
 - 2. ASHRAE Std 62.1 - Ventilation for Acceptable Indoor Air Quality Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
 - 3. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
 - 4. ASHRAE Std 103 - Method of Testing for Annual Fuel Utilization Efficiency of Residential Central Furnaces and Boilers 2022.
- K. ASSE -- American Society Of Sanitary Engineering
- L. ASTM -- ASTM International
 - 1. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2022.
 - 2. ASTM B177/B177M - Standard Guide for Engineering Chromium Electroplating 2011 (Reapproved 2021).
 - 3. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate 2014.
 - 4. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel 2019.
 - 5. ASTM C1184 - Standard Specification for Structural Silicone Sealants 2018, with Editorial Revision.
 - 6. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications 2019.
 - 7. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position 2022.
 - 8. ASTM D882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting 2018.

9. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials 2020.
 10. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2022.
 11. ASTM E2273 - Standard Test Method for Determining the Drainage Efficiency of Exterior Insulation and Finish Systems (EIFS) Clad Wall Assemblies 2018.
 12. ASTM E2486/E2486M - Standard Test Method for Impact Resistance of Class PB and PI Exterior Insulation and Finish Systems (EIFS) 2022.
 13. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi 2015, with Editorial Revision (2021).
- M. AWI/AWMAC/WI -- Joint Publication Of Architectural Woodwork Institute/Architectural Woodwork Manufacturers Association Of Canada/Woodwork Institute
- N. BIA -- Brick Industry Association
- O. HPVA -- Hardwood Plywood Veneer Association
- P. ICC-ES -- Icc Evaluation Service, Inc.
1. ICC-ES AC235 - Acceptance Criteria for EIFS Clad Drainage Wall Assemblies 2009, with Editorial Revision (2012).
- Q. ISO -- International Standards Organization
- R. MFMA -- Maple Flooring Manufacturers Association
- S. MFMA -- Metal Framing Manufacturers Association
1. MFMA-4 - Metal Framing Standards Publication 2004.
- T. MPI -- Master Painters Institute (Master Painters And Decorators Association)
1. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association Current Edition.
 2. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual Current Edition.
- U. MSS -- Manufacturers Standardization Society Of The Valve And Fittings Industry, Inc.
1. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation 2018, with Amendment (2019).
- V. NAAMM -- The National Association Of Architectural Metal Manufacturers
1. NAAMM AMP 510 - Metal Stairs Manual 1992.
- W. NEMA -- National Electrical Manufacturers Association
1. NEMA MG 1 - Motors and Generators 2021.
- X. NFPA -- National Fire Protection Association
1. NFPA 54 - National Fuel Gas Code 2021.
 2. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
 3. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems 2021.
 4. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems 2021.
 5. NFPA 211 - Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances 2019.
 6. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films 2019.
- Y. NSF -- NSF International (The Public Health And Safety Organization)
- Z. RCSC -- Research Council On Structural Connections
- AA. RIS -- Redwood Inspection Service
- BB. SMACNA -- Sheet Metal And Air Conditioning Contractors' National Association, Inc.
1. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible 2021.

CC. TMS -- The Masonry Society

DD. TPI -- Truss Plate Institute

EE. UL -- Underwriters Laboratories Inc.

1. UL (DIR) - Online Certifications Directory Current Edition.
2. UL 705 - Power Ventilators Current Edition, Including All Revisions.
3. UL 900 - Standard for Air Filter Units Current Edition, Including All Revisions.

SECTION 01 4523 TESTING AND INSPECTION SERVICES

A. General:

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

B. 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. Other tests, certificates, and similar documents will be obtained by Contractor and delivered to Owner's Representative and Architect in such time as not to delay progress of the Work or final payment therefore.
4. Submittal Format:
 - a. Schedule of Tests and Inspections: Prepare in tabular form and include following:
 - 1) Specification Section number and title.
 - 2) Description of test and inspection.
 - 3) Identification of applicable standards.
 - 4) Identification of test and inspection methods.
 - 5) Number of tests and inspections required.
 - 6) Time schedule or time span for tests and inspections.
 - 7) Entity responsible for performing tests and inspections.
 - 8) Requirements for obtaining samples.
 - b. Certified written reports of each inspection, test, or similar service will include, but not be limited:
 - 1) Date of issue.
 - 2) Project title and number.
 - 3) Name, address, and telephone number of Testing Agency.
 - 4) Dates and locations of samples and tests or inspections.
 - 5) Names of individuals making tests and inspections.

- 6) Description of the Work and test and inspection method.
 - 7) Identification of product and Specification Section.
 - 8) Complete test or inspection data.
 - 9) Test and inspection results and an interpretation of test results.
 - 10) Record of temperature and weather conditions at time of sample taking and testing and inspecting.
 - 11) Comments or professional opinion on whether tested or inspected Work complies with Contract Document requirements.
 - 12) Name and signature of laboratory inspector.
 - 13) Recommendations on retesting and re-inspecting.
5. Source Quality Control Submittals:
- a. Testing Agency will submit following prior to commencing the Work:
 - 1) Qualifications of Testing Agency management and personnel designated to project.
 - 2) Testing Agency 'Written Practice for Quality Assurance'.
 - 3) Qualification records for Inspector and non-destructive testing technicians designated for project.
 - 4) Testing Agency non-destructive testing procedures, equipment calibration records, and personnel training records.
 - 5) Testing Agency Quality Control Plan for monitoring and control of testing operations.
 - 6) Welding Inspection Procedures (Structural Steel testing).
 - 7) Bolting Inspection Procedures (Structural Steel testing).
 - 8) Shear Connector Stud Inspection Procedures (Structural Steel testing).
 - 9) Seismic Connections Inspection Procedures (Structural Steel testing).
6. Testing and Inspection Reports:
- a. Conduct and interpret tests and inspections and state in each report whether tested and inspected the 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.
 - 2) Prepare non-compliance log to track non-compliant testing or inspections.
 - f. Final Report:

- 1) Submit final report of tests and inspections at Substantial Completion, which identify unresolved deficiencies.
- C. Testing Agency Qualifications:
1. 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.
 2. Testing Laboratory:
 - a. AASHTO Materials Reference Laboratory (AMRL) Accreditation Program.
 - b. Cement and Concrete Reference Laboratory (CCRL).
 - c. Nationally Recognized Testing Laboratory (NRTL): Nationally recognized testing laboratory according to 29 CFR 1910.7.
 - d. National Voluntary Laboratory (NVLAP): Testing Agency accredited according to National Institute of Standards and Technology (NIST) Technology Administration, U. S. Department of Commerce Accreditation Program.
- D. Testing And Inspection
1. See individual specification sections for testing and inspection required.
 2. Activities performed by Owner's Quality Assurance Testing Agency include, but are not limited to following:
 - a. Individual Sections in Division 01 through Division 49:
 - 1) Pre-Installation Conference agenda review items for:
 - (a) Schedule requirements.
 - (b) Testing and inspection requirements:
 - (c) Requirements and frequency of testing and inspections.
 - (d) Mock-up or sample requirements.
 - (e) Submittals requirements.
 - 2) Quality Assurance personal qualifications.
 - (a) Qualification documentation including certificates if required.
 - 3) Non-Conforming Work:
 - (a) Prepare non-compliance log to track non-compliant testing or inspections.
 - b. Weekly Activities:
 - 1) Summarize and track any non-compliance issues.
 - 2) Provide summary report of previous week's performed Work.
 - 3) Visit contractors periodically to find out if they have any concerns with Quality Assurance inspectors and check on any schedule changes.
 - 4) Visit Owner's Representatives periodically to find out if they have any concerns with how project is progressing.
 3. Testing Agency Duties:
 - a. Test samples of mixes submitted by Contractor.
 - b. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
 - c. Perform specified sampling and testing of products in accordance with specified standards.
 - d. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 - e. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
 - f. Perform additional tests and inspections required by Architect.
 - g. Attend preconstruction meetings and progress meetings.
 - h. Submit reports of all tests/inspections specified.
 4. Limits on Testing/Inspection Agency Authority:
 - a. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 - b. Agency may not approve or accept any portion of the Work.

- c. Agency may not assume any duties of Contractor.
- d. Agency has no authority to stop the Work.
- 5. Contractor Responsibilities:
 - a. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
 - b. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
 - c. Provide incidental labor and facilities:
 - 1) To provide access to Work to be tested/inspected.
 - 2) To obtain and handle samples at the site or at source of Products to be tested/inspected.
 - 3) To facilitate tests/inspections.
 - 4) To provide storage and curing of test samples.
 - d. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
 - e. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
 - f. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- 6. Architect Duties:
 - a. Notify Owner's Representative before each test and/or inspection.
- 7. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect, and shall be paid for by Contractor.

SECTION 01 5000 TEMPORARY FACILITIES AND CONTROLS

- A. Reference Standards
 - 1. 29 CFR 1926 - Safety and Health Regulations for Construction Current Edition.
- B. Administrative Requirements
 - 1. Protection of Existing Improvements: Protect streets, private roads, and sidewalks, including overhead protection where required. Repair damage to existing improvements caused by construction activities.
 - 2. Protection of Adjacent Property: Provide necessary protection for adjacent property and lateral support thereof.
 - 3. 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.

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

C. Safety Requirements

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

- D. Temporary Utilities - See Section 01 5100
- E. Temporary Sanitary Facilities
 - 1. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
 - 2. Maintain in clean and sanitary condition.
 - 3. At end of construction, return facilities to same or better condition as originally found.
- F. Barriers
 - 1. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
 - 2. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.
 - 3. Provide protection for plants designated to remain. Replace damaged plants.
 - 4. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.
 - 5. Secure building at the end of each workday.
 - 6. Maintain exterior building security until Substantial Completion.
- G. Fencing
 - 1. Construction Fencing at Contractor's option.
 - 2. Before construction begins, install a fence sufficient in height and structure to protect the site and preclude access except through lockable entrance gates. Locate where shown on Drawings. If not shown on Drawings, enclose entire site or portion sufficient to accommodate construction operations.
- H. Exterior Enclosures
 - 1. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.
- I. Interior Enclosures
 - 1. Provide temporary partitions and ceilings as indicated to separate work areas from Owner-occupied areas, to prevent penetration of dust and moisture into Owner-occupied areas, and to prevent damage to existing materials and equipment.
- J. Scaffolding, Platforms, Stairs, Etc
 - 1. Furnish and maintain equipment such as temporary stairs, ladders, ramps, platforms, scaffolds, hoists, runways, derricks, chutes, and elevators as required for proper execution of The Work.
 - 2. Apparatus, equipment, and construction shall meet requirements of applicable laws and safety regulations.
- K. Temporary Erosion And Sediment Control
 - 1. Take precautions necessary to prevent erosion and transportation of soil downstream, to adjacent properties, and into on-site or off-site drainage systems.
 - 2. Develop, install, and maintain an erosion control plan if required by law.
 - 3. Repair and correct damage caused by erosion.
- L. Temporary Environmental Controls
 - 1. 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:
 - 2. Avoid use of tools and equipment that produce harmful noise.
 - 3. Restrict use of noise making tools and equipment to hours that will minimize complaints from persons or firms near site.
 - 4. Provide protection against weather (rain, winds, storms, frost, or heat) to maintain all work, materials, apparatus, and fixtures free from injury or damage.

5. Protect excavation, trenches, and building from damage from rainwater, spring water, ground water, backing up of drains or sewers, and all other water:
 6. For temporary drainage and dewatering facilities and operations not directly associated with construction activities included under individual Sections, comply with requirements of applicable local regulations. Where feasible, use permanent facilities.
 7. If sewers are not available or cannot be used, provide drainage ditches, dry wells, stabilization ponds, and similar facilities. Filter out excessive amounts of soil, construction debris, chemicals, oils and similar contaminants that might clog sewers or pollute waterways before discharge.
 8. Comply with governing ordinances relating to weed control and removal.
- M. Temporary Tree And Plant Protection
1. Protection:
 - a. Before commencing site work, build and maintain protective fencing around existing trees and vegetation as shown on the drawings.
 - b. Individual trees will have protective fencing built beyond drip line.
 - c. Build protective fencing around groups of trees and other vegetation as indicated on Drawings.
 - d. Keep areas within protective fencing undisturbed and do not use for any purpose.
 2. Maintenance:
 - a. Maintain existing tree, shrubs, and vegetation as indicated in Contract Documents:
 - b. Remove and replace vegetation that dies or is damaged beyond repair due to construction.
 - c. Damage to any tree, shrub, or vegetation that has been indicated to remain and be protected, will have a cost associated with it. This includes branches, trunk and root systems:
 - 1) Trees: \$1,000.00.
 - 2) Shrubs: \$ 100.00.
 - 3) Vegetation: \$ 50.00.
 3. Pruning:
 - a. Provide a qualified Tree Service Firm if pruning is required:
 - b. Coordinate with authorities having jurisdiction.
 - c. Coordinate with Owner and Architect on site before pruning is to begin.
- N. Field Offices
1. Where required by Owner, provide a construction field office with weathertight, with lighting, electrical outlets, heating, cooling and ventilating equipment, and equipped with sturdy furniture, drawing rack, drawing display table, locking door, light(s), table(s), bench(es), rack(s) for drawings, telephone, and fax machine. Provide an operable fire extinguisher in facility.
 2. Provide hardhats for Owner's Representatives for site visits.
 3. Provide space for Project meetings, with table and chairs to accommodate 6 persons.
 4. If Owner agrees to permit removal of temporary office before Substantial Completion or otherwise allows use of existing facilities, Contractor may use a room as an office after temporary office is removed. Equip room as specified above and restore to "like-new" condition before Substantial Completion.

SECTION 01 5100 TEMPORARY UTILITIES

- A. Contractor may use existing utilities at the existing facility to the extent they are available and convenient to the work areas.
- B. Temporary Electrical Power:
1. Owner will provide electric power for construction activities within limits available at existing facility.
 2. Any additional power requirements shall be paid for by contractor and shall be weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period.

- C. Temporary Fire Protection:
1. Install and maintain temporary fire protection facilities of types needed to protect against predictable and controllable fire losses.
 - a. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher.
 - b. Store combustible materials in containers in fire-safe locations.
 - c. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways, and other access routes for fighting fires.
 - d. Provide supervision of welding operations, combustion type temporary heating units, and similar sources of fire ignition.
 - e. Exercise caution to avoid fire damage. Do not build fires on site.
- D. Temporary Lighting For Construction Purposes
1. Install and operate temporary lighting that will provide adequate illumination for construction operations and traffic conditions.
 2. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.
 3. Existing lighting system may be used by Contractor.
 4. Permanent building lighting may be utilized during construction.
- E. Heating, Cooling, And Ventilation:
1. Permanent mechanical system may be operated upon following conditions:
 - a. Do not interfere with normal set-back temperature patterns except as approved by Project Manager.
 - b. 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.
- F. Water Service:
1. Contractor will use existing water supply for construction purposes to extent of existing facilities.

SECTION 01 6000 PRODUCT REQUIREMENTS

- A. Existing Products
1. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.
 2. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.
 3. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.
- B. New Products
1. Provide new products unless specifically required or permitted by Contract Documents.
 2. Provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for complete installation and for intended use and effect.
 3. Provide interchangeable components of the same manufacturer for components being replaced.
 4. Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on surfaces of products that will be exposed to view in occupied spaces or on building exterior.
 - a. Locate required product labels and stamps on concealed surface or, where required for observation after installation, on accessible surface that is not conspicuous.
 - b. Provide permanent nameplates on items of service-connected or power-operated equipment. Locate on easily accessible surface that is inconspicuous in occupied spaces. Nameplate will contain following information and other essential operating data, including name of product and manufacturer, model and serial number, capacity, speed, ratings.
- C. Product Options

1. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
 2. Where Specifications require compliance with performance requirements, provide products that comply with these requirements and are recommended by manufacturer for application described. General overall performance of product is implied where product is specified for specific application. Manufacturer's recommendations may be contained in published product literature, or by manufacturer's certification of performance.
 3. Where specifications only require compliance with an imposed code, standard, or regulation, select product that complies with standards, codes or regulations specified.
 4. Where Specifications require matching an established Sample, Architect's decision will be final on whether proposed product matches satisfactorily. Where no product available within specified category matches satisfactorily nor complies with other specified requirements, refer to Architect.
 5. Where specified product requirements include phrase "...as selected from manufacturer's standard colors, patterns, textures..." or similar phrase, select product and manufacturer that comply with other specified requirements. Architect will select color, pattern, and texture from product line selected.
 6. Remove and replace products and materials not specified in Contract Documents but installed in the Work with specified products and materials at no additional cost to Owner and for no increase in Contract time.
 7. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.
 8. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.
- D. Substitution Limitations
1. Product selection is governed by Contract Documents and governing regulations, not by previous Project experience. Procedures governing product selection include below requirements.
 2. Substitutions and Equal Products:
 - a. Substitutions for specified products and systems, as defined in the Uniform Commercial Code, are not acceptable. However, equal products may be approved upon compliance with Contract Document requirements.
 3. Acceptable Products / Manufacturers / Suppliers / Installers:
 - a. Use 'Equal Product Approval Request Form' to request approval of equal products, manufacturers, or suppliers before bidding or before installation, as noted in individual Sections.
 4. Quality / Performance Standard Products / Manufacturers:
 - a. Products / manufacturers used shall conform to Contract Document requirements.
 5. Comparable Product Requests:
 - a. Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
 - b. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request.
 - c. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.
- E. Transportation and Handling
1. Package products for shipment in manner to prevent damage or theft; for equipment, package to avoid loss of factory calibration.
 2. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

3. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
 4. Schedule delivery to reduce long-term storage at site and to prevent overcrowding of construction spaces.
 5. 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.
 6. Transport and handle products in accordance with manufacturer's instructions.
 7. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
 8. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
 9. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.
 10. Arrange for the return of packing materials, such as wood pallets, where economically feasible.
- F. Storage and Protection
1. Provide protection of stored materials and products against theft, casualty, or deterioration.
 2. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 01 7419.
 3. Store and protect products in accordance with manufacturers' instructions.
 4. Store with seals and labels intact and legible.
 5. Arrange storage of materials and products to allow for visual inspection for the purpose of determination of quantities, amounts, and unit counts. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.
 6. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.
 7. Store heavy materials away from Project structure so supporting construction will not be endangered.
 8. For exterior storage of fabricated products, place on sloped supports above ground.
 9. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
 10. Comply with manufacturer's warranty conditions, if any.
 11. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
 12. Prevent contact with material that may cause corrosion, discoloration, or staining.
 13. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
 14. Owner-Furnished Products: Install items furnished by Owner or receive and store in safe condition items purchased directly by Owner according to requirements of Contract Documents.
- G. Non-Conforming Work
1. Non-conforming work as covered in General Conditions applies, but is not limited, to use of non-specified products or manufacturers.

SECTION 01 7000 EXECUTION AND CLOSEOUT REQUIREMENTS

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

1. Use of explosives is not permitted.
 2. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
 3. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.
 4. Perform dewatering activities, as required, for the duration of the project.
 5. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
 6. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
 - a. Provide dust-proof enclosures to prevent entry of dust generated outdoors.
 - b. Provide dust-proof barriers between construction areas and areas continuing to be occupied by Owner.
 7. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
 - a. Minimize amount of bare soil exposed at one time.
 - b. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
 - c. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
 - d. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.
 8. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
 - a. At All Times: Excessively noisy tools and operations will not be tolerated inside the building at any time of day; excessively noisy includes jackhammers. Limit conduct of especially noisy exterior and interior work as required by local ordinances.
 9. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests, rodents, and insects from damaging the work.
 10. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.
- C. Examination
1. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
 2. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
 3. Examine and verify specific conditions described in individual specification sections.
 4. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or mis-fabrication.
 5. Verify that utility services are available, of the correct characteristics, and in the correct locations.
 6. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.
- D. Preparation
1. Clean substrate surfaces prior to applying next material or substance.
 2. Seal cracks or openings of substrate prior to applying next material or substance.
 3. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.
- E. Laying Out the Work
1. Verify locations of survey control points prior to starting work.

2. Promptly notify Architect of any discrepancies discovered.
 3. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
 4. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
 5. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.
 6. Utilize recognized engineering survey practices.
 7. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
 - a. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
 - b. Grid or axis for structures.
 - c. Building foundation, column locations, ground floor elevations.
 - d. Periodically verify layouts by same means.
 - e. Maintain a complete and accurate log of control and survey work as it progresses.
- F. General Installation Requirements
1. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations to extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents. Notify Architect of conflicts between Manufacturer's installation instructions and Contract Document requirements.
 2. Provide attachment and connection devices and methods necessary for securing Work. Secure work true to line and level. Anchor each product securely in place, accurately located, and aligned with other Work. Allow for expansion and building movement.
 3. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
 4. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
 5. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
 6. Visual Effects: Provide uniform joint widths in exposed work. Arrange joints in exposed work to obtain best visual effect. Refer questionable choices to Architect for final decision.
 7. Install each component during weather conditions and Project status that will ensure best possible results. Isolate each part of completed construction from incompatible material as necessary to prevent deterioration.
 8. Coordinate temporary enclosures with required inspections and tests, to reduce necessity of uncovering completed construction for that purpose.
 9. Mounting Heights: Where mounting heights are not shown, install individual components at standard mounting heights recognized within the industry or local codes for that application. Refer questionable mounting height decisions to Architect for final decision.
- G. Cutting and Patching
1. Whenever possible, execute the work by methods that avoid cutting or patching.
 2. Perform whatever cutting and patching is necessary to complete the work, fit products together to integrate with other work, provide openings for penetration of mechanical, electrical, and other services, match work that has been cut to adjacent work, repair areas adjacent to cuts to required condition, repair new work damaged by subsequent work, remove samples of installed work for testing when requested, remove and replace defective and non-complying work.
 3. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
 4. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
 5. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
 6. Restore work with new products in accordance with requirements of Contract Documents.

7. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
 8. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 8400, to full thickness of the penetrated element.
 9. Patching:
 10. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
 11. Match color, texture, and appearance.
 12. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.
- H. Progress Cleaning
1. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
 2. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
 3. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
 4. Keep site and adjoining streets reasonably clean. If necessary, sprinkle rubbish and debris with water to suppress dust.
 5. 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.
 6. Clean and maintain completed construction as frequently as necessary throughout construction period. Adjust and lubricate operable components to ensure ability to operate without damaging effects.
 7. Supervise construction activities to ensure that no part of construction completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during construction period.
 8. Before and during application of painting materials, clear area where such work is in progress of debris, rubbish, and building materials that may cause dust. Sweep floors and vacuum as required and take all possible steps to keep area dust free.
 9. Clean exposed surfaces and protect as necessary to avoid damage and deterioration.
 10. Place extra materials of value remaining after completion of associated work have become Owner's property as directed by Owner or Architect.
 11. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.
- I. Protection Of Installed Work
1. Protect installed work from damage by construction operations.
 2. Provide special protection where specified in individual specification sections.
 3. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
 4. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
 5. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
 6. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
 7. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.
- J. Final Cleaning
1. Execute final cleaning after Substantial Completion but before making final application for payment.
 2. Clean areas to be occupied by Owner prior to final completion before Owner occupancy.

3. Use cleaning materials that are nonhazardous.
 4. Comply with individual manufacturer's cleaning instructions.
 5. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
 6. Clean each surface or unit to condition expected in normal, commercial building cleaning and maintenance program, including but not limited to:
 7. Interior Cleaning:
 - a. Exercising care not to scratch glass.
 - b. Remove marks, stains, fingerprints and dirt.
 - c. Clean and polish woodwork and finish hardware.
 - d. Clean plumbing fixtures and tile work. Remove spots, soil or paint.
 - e. Clean surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean light fixtures and lamps.
 - f. Clean other fixtures and equipment and remove stains, paint, dirt, and dust.
 - g. Remove temporary floor protection and clean floors.
 8. Exterior Cleaning:
 - a. Exercising care not to scratch glass.
 - b. Remove marks, stains, and dirt from exterior surfaces.
 - c. Clean and polish finish hardware.
 - d. Remove temporary protection systems.
 - e. Clean dirt, mud, and other foreign material from paving and sidewalks.
 - f. Clean drop inlets, through-curb drains, and other drainage structures.
 - g. Remove trash, debris, and foreign material from landscaped areas.
 9. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
 10. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
 11. Clean filters of operating equipment.
 12. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, drainage systems.
 13. Clean site; sweep paved areas, rake clean landscaped surfaces.
 14. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.
- K. Closeout Procedures
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 and included on Certificate of Substantial Completion.
 4. Make submittals that are required by governing or other authorities and provide copies to Architect and Owner.
 5. Preliminary Closeout Review:
 6. 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.
 7. 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.

8. Architect and his appropriate consultants, together with Contractor and mechanical, plumbing, fire protection, and electrical sub-contractors shall conduct a space by space and exterior inspection to review materials and workmanship and to demonstrate that systems and equipment are operational.
 - a. Punch list of items requiring completion and correction will be created.
 - b. Time frame for completion of punch list items will be established, and date for Substantial Completion Inspection shall be set.
9. Substantial Completion Inspection:
 - a. When Architect, Owner and Contractor agree that project is ready for Substantial Completion, an inspection is held. Punch list created at Pre-Substantial Inspection is to be substantially complete.
 - b. Prior to this inspection, Contractor shall discontinue or change over and remove temporary facilities from the site, along with construction tools, mock-ups and similar elements.
 - c. Architect, Owner and Contractor review completion of punch list items. When Owner and Architect confirm that Contractor has achieved Substantial Completion of The Work, Owner, Architect and Contractor will execute Certificate of Substantial Completion that contains:
 - 1) Date of Substantial Completion.
 - 2) Punch List Work not yet completed, including seasonal and long lead items.
 - 3) Amount to be withheld for completion of Punch List Work.
 - 4) Time period for completion of Punch List Work.
 - 5) Amount of liquidated damages set forth in Supplementary Conditions to be assessed if Contractor fails to complete Punch List Work within time set forth in Certificate.
 - d. Contractor shall present Closeout Submittals to Architect and place tools, spare parts, extra stock, and similar items required by Contract Documents in locations as directed by Facilities Manager.
10. Final Acceptance Meeting:
 - a. When punch list items except for any seasonal items or long lead items which will not prohibit occupancy are completed, Final Acceptance Meeting is held.
 - b. Owner, Architect and Contractor execute Owner's Project Closeout - Final Acceptance form, and verify:
 - 1) All seasonal and long lead items not prohibiting occupancy, if any, are identified, with committed to completion date and amount to be withheld until completion.
 - 2) Owner's maintenance personnel have been instructed on all system operation and maintenance as required by the Contract Documents.
 - 3) Final cleaning requirements have been completed.
 - c. If applicable, once any seasonal and long lead items are completed, Closeout Inspection is held where Owner and Architect verify that The Work has been satisfactorily completed, and Owner, Architect and Contractor execute Closeout portion of the Project Closeout - Final Acceptance form.
 - d. When Owner and Architect confirm that The Work is satisfactorily completed, Architect will authorize final payment.
- L. Maintenance
 1. Provide service and maintenance of components indicated in specification sections.
 2. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.
 3. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.
 4. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.
 5. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

SECTION 01 7419 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL**A. Waste Management Requirements**

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

B. Definitions

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

C. Waste Management Plan Implementation

1. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.
2. Meetings: Discuss trash/waste management goals and issues at project meetings.
 - a. Prebid meeting.
 - b. Preconstruction meeting.
 - c. Regular job-site meetings.
3. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
 - a. Provide containers as required.
 - b. Provide adequate space for pick-up and delivery and convenience to subcontractors.
 - c. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.
4. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.
5. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.

SECTION 01 7800 CLOSEOUT SUBMITTALS**A. Project Record Documents**

1. Do not use record documents for construction purposes:
 - a. Protect from deterioration and loss in secure, fire-resistive location.
 - b. Provide access to record documents for Architect's reference during normal working hours.
2. Maintain clean, undamaged set of Drawings:

- a. Mark set to show actual installation where installation varies from the Work as originally shown.
- b. Give particular attention to concealed elements that would be difficult to measure and record at a later date.
- c. Mark record sets with red erasable pencil. Use other colors to distinguish between variations in separate categories of the Work.
- d. Mark new information that is important to Owner, but was not shown on Drawings.
- e. Note related Change Order numbers where applicable.
3. As Built Record Drawings:
 - a. Architect will submit updated As Built Record Drawings 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 in AutoCAD drawing files and in PDF to Owner.
4. Maintain on site or available online from the site the following record documents; record actual revisions to the Work:
 - a. Drawings.
 - b. Specifications.
 - c. Addenda.
 - d. Change Orders and other modifications to the Contract.
 - e. Reviewed shop drawings, product data, and samples.
 - f. Manufacturer's instruction for assembly, installation, and adjusting.
 - g. Ensure entries are complete and accurate, enabling future reference by Owner.
 - h. Store record documents separate from documents used for construction.
 - i. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
 - 1) Manufacturer's name and product model and number.
 - 2) Product substitutions or alternates utilized.
 - 3) Changes made by Addenda and modifications.
- B. Contractor Submittals For Project Closeout:
 1. Submit Correction Punch List for Substantial Completion.
 2. Submit Final Correction Punch List for Substantial Completion.
 3. Submit redlined drawings to Architect for preparation of record drawings with any changes that have occurred during construction, including change orders, locations of installed or existing work, etc.
 4. Digital (.pdf) format only Operations and Maintenance Manual. All documents are to be compiled by the Contractor into a single .pdf format file containing all applicable information. Document shall be ordered to follow specification and project manual section order, with each section's information together. When the following are specified in individual sections, submit them to the Architect at project closeout:
 - a. Project record documents, including cover sheet with project information and contractor information.
 - b. Warranty letter from General Contractor.
 - c. Copies of permits, AHJ approvals, and inspections, including final inspection and/or certificate of occupancy. Releases enabling Owner unrestricted use of The Work and access to services and utilities.
 - d. Submittals, including manufacturer's literature, cut sheets, shop drawings.
 - e. Operation and maintenance data, including cleaning instructions, maintenance instructions, operations instructions, equipment list, parts list.
 - f. Warranties, digital format of final, executed warranties.
 - g. Maintenance Contracts.
 - h. Landscape Irrigation Plan and Landscape Management Plan where specified in Division 32
 - i. Project Manual: Complete Project Manual including Addenda and Modifications as defined in General Conditions.

C. Maintenance Material Submittals

1. Provide materials as described in each specification section for Owner's use in facility operation and maintenance at completion of this Work.
2. Spare parts are generally understood to be items such as filters, motor drive belts, lamps, and other similar manufactured items that require only simple replacement.
3. Extra stock materials are generally understood to be items such as ceiling tiles, flooring, paint etc.
4. Tools are generally understood to be wrenches, gauges, circuit setters, etc, required for proper operation or maintenance of a system.

END OF DIVISION 01

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SECTION 01 4546**DUCT TESTING, ADJUSTING, AND BALANCING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Is Not Limited To:
 - 1. Test, balance, and adjust air duct systems services provided by Owner as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
 - 2. Division 23:
 - a. Completing installation and start-up of mechanical systems, and changing sheaves, belts, and dampers as required for correct balance.
 - b. Maintain HVAC system and equipment in full operation each working day of testing, balancing, and adjusting.

1.2 ADMINISTRATIVE REQUIREMENTS

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

1.3 SUBMITTALS

- A. Informational Submittals:
 - 1. Test and Evaluation Reports:
 - a. Preliminary Report(s):
 - 1) Four copies to be given to Owner's Representative.
 - b. Final Report :
 - 1) Four copies to be given to Owner's Representative.
- B. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Record Documentation:
 - 1) Testing and Inspection Reports:
 - a) Testing Agency Testing and Evaluation Final Report of testing, balancing, and adjusting air duct systems. Bind approved copy of Testing and Evaluation Report in Operations And Maintenance Manual for Division 23.

1.4 QUALITY ASSURANCE

A. Qualifications:

1. Approved Testing Agency. Section 01 4301 applies, but is not limited to following:
 - a. Testing Agency shall specialize in testing and balancing of heating, ventilating, and cooling systems to balance, adjust, and test air moving equipment, air distribution, and exhaust systems.
 - b. Testing Agency shall provide proof of having successfully completed at least five years of specialized experience in air and hydronic system balancing.
 - c. Testing Agency shall provide testing under direct supervision of qualified heating and ventilating engineer.
 - d. Neither Architect's engineering consultant nor anyone performing work on this Project under other Sections of Division 23 shall be permitted to do this work.

PART 2 - PRODUCTS: Not Used

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

A. Field Tests

1. Air System Testing, Adjusting, And Balance:
 - a. Inspections and site visits. (For paragraph a thru c, note deficiencies, if any, that needs to be corrected and report this to Owner's Representative, Architect, and Mechanical Engineer):
 - 1) Site visit for test and balance. Before commencing test and balance, perform an inspection to verify 100 percent completion of system. Confirm completion of work, correction of previously noted deficiencies, and look for new deficiencies not noted in previous inspections. If the work is complete, then proceed with test and balance. If the work is not complete and ready for test and balance, inform Contractor and submit an invoice to Owner's Representative for compensation for travel time, expenses, and time on site. Report deficiencies or incomplete work to Owner's Representative, Architect, and Mechanical Engineer.
 - 2) Additional site visits (beyond those set forth above) to complete the work after issues are resolved may be needed and will be paid for separately from compensation for services set forth in this Agreement, pursuant to hourly rates and conditions set forth in Attachment "A".
 - b. Checklist for Inspections and site visits:
 - 1) Pre-Startup Inspection – use for inspections and site visits a thru d in paragraph 1 above. All pertinent items shall be checked, including but not limited to following:
 - a) Removal of shipping blocks and stops.
 - b) Vibration isolators' alignment and adjustment.
 - c) Flexible connections properly installed and aligned.
 - d) Safety controls, safety valves and high or low limits in operation.
 - e) All systems properly filled.
 - f) Filters in place and seal provided around edges.
 - g) Filters and strainers are clean.
 - h) Fire damper installation and operation, and access door installation.
 - i) Installation of all gauges on equipment.
 - j) Control system is operating.
 - k) All dampers, valves, and operators are properly installed and operating.
 - l) All ductwork is installed and sealed.
 - m) Voltage to unit matches nameplate voltage.
 - 2) First Run Inspection – use for inspections and site visits d and e in paragraph 1 above. Recheck items in Pre-Startup list, and check for following items:
 - a) Excessive vibration or noise.
 - b) Loose components.
 - c) Initial control settings.
 - d) Motor amperages.
 - e) Heat buildup in motors.
 - f) Control system is calibrated and functioning as required.

- 3) System Operation Inspection – use for inspections and site visits d and e in paragraph 1 above. Observe mechanical systems under operation for sufficient amount of time to ensure proper operation in all running modes. Check following items periodically.
 - a) Filters and strainers.
 - b) Filters and strainers.
 - c) Check for system leaks at seals and valves.
- c. Performance Requirements:
 - 1) Testing and balancing in complete accordance with Associated Air Balance Council (AABC) Standards for Field Measurement & Instructions, Form P1266, Volume I.
- d. Site tests: Air Test and Balancing Procedure:
 - 1) Instruments used by Consultant shall be accurately calibrated and maintained in good working order.
 - 2) All supply air and return air fans in all HVAC zone systems and exhaust fans in building shall be operating when final setup of all units is performed.
 - 3) Perform tests at high and low speeds of multi-speed systems and single speed systems.
 - 4) Perform following testing and balancing functions in accordance with Associated Air Balance Council National Standards.
 - a) Fan Speeds - Air handling units (with variable pitch pulleys and sheaves): Test and adjust fan RPM to achieve design CFM requirements.
 - b) Fan Speeds - Furnaces (with direct drive motors): Set fan speed to lowest possible setting that will achieve design CFM requirements. Adjust down from Contractor setting, if necessary. Adjust low voltage fan speed jumpers (provided and installed by installing contractor) as necessary to achieve design cooling air flow at lowest possible setting. An exception to this would be when furnace is variable speed blower for dehumidification applications.
 - c) Current And Voltage: Measure and record motor current and voltage.
 - d) Pitot-Tube Traverse Method:
 - (1) Make measurements in duct where velocity is uniform, 7-1/2 duct diameters downstream and 2 duct diameters minimum upstream from any turbulence, i.e., elbow, damper, take-off, etc.
 - (2) Perform pitot-tube traverse of outdoor ventilation air duct serving each piece of air moving equipment.
 - (3) Where single outdoor ventilation air trunk duct serves multiple pieces of equipment, perform pitot-tube traverse of duct branch serving each piece of equipment as well as pitot-tube traverse of total air flow in trunk with all pieces of equipment operating.
 - e) Where pitot-tube traverse is not possible or if pitot-tube traverse is unreliable, flow hood measurement over exterior intake louver or grille is acceptable for measuring outdoor ventilation air.
 - f) Use proportionate method of air balance leaving fan at lowest possible speed and at least one branch balance damper fully open.
 - 5) Static Pressure: Test and record system static pressures, including suction and discharge static pressure of each fan.
 - 6) Air Temperature: Take dry bulb air temperatures on entering and leaving side of each cooling coil. Dry bulb temperatures shall be taken on entering and leaving side of each heating unit.
 - 7) Zone Ducts: Adjust zone ducts to within design CFM requirements. At least one zone balancing damper shall be completely open.
 - 8) Branch Ducts: Adjust branch ducts to within design CFM requirements. Multi-diffuser branch ducts shall have at least one outlet or inlet volume damper completely open.
 - 9) Tolerances: Test and balance all fans, zone ducts, registers, diffusers etc. to + or – 10 percent of design CFM.
 - 10) Identification: Identify location and area of each grille, diffuser, register, and terminal box. Record on air outlet data sheets.
 - 11) Description: Record size, type, and manufacturer of each diffuser, grille, and register on air outlet data sheets.
 - 12) Drafts: Adjust diffusers, grilles, and registers to minimize drafts. For high sidewall supply air diffusers install horizontal blade core to direct air flow upward 15 degree and set adjustable vertical blades to spread air flow horizontally and evenly in fan pattern.

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

3.2 PREPARATION

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

END OF SECTION

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

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Concrete formwork.
- B. Concrete anchors
- C. Concrete reinforcement.
- D. Joint devices associated with concrete work.
- E. Concrete curing.

1.02 RELATED REQUIREMENTS

- A. Section 07 9200 - Joint Sealants: Products and installation for sealants and joint fillers for saw cut joints and isolation joints in slabs.

1.03 REFERENCE STANDARDS

- A. ACI CODE-318 - Building Code Requirements for Structural Concrete and Commentary; 2019 (Reapproved 2022).
- B. ACI PRC-302.1 - Guide to Concrete Floor and Slab Construction; 2015.
- C. ACI PRC-304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).
- D. ACI PRC-305 - Guide to Hot Weather Concreting; 2020.
- E. ACI PRC-306 - Guide to Cold Weather Concreting; 2016.
- F. ACI PRC-308 - Guide to External Curing of Concrete; 2016.
- G. ACI PRC-347 - Guide to Formwork for Concrete; 2014 (Reapproved 2021).
- H. ACI SPEC-117 - Specification for Tolerances for Concrete Construction and Materials; 2010 (Reapproved 2015).
- I. ACI SPEC-301 - Specifications for Concrete Construction; 2020.
- J. ANSI/NFSI B101.1 - Test Method For Measuring Wet SCOF Of Common Hard-Surface Floor Materials; 2009.
- K. ANSI/NFSI B101.3 - Test Method For Measuring Wet DCOF Of Common Hard-Surface Floor Materials; 2012.
- L. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished; 2018.
- M. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2021.
- N. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts; 2021a.
- O. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2022.
- P. ASTM A775/A775M - Standard Specification for Epoxy-Coated Steel Reinforcing Bars; 2022.
- Q. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement; 2014.
- R. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2022.
- S. ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation; 2017.

- T. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2018.
- U. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2021.
- V. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2023.
- W. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2020.
- X. ASTM C150/C150M - Standard Specification for Portland Cement; 2022.
- Y. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2020.
- Z. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2016.
- AA. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2019.
- BB. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2022.
- CC. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing; 2017.
- DD. ASTM C779/C779M - Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces; 2019.
- EE. ASTM C827/C827M - Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures; 2016.
- FF. ASTM C1059/C1059M - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete; 2021.
- GG. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2020.
- HH. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures; 2020.
- II. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete; 2019.
- JJ. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2018.
- KK. ASTM D471 - Standard Test Method for Rubber Property--Effect of Liquids; 2016a (Reapproved 2021).
- LL. ASTM D523 - Standard Test Method for Specular Gloss; 2014 (Reapproved 2018).
- MM. ASTM D994/D994M - Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type); 2011 (Reapproved 2022).
- NN. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2018.
- OO. ASTM D1752 - Standard Specification for Preformed Sponge Rubber, Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction; 2018.
- PP. ASTM D2103 - Standard Specification for Polyethylene Film and Sheeting; 2015.
- QQ. ASTM D3963/D3963M - Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Steel Reinforcing Bars; 2021.
- RR. ASTM D5767 - Standard Test Method for Instrumental Measurement of Distinctness-of-Image (DOI) Gloss of Coated Surfaces; 2018.
- SS. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022a.

- TT. ASTM E154/E154M - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover; 2008a (Reapproved 2019).
- UU. ASTM E1155 - Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers; 2020.
- VV. ASTM E1155M - Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers (Metric); 2014.
- WW. ASTM E1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2018a.
- XX. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs; 2017.
- YY. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2021.
- ZZ. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength; 2020.
- AAA. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2022.
- BBB. COE CRD-C 48 - Handbook for Concrete and Cement Standard Test Method for Water Permeability of Concrete; 1992.
- CCC. COE CRD-C 513 - Handbook for Concrete and Cement Corps of Engineers Specifications for Rubber Waterstops; 1974.
- DDD. COE CRD-C 572 - Handbook for Concrete and Cement Corps of Engineers Specifications for Polyvinylchloride Waterstop; 1974.
- EEE. COE CRD-C 621 - Handbook for Concrete and Cement Standard Specification for Packaged, Dry; 1997.
- FFF. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2015.
- GGG. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2016.
- HHH. ICC-ES AC380 - Acceptance Criteria for Termite Physical Barrier Systems; 2014, with Editorial Revision (2017).
- III. ICRI 310.2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair; 2013.
- JJJ. NSF 61 - Drinking Water System Components - Health Effects; 2022, with Errata.
- KKK. NSF 372 - Drinking Water System Components - Lead Content; 2022.

1.04 SUBMITTALS

- A. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
1. For curing compounds, provide data on method of removal in the event of incompatibility with floor covering adhesives.
 2. For chemical-resistant waterstops, provide data on ASTM D471 test results.
 3. Printed application instructions for form release agents.
- B. Mix Design: Submit proposed concrete mix design.

1. Indicate proposed mix design complies with requirements of ACI SPEC-301, Section 4 - Concrete Mixtures.
2. Indicate proposed mix design complies with requirements of ACI CODE-318, Chapter 5 - Concrete Quality, Mixing and Placing.
- C. Shop Drawings:
 1. Show dimensioned locations of anchor bolts for hold-down anchors and columns.
 2. Show reinforcement and all necessary bending diagrams and reinforcing steel list, and construction joint locations.
 3. Provide bar schedules and bending details.
 4. Show all formwork for concrete surfaces which are to remain exposed in the finished work.
 5. Joint layout plan for control and expansion joints for sidewalks, curbs, and gutters for written approval before starting work on this Section.
- D. Samples: Submit samples of underslab vapor retarder to be used.
- E. Ready-Mix Supplier:
 1. Require mix plant to furnish delivery ticket for each batch of concrete. Keep delivery tickets at job-site for use of Owner or its representatives. Tickets shall show following:
 - a. Name of ready-mix batch plant.
 - b. Serial number of ticket.
 - c. Date and truck number.
 - d. Name of Contractor.
 - e. Name and location of Project.
 - f. Specific class or designation of concrete conforming to that used in Contract Documents.
 - g. Amount of concrete.
 - h. Amount and type of cement.
 - i. Total water content allowed by mix design.
 - j. Amount of water added at plant.
 - k. Sizes and weights of sand and aggregate.
 - l. Time loaded.
 - m. Type, name, manufacturer, and amount of admixtures used.
 2. Provide certificates with supporting testing reports verifying compliance with Contract Document requirements and that materials provided are from single source for following:
 - a. Cement.
 - b. Aggregate.
 - c. Fly Ash.
- F. Test Reports: Submit report for each test or series of tests specified.
- G. Test Reports: Submit termite-resistant sheet manufacturer's summary of independent laboratory and field testing for effectiveness in subterranean termite exclusion.
- H. Manufacturer's Installation Instructions: For concrete accessories and form release agents, indicate installation procedures and interface required with adjacent construction.
- I. Manufacturer's Reports:
 1. Provide Manufacturer's performance and testing data for following:
 - a. Each admixture used.
- J. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.
- K. Closeout Submittals:
 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Record Documentation:
 - 1) Pour Reports:

- (a) Provide report that records following information:
 - (1) Date and time of start of pour, Date and time of end of pour, and Date and time of end of finishing procedures.
 - (2) Temperature at start of pour, Temperature at end of Pour, and Maximum temperature during performance of finishing procedures.
 - (3) Wind speed at start of pour, Wind speed at end of pour, and Maximum wind speed during performance of finishing procedures.
 - (4) Humidity at start of pour, Humidity at end of pour, and High and low humidity during performance of finishing procedures.
 - (5) Cloud cover at start of pour, Cloud cover at end of pour, and High and low cloud cover during performance of finishing procedures.
 - (6) Screeding method and equipment used.
 - (7) Saw cut method and equipment used.
- 2) Testing and Inspection Reports:
 - (a) Testing Agency Testing and Inspecting Reports of concrete.
- 3) Warranty. Submit rapid concrete drying or MVRA manufacturer warranties for concrete moisture vapor emission induced flooring failure and adhesion; ensure both have been completed in project's name and registered with manufacturer.
 - (a) Provide warranty to cover cost of flooring failures due to moisture migration from slabs for life of concrete. Include cost of repair or removal of failed flooring, placement of topical moisture remediation system, and replacement of flooring with comparable flooring system.
 - (b) Provide stand-alone adhesion warranty matching duration of flooring adhesive or primer manufacturer's material defect warranty.
- L. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 DEFINITIONS

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

1.06 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI SPEC-301 and ACI CODE-318.
 - 1. Maintain one copy of each document on site.
- B. Qualifications: Requirements of Section 01 4000 applies, but is not limited to following:
 - 1. Installers and Installation Supervisor:
 - a. ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
 - b. Certification for National Ready Mixed Concrete Association (NRMCA).
 - 2. Ready-Mix Supplier:
 - a. Comply with ASTM C94/C94M requirements and be certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities".
 - 3. Testing Agencies:
 - a. Independent agency qualified according to ASTM C1077 and ASTM E329.
 - 1) Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technicians, Grade I according to ACI CP-1 or equivalent certification program.

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

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

1.07 WARRANTY

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

PART 2 PRODUCTS

2.01 CONCRETE FORMWORK

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

2.02 CONCRETE ANCHORS

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

- a. Install hot-dipped or stainless steel anchor bolts to attach wood sill plates to foundation with 1/4 inch by 3 inch x 3 inch minimum adjustable plate washers and standard cut washers between wood sill plates and nuts.
 - b. Nut: Conform to requirements of ASTM A563, Grade A, Hex.
 - c. Conform to requirements of ASTM F3125/F3125M for chemical, physical and mechanical requirements for quenched and tempered bolts manufactured from steel and alloy steel.
2. Threaded rod for adhesive anchors and cast-in anchors:
 - a. Conform to requirements of ASTM A307, Grade A or ASTM F1554 Grade 36 unless indicated otherwise on Contract Drawings.
3. Cast-In-Place Anchor Bolts:
 - a. J-Bolts:
 - 1) Non-headed type threaded 2 inches minimum conforming to requirements of ASTM F1554, Grade A.
 - 2) Anchor hook to project 2 inches minimum including bolt diameter.
 - b. Headed Bolts:
 - 1) Headed type threaded 2 inches minimum conforming to requirements of ASTM F1554, Grade A.
4. Headed Concrete Anchor Studs:
 - a. Composed of low carbon steel meeting requirements of ASTM A108.
 - b. Tensile Strength: 61,000 psi minimum.
 - c. Yield Strength: 49,000 psi minimum.
5. Deformed Bar Anchors:
 - a. Manufactured in accordance with requirements of ASTM A1064/A1064M.
 - b. Tensile Strength: 80,000 psi minimum.
 - c. Yield Strength: 70,000 psi minimum.
6. Reinforcing Bars:
 - a. Composed of deformed carbon steel meeting requirements of ASTM A615/A615M, Grade 60 (field bent bars may be Grade 40)
7. Adhesive Anchors:
 - a. Products shall have current ESR conforming to current ICC Acceptance Criteria ICC-ES AC308 for concrete.
 - b. Rod diameter and embedment length as indicated on Contract Drawings.
 - c. Acceptable Products:
 - 1) HIT-RE 500V3 with SafeSet Epoxy Adhesive by Hilti Fastening Systems, Tulsa, OK www.us.hilti.com.
 - 2) Pure 110+ by DeWalt Anchors & Fasteners, Towson, MD, www.anchors.dewalt.com.
 - 3) SET-3G Epoxy by Simpson Strong-Tie Co., Pleasanton, CA www.strongtie.com.com.
 - 4) Equal as approved by Architect before installation. See Section 01 6000.
8. Expansion Anchors:
 - a. Products shall have current ESR conforming to current ICC Acceptance Criteria ICC-ES AC193 for concrete.
 - b. Acceptable Products:
 - 1) KWIK Bolt TZ2 Expansion Anchor by Hilti Fastening Systems, Tulsa, OK www.us.hilti.com.
 - 2) Power-Stud +SD2 by DeWalt Anchors & Fasteners, Brewster, NY, www.ancors.dewalt.com.
 - 3) Strong-Bolt 2 by Simpson Strong-Tie Co., Pleasanton, CA www.strongtie.com.
 - 4) Equal as approved by Architect before installation. See Section 01 6000.
9. Screw Anchors:

- a. Provide anchors with length identification markings conforming to ICC Acceptance Criteria ICC-ES AC193 for concrete.
- b. Type Two Acceptable Products:
 - 1) KWIK KH-EZ by Hilti Fastening Systems, Tulsa, OK www.us.hilti.com.
 - 2) Screw-Bolt+ by DeWalt Anchors & Fasteners Inc., Towson, MD, www.anchors.dewalt.com.
 - 3) Titen HD by Simpson Strong Tie Co, Pleasanton, CA www.strongtie.com.
 - 4) Equals as approved by Architect through shop drawing submittal before installation. See Section 01 6000.

2.03 REINFORCEMENT MATERIALS

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi), except dowels that are to be field bent, Grade 40 minimum.
 1. Type: Deformed billet-steel bars.
 2. Finish: Unfinished, unless otherwise indicated.
 3. Bars shall be free of heavy rust scales and flakes, or other bond-reducing coatings.
- B. Steel Welded Wire Reinforcement (WWR): Galvanized, plain type, ASTM A1064/A1064M.
 1. Form: Coiled Rolls.
 2. WWR Style: 6 x 6 - W1.4 x W1.4..
- C. Reinforcement Accessories:
 1. Tie Wire: Annealed, minimum 16 gauge, 0.0508 inch.
 2. Bar Supports:
 - a. Concrete masonry units or bricks are not acceptable.
 - b. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs which are plastic protected (CRSI, Class 1) or stainless steel protected (CRSI, Class 2).
 - c. Acceptable Products:
 - 1) Concrete 'dobies' or blocks wired to reinforcing.
 - 2) Manufactured chairs with 4 sq inch bearing surface on sub-grade, or other feature to prevent chair from being pushed into sub-grade or damaging vapor retarder under slabs on grade.
 3. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
 4. Provide stainless steel, galvanized, plastic, or plastic coated steel components for placement within 1-1/2 inches of weathering surfaces.

2.04 CONCRETE MATERIALS

- A. Performance:
 1. Design Criteria: Conform to requirements of ASTM C94/C94M unless specified otherwise:
 2. Capacities:
 - a. For testing purposes, following concrete strengths are required:
 - 1) At 7 days: 70 percent minimum of 28 day strengths.
 - 2) At 28 days: 100 percent minimum of 28 day strengths.
- B. Cement: ASTM C150/C150M, Type I - Normal Portland type.
 1. Acquire cement for entire project from same source.
- C. Concrete mix design: Submit mix designs to meet following requirements:
 1. Unexposed Interior Concrete:
 - a. For unexposed interior concrete slabs on grade and as otherwise required by the contract drawings.
 - b. 3500 psi (24.13 MPa) minimum at twenty-eight (28) days.
 - c. Water / Cementitious Material: 0.45 maximum by weight.

2. Exposed Interior Concrete:
 - a. For exposed interior concrete slabs on grade that receive polished floor finishing system and as otherwise required by the contract drawings.
 - b. 3500 psi (24.13 MPa) minimum at twenty-eight (28) days.
 - c. Water / Cementitious Material: 0.45 maximum by weight.
 - d. Drying shrinkage of concrete mix is to be limited to 0.032 percent at twenty-eight (28) days when tested per ASTM C157. Use 1 gal (3.785 liter) of shrinkage reducing admixture per 1 cu yd (0.765 cu m) of concrete.
 3. Air Entrainment: Six (6) percent, plus or minus 1-1/2 percent for exterior concrete and foundation walls exposed to freeze/thaw cycles.
 4. Do not add water any time during mixing cycle above amount required to meet specified water / cement ratio. No reduction in amount of cementitious material is allowed.
 5. Mix design strengths specified are a minimum due to exposure to sulfates, chlorides, freeze/thaw, water, etc. Refer to the structural drawings for additional concrete strength requirements. The most stringent requirements should be met.
- D. Slump:
1. 4 inch (100 mm) slump maximum before addition of high range water reducer.
 2. 8 inch (200 mm) slump maximum with use of high range water reducer.
 3. Slump not required for Mix Type G.
- E. General:
1. Submit a letter on quarry's letterhead that certifies all aggregate for concrete complies with the requirements of this section. Material certificates which are submitted shall be signed by both the materials producer and the contractor, certifying that materials comply with or exceed requirements specified herein to the Architect, Civil and Structural Engineering Consultant and the Independent Testing Laboratory for review and approval.
 2. Aggregates for all concrete shall come from a quarry that is DOT approved and meets or exceeds durability Class I aggregate. The quarry shall submit a letter to Engineer that certifies that all aggregate complies with DOT requirements for durability. Aggregate not meeting DOT durability requirements shall not be used.
- F. Fine and Coarse Aggregates: ASTM C33/C33M.
1. Acquire aggregates for entire project from same source.
- G. Fly Ash: ASTM C618, Class C or F.
1. Not to exceed twenty-five (25) percent of weight of cementitious materials.
- H. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

2.05 ADMIXTURES

- A. No admixture shall contain calcium chloride nor shall calcium chloride be used as an admixture. All chemical admixtures used shall be from same manufacturer and compatible with each other.
1. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.
- B. Mix design shall show proposed admixtures, amount, usage instructions, and justification for proposed use. Do not use any admixtures without Architect's written approval.
1. Chemical accelerator or retarder may be used if necessary to meet environmental conditions and construction schedules.
- C. Alkali-Silica Reactivity Inhibiting Admixture:
1. Specially formulated lithium nitrate admixture for prevention of alkali-silica reactivity (ASR) in concrete. Admixture must have test data indicating conformance to ASTM C1293.
 2. Manufacturer: As approved by Architect before use. See Section 01 6000.
- D. Viscosity Modifying Admixture (VMA):

1. Liquid admixture used to optimize viscosity of Self-Consolidating Concrete (SCC). Subject to compliance with requirements, provide following at dosage rates per manufacturer's recommendations.
2. Manufacturer: As approved by Architect before use. See Section 01 6000.
- E. Air Entraining Admixture: ASTM C260/C260M.
 1. Manufacturer: As approved by Architect before use. See Section 01 6000.
- F. High Range Water Reducing Admixture: ASTM C494/C494 Type F.
 1. Manufacturer: As approved by Architect before use. See Section 01 6000.
- G. High Range Water Reducing and Retarding Admixture (Superplasticizer): ASTM C494/C494M Type G.
 1. Manufacturer: As approved by Architect before use. See Section 01 6000.
- H. Water Reducing Admixture: ASTM C494/C494M Type A.
 1. Manufacturer: As approved by Architect before use. See Section 01 6000.
- I. Water Reducing and Accelerating Admixture: ASTM C494/C494 Type E.
 1. Manufacturer: As approved by Architect before use. See Section 01 6000.
- J. Water Reducing and Retarding Admixture: ASTM C494/C494M Type D
 1. Manufacturer: As approved by Architect before use. See Section 01 6000.
- K. Accelerating Admixture: ASTM C494/C494M Type C.
 1. Manufacturer: As approved by Architect before use. See Section 01 6000.
- L. Retarding Admixture: ASTM C494/C494M Type B.
 1. Manufacturer: As approved by Architect before use. See Section 01 6000.
- M. Shrinkage Reducing Admixture: ASTM C494/C494M Type S.
 1. Manufacturer: As approved by Architect before use. See Section 01 6000.
- N. Non-Chloride, Non-Corrosive Accelerating Admixture: ASTM C494/C494M Type C or E.
 1. Manufacturer: As approved by Architect before use. See Section 01 6000.
- O. Corrosion Inhibiting Admixture: ASTM C494/C494M Type C and ASTM C1582/C1582M.
 1. Liquid admixture to inhibit corrosion of steel reinforcement in concrete by introducing proper amount of anodic inhibitor. Admixture shall contain thirty (30) percent calcium nitrite solution and shall be used where called for in specifications or on drawings.
 2. Manufacturer: As approved by Architect before use. See Section 01 6000.
- P. Moisture Vapor Reduction Admixture (MVRA):
 1. Liquid, inorganic admixture free of volatile organic compounds (VOCs) and formulated to close capillary systems formed during curing to reduce moisture vapor emission and transmission with no adverse effect on concrete properties or finish flooring.
 2. Manufacturer: As approved by Architect before use. See Section 01 6000.
- Q. Waterproofing Admixture:
 1. Admixture formulated to reduce permeability to liquid water, with no adverse effect on concrete properties.
 2. Admixture Composition: Crystalline, functioning by growth of crystals in capillary pores.
 3. Admixture Composition: Hydrophobic polymer waterproofing and corrosion inhibitor, functioning by closing concrete pores and chemical bonding.
 4. Permeability of Cured Concrete: No measurable leakage when tested in accordance with COE CRD-C 48 at 200 psi; provide test reports.
 5. Potable Water Contact Approval: National Science Foundation (NSF) certification for use on structures holding potable water, based on testing in accordance with NSF 61 and NSF 372.
 6. Manufacturer: As approved by Architect before use. See Section 01 6000.

- R. Rapid Drying Admixture in Interior Concrete Slabs on Grade:
1. Admixture specifically designed to promote rapid drying of concrete.
 2. Manufacturer: As approved by Architect before use. See Section 01 6000.

2.06 ACCESSORY MATERIALS

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

2.07 BONDING AND JOINTING PRODUCTS

- A. Bonding Agents:
1. Manufacturers: As approved by Architect before use. See Section 01 6000.
- B. Latex Bonding Agent: Non-redispersable acrylic latex, complying with ASTM C1059/C1059M, Type II.
1. Manufacturers: As approved by Architect before use. See Section 01 6000.
- C. Waterstops (Contractor Option):
1. Waterstops: PVC, complying with COE CRD-C 572.
 - a. Configuration: As indicated on drawings.
 - b. Size: As indicated on drawings.
 - c. Manufacturers: As approved by Architect before use. See Section 01 6000.

2. Waterstops: Bentonite and butyl rubber, complying with NSF 61 and NSF 372.
 - a. Configuration: As indicated on drawings.
 - b. Size: As indicated on drawings.
 - c. Manufacturers: As approved by Architect before use. See Section 01 6000.
- D. Slab Isolation Joint Filler: 1/2 inch thick, height equal to slab thickness, with removable top section that will form 1/2 inch deep sealant pocket after removal.
 1. Material: ASTM D1751, cellulose fiber.
 2. Manufacturers: As approved by Architect before use. See Section 01 6000.
- E. 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 or ASTM D8139.
 - 2) 1/2 inch (12.7 mm) thick.
 - 3) Resilience:
 - (a) When compressed to half of original thickness, recover to minimum of seventy (70) percent of original thickness.
 - b. Manufacturers: As approved by Architect before use. See Section 01 6000.
- F. Finishing Material (Exposed Vertical Faces of Foundation and Retaining Walls):
 1. Do not apply finishing material (parge coat) to foundation or retaining walls.
- G. Slab Contraction Joint Device (if used): Preformed linear strip intended for pressing into wet concrete to provide straight route for shrinkage cracking.
 1. Manufacturers: As approved by Architect before use. See Section 01 6000.
- H. Slab Construction Joint Devices (if used and required by contract drawings): Combination keyed joint form and screed, galvanized steel, with rectangular or round knockout holes for conduit or rebar to pass through joint form at 6 inches on center; ribbed steel stakes for setting.
 1. Provide removable plastic cap strip that forms wedge-shaped joint for sealant installation.
 - a. Height: To suit slab thickness.
 - b. Manufacturers: As approved by Architect before use. See Section 01 6000.
 2. Dowel Sleeves: Plastic sleeve for smooth, round, steel load-transfer dowels.
 - a. Manufacturers: As approved by Architect before use. See Section 01 6000.

2.08 CURING MATERIALS

- A. Membrane Curing:
 1. Clear water-based, ready-to use membrane curing agent that cures freshly placed concrete, forming effective barrier against moisture loss from concrete surface.
 2. Design Criteria:
 - a. Exterior Concrete:
 - 1) Dissipating or non-dissipating membrane curing agent.
 - b. Interior Concrete:
 - 1) Dissipating membrane curing agent only.
 - 2) Gradually dissipate after twenty-eight (28) days without leaving stain or discoloring concrete surface.
 - c. VOC-compliant compound.
 - d. Meet requirements of ASTM C309 and AASHTO M 148, Type 1 or 1-D, Class B.
 - e. Interior concrete: containing no mineral spirits, naphtha, or other components detrimental to finish flooring installation.
 - f. Maintain ninety-five (95) percent of mix water present in concrete mass after application.
 3. Horizontal and Vertical Cast-In-Place Structural Concrete:

- a. Acceptable Products.
 - 1) Exterior Concrete:
 - (a) Clear Cure J7WB by Dayton Superior Corporation, Miamisburg. OH
www.daytonsuperior.com.
 - (b) Clear Water Resin by Right Point, Dekalb, IL www.rightpointe.com.
 - (c) L&M Cure R by L&M Construction Chemicals, Inc. Omaha, NE
www.lmcc.com.
 - (d) VOCOMP 20 (do not use when concrete sealer will be applied in areas of freeze/thaw and deicer salts) by W.R. Meadows, Inc. Hampshire, IL
www.wrmeadows.com.
 - (e) 1100-Clear by W. R. Meadows, Inc. Hampshire, IL www.wrmeadows.com.
 - (f) Equal as approved by Architect before use. See Section 01 67000
 - 2) Interior Concrete:
 - (a) Clear Cure J7WB by Dayton Superior Corporation, Miamisburg. OH
www.daytonsuperior.com.
 - (b) Clear Water Resin by Right Point, Dekalb, IL www.rightpointe.com.
 - (c) L&M Cure R by L&M Construction Chemicals, Inc. Omaha, NE
www.lmcc.com.
 - (1) 1100-Clear by W. R. Meadows, Inc. Hampshire, IL
www.wrmeadows.com.
 - (d) Equal as approved by Architect before use. See Section 01 6000.

2.09 MIXING

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

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify lines, levels, and dimensions before proceeding with work of this section and before concrete is placed.
 - 1. Notify Architect of incorrect dimensions or spot elevations in writing.
 - 2. Do not place concrete until corrections are made and verified.
- B. Detectable Warning Panels:
 - 1. Examine substrate and verify substrate is suitable for installation of detectable warning panels:
 - a. Notify Architect of unsuitable conditions in writing.
 - b. Do not install detectable warning panels over unsuitable conditions.
 - c. 3) Commencement of Work by installer is considered acceptance of substrate.

3.02 PREPARATION

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

- a. All concrete shall be machine mixed.
- b. Water gauge shall be provided to deliver exact predetermined amount of water for each batch.
- c. Reliable system must be employed to insure that no less than predetermined amount of cement goes into each batch.
- d. Re-tempering partly set concrete will not be permitted.
- 2. Transit Mix:
 - a. Transit mix concrete may be used provided it conforms to Specifications and tests herein described and ASTM C94/C94M.
 - b. Central plant producing concrete and equipment transporting it are suitable for production and transportation of controlled concrete and plant is currently approved by local state DOT.
 - c. Maximum elapsed time between time of introduction of water and placing shall be one (1) hour.
 - d. Minimum time of mixing shall be one (1) minute per cubic yard after all material, including water, has been placed in drum, and drum shall be reversed for an additional two (2) minutes.
 - e. Mixing water shall be added only in presence of Inspecting Engineer or inspector employed by Testing Agency.
 - f. Trucks shall not be overloaded in excess of rated capacity as recommended by manufacturer.
- 3. Cold Weather Concreting Procedures:
 - a. General Requirements:
 - 1) Materials and equipment required for heating and protection of concrete shall be approved and available at Project site before beginning cold weather concreting.
 - 2) Forms, reinforcement, metallic embedments, and fillers shall be free from snow, ice, and frost. Surfaces that will be in contact with newly placed concrete, including subgrade materials, shall be 35 deg F (2 deg C) minimum at time of concrete placement.
 - 3) Thaw sub-grade 6 inches (150 mm) deep minimum before beginning concrete placement. If necessary, re-compact thawed material.
 - 4) Use no frozen materials or materials containing ice.
 - 5) See ACI 306.1 'Standard Specification for Cold Weather Concreting' for additional requirements.
- 4. Hot Weather Concreting Procedures:
 - a. General:
 - 1) Maximum concrete temperature allowed is 90 deg F (32 deg C) in hot weather.
 - 2) Cool aggregate and subgrades by sprinkling.
 - 3) Avoid cement over 140 deg F (60 deg C).
 - 4) Use cold mixing water or ice.
 - 5) Use fog spray or evaporation retardant to lessen rapid evaporation from concrete surface.
 - 6) See ACI 305.1 'Specification for Hot Weather Concreting' for additional requirements.
- E. Surface Preparation:
 - 1. Earthwork Preparation:
 - a. Aggregate base and subgrade:
 - 1) Prepare aggregate base as specified in Section 312323.
 - 2) Prepare natural soil subgrade as specified in Section 31 2200.
 - 3) Prepare fill subgrade as specified in Section 31 2323.
 - 2. Concrete Slab Thickness:
 - a. Increase thickness of concrete beneath detectable warning panels one inch (25 mm).

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

3.03 INSTALLATION OF FORMWORK

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

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

3.04 PLACING CONCRETE

- A. Place concrete in accordance with ACI PRC-304.
- B. Place concrete for floor slabs in accordance with ACI PRC-302.1.
- C. Notify Architect not less than 24 hours prior to commencement of placement operations.
- D. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
- E. General:
1. Place as soon after mixing as possible.
 2. Deposit as nearly as possible in final position.
 3. No concrete shall be deposited in water.
 4. Placing of concrete shall be continuous until panel or section is complete.
 5. Compact concrete in forms by vibrating and other means where required.
 - a. Thoroughly consolidate concrete around reinforcing bars (Consolidation not required in concrete around reinforcing bars with Mix Type G).
 - b. Use and type of vibrators shall conform to ACI 309.
 6. Form vertical surfaces full depth. Do not allow concrete to flow out from under forms in any degree into landscaped areas.
 7. Consolidate concrete thoroughly.
 8. Do not embed aluminum in concrete.
 9. Do not use contaminated, deteriorated, or re-tempered concrete.
 10. Avoid accumulation of hardened concrete.
 11. Dusting with cement not permitted.
- F. Interior Slabs:
1. For continuous placing and where shown on Drawings, saw cut one inch (25 mm) deep control joints before shrinkage occurs (2 inches at 6 inch slabs) (50 mm at 150 mm slabs).
 - a. Do not install control joints where Drawings indicate they are not to be installed.
- G. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.
- H. Place concrete continuously without construction (cold) joints wherever possible; where construction joints are necessary, before next placement prepare joint surface by removing laitance and exposing the sand and sound surface mortar, by sandblasting or high-pressure water jetting.

3.05 SLAB JOINTING

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

- d. Flat Drainage Structures: 10 feet.
 - e. Retaining Walls with guardrails: Align with posts.
 - f. Retaining Walls with Fencing: Align with posts.
- 2. Concrete Expansion Joint (isolation) Joints on Center Spacing.
 - a. Sidewalks, Curbs and Gutters: 40-100 feet
 - b. Mow Strips and Aprons: 20-40 feet.
 - c. Flat Drainage Structures: 50 feet.
 - d. Retaining Walls with guardrails: 36 feet.
 - e. Retaining Walls with Fencing: 50 feet.
- B. Anchor joint fillers and devices to prevent movement during concrete placement.
- C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.
 - 1. Install wherever necessary to separate slab from other building members, including columns, walls, equipment foundations, footings, stairs, manholes, sumps, and drains.
- D. Load Transfer Construction and Contraction Joints: Install load transfer devices as indicated; saw cut joint at surface as indicated for contraction joints.
- E. Saw Cut Contraction Joints: Saw cut joints before concrete begins to cool, within 4 to 12 hours after placing; use 3/16 inch thick blade and cut at least 1 inch deep but not less than one quarter (1/4) the depth of the slab.
- F. Contraction Joint Devices: Use preformed joint device, with top set flush with top of slab.
- G. Construction Joints: Where not otherwise indicated, use metal combination screed and key form, with removable top section for joint sealant.
- H. Seal expansion joints as specified in Section 07 9200 for following areas:
 - 1. Between entryway slabs and building foundations.
 - 2. Between sidewalks and building foundations.
 - 3. Concrete retaining walls.
 - 4. Within curbs and gutters.
 - 5. Within flat drainage structures and at joints between flat drainage structures and other concrete elements.
- I. Expansion joints are not required to be sealed for following areas:
 - 1. Within aprons and where apron abuts sidewalks.
 - 2. Within mow strips and where mow strip abuts building foundation and sidewalks.
 - 3. Within sidewalks.

3.06 FLOOR FLATNESS AND LEVELNESS TOLERANCES

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

- F. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.07 CONCRETE FINISHING

- A. Repair surface defects, including tie holes, immediately after removing formwork.
- B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch or more in height.
- C. Interior Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:
1. Screed Concrete.
 2. Float Finish:
 - a. Float as soon after screeding as possible.
 - b. Consolidate surface with power-driven floats with exception of areas inaccessible to power-driven floats, which may be hand-floated.
 - c. Re-straighten, cutting down high spots and filling low spots.
 - d. Repeat float passes and re-straightening until surface has uniform, smooth, granular texture.
 - e. Surfaces to Receive Thick Floor Coverings: "Wood float" as described in ACI 302.1R; thick floor coverings include quarry tile, ceramic tile, and Portland cement terrazzo with full bed setting system.
 3. Trowel Finish:
 - a. Steel trowel slab after concrete has set enough to avoid bringing water and fines to surface.
 - b. Perform troweling with power-driven trowels with exception of areas inaccessible to power-driven trowels, which may be hand-troweled.
 - c. Continue troweling passes and re-straightening with 10 foot (3 meter) highway straightedge until surface is free of trowel marks and uniform in texture and appearance.
 - d. Apply burnished, burned-out trowel finish.
 - e. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI 302.1R; thin floor coverings include carpeting, resilient flooring, seamless flooring, resinous matrix terrazzo, thin set quarry tile, and thin set ceramic tile.
 4. Decorative Exposed Surfaces: Trowel as described in ACI PRC-302.1; take measures necessary to avoid black-burnish marks; decorative exposed surfaces include surfaces to be stained or dyed, pigmented concrete, surfaces to receive liquid hardeners, surfaces to receive dry-shake hardeners, surfaces to be polished, and all other exposed slab surfaces.
 5. Other Surfaces to Be Left Exposed: Trowel as described in ACI PRC-302.1, minimizing burnish marks and other appearance defects.
- D. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains at 1:100 nominal.
- E. Concrete Polishing: See Section 03 3511.

3.08 CURING AND PROTECTION

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

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

3.09 POST INSTALLED ANCHORS

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

3.10 NON-SHRINK GROUTING

- A. Surface Preparation:
 1. Prepare concrete surfaces in accordance with Manufacturer's written instructions:

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

3.11 FIELD QUALITY CONTROL

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

- G. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
- H. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.
- I. Slab Testing: Cooperate with manufacturer of specified moisture vapor reducing admixture (MVRA) to allow access for sampling and testing concrete for compliance with warranty requirements.
- J. Permeability Test: Test concrete with waterproofing admixture according to COE CRD-C 48.
- K. Expansion Anchors / Adhesive Anchors / Screw Anchors:
 - 1. Certified Inspector from Testing Agency shall verify procedures used for installation of all concrete anchors and monitor their installation for compliance with Manufacturer's requirements.
 - 2. Inspections:
 - a. Inspections shall include required verification and inspection of anchors as referenced in IBC Table 1704.4 and in accordance with most current version of ACI 318 or ACI 318M and applicable ASTM material standards that:
 - 1) The correct rod/anchor is used; size and type.
 - 2) The correct hole size is used and prepared per Manufacturer's instructions.
 - 3) That climactic conditions, and concrete temperature, allow for the anchors' installation and use.
 - 4) Proper hole cleaning equipment, per Manufacturer's instructions, is used.
 - 5) Torque applied to anchors does not exceed Manufacturer's allowable limits.
 - (a) Torque applied to anchors is per Manufacturer's instructions.

3.12 DEFECTIVE CONCRETE

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

3.13 PROTECTION

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

END OF SECTION 03 3000

**SECTION 05 5000
METAL FABRICATIONS**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Shop fabricated steel and aluminum items.
- B. Bench brackets.
- C. Miscellaneous steel.
 - 1. Lintels.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.
- B. Section 04 2000 - Unit Masonry: Placement of metal fabrications in masonry.

1.03 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2014.
- B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless 2022.
- C. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates 2018.
- D. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength 2021.
- E. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes 2021a.
- F. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing 2021.
- G. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength 2022.
- H. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination 2020.
- I. AWS D1.1/D1.1M - Structural Welding Code - Steel 2020, with Errata (2022).
- J. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer 2004.
- K. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic) 2019.

1.04 SUBMITTALS

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

- 4) Details of connections.
- 5) Support reactions.
- 6) Bracing requirements.

1.05 QUALITY ASSURANCE

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

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

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

2.02 FABRICATION

- A. Fit and shop assemble items in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. Continuously seal joined members by intermittent welds and plastic filler.
- D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- F. After fabrication, and before shop priming, hot-dip or mechanically galvanize to be installed in following:
 1. Lintels in exterior walls
- G. Powder Coated:
 1. Bench Brackets:
 - a. Powder coated after complete fabrication:
 - 1) Preparation:
 - (a) Meet ASTM standards for powder coating.
 - (b) Steel must be free of any scale, paint, varnish, grease or rust.
 - (c) Chemical wash and rinse.
 - (d) Apply corrosion-inhibiting iron phosphate treatment
 - 2) Apply powder coating
 - b. Color: As selected by Owner from Manufacturer's standard colors.

- H. Furnish components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.03 FABRICATED ITEMS

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

2.04 FABRICATION TOLERANCES

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

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.
- B. Before fabrication of ships ladder, verify by field measurements that ships ladder will fit in space where it is to be installed.
- C. Confirm that the ladder structure to which the ladder safety system is installed is capable of withstanding the loads applied by the system in the event of a fall.

3.02 PREPARATION

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

3.03 INSTALLATION

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

3.04 TOLERANCES

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

3.05 ADJUSTING

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

END OF SECTION

**SECTION 06 1000
ROUGH CARPENTRY****PART 1 GENERAL****1.01 SECTION INCLUDES**

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

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Setting anchors in concrete.
- B. Section 05 5000 - Metal Fabrications: Miscellaneous steel connectors and support angles for wood framing.

1.03 REFERENCE STANDARDS

- A. ASTM D2559 - Standard Specification for Adhesives for Bonded Structural Wood Products for Use Under Exterior Exposure Conditions 2012a (Reapproved 2018).
- B. ASTM F1667 - Standard Specification for Driven Fasteners: Nails, Spikes, and Staples 2021.
- C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.
- D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2022.
- E. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing 2003 (Reapproved 2017).
- F. ASTM D3498 - Standard Specification for Adhesives for Field-Gluing Wood Structural Panels (Plywood or Oriented Strand Board) to Wood Based Floor System Framing 2019a.
- G. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials 2022a.
- H. ICC-ES AC38 - Acceptance Criteria for Water-Resistive Barriers 2016, with Editorial Revision (2019).
- I. ICC-ES AC380 - Acceptance Criteria for Termite Physical Barrier Systems 2014, with Editorial Revision (2017).
- J. PS 1 - Structural Plywood 2009 (Revised 2019).
- K. PS 2 - Performance Standard for Wood Structural Panels 2018.
- L. PS 20 - American Softwood Lumber Standard 2021.
- M. SPIB (GR) - Grading Rules 2014.
- N. WCLIB (GR) - Standard Grading Rules for West Coast Lumber No. 17 2018.
- O. WWPA G-5 - Western Lumber Grading Rules 2021.

1.04 SUBMITTALS

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

1.05 DELIVERY, STORAGE, AND HANDLING

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

1.06 QUALITY ASSURANCE

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

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
 - 1. Species: Douglas Fir-Larch, unless otherwise indicated.

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

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

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

2.03 CONSTRUCTION PANELS (WOOD SHEATHING)

- A. See Contract Drawings for required thicknesses, span ratings and attachment requirements.
- B. Sheathing: Meet requirements of PS 1, PS 2, or PRP-133 (TECO). Except where plywood is specifically indicated on Contract Drawings, oriented strand board (OSB) is acceptable.
- C. Sheathing shall bear grade stamp from American Plywood Association (APA) or equal grading organization.
- D. Sheathing shall not exceed 18 percent moisture content when fabricated or more than 19 percent when installed in Project.
- E. Sheathing used for same purpose shall be of same thickness. In all cases, thickness specified is minimum required regardless of span rating.

F. Minimum span ratings for given thicknesses shall be as follows:

1. Thickness = Span Rating
 - a. 3/8 inch = 24 / 0
 - b. 7/16 inch nominal = 24 / 16
 - c. 15/32 inch actual = 32 / 16
 - d. 1/2 inch nominal = 32 / 16
 - e. 19/32 inch actual = 40 / 20
 - f. 5/8 inch nominal = 40 / 20
 - g. 23/32 inch actual = 48 / 24

2.04 ACCESSORIES

A. Fasteners and Anchors:

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

B. Joist Hangers: Hot dipped galvanized steel, sized to suit framing conditions.

1. For contact with preservative treated wood in exposed locations, provide minimum G185 galvanizing complying with ASTM A653/A653M.

C. Sill Gasket on Top of Foundation Wall: 1/4 inch thick, plate width, closed cell plastic foam from continuous rolls.

D. Termite-Resistant Sill Plate Barrier: Self-adhesive, film-backed barrier with release sheet; adheres to concrete substrates and blocks termite access.

1. Thickness: 68 mil, 0.068 inch.
2. Termite Resistance: 100 percent when tested in accordance with ICC-ES AC380.
- E. Subfloor Adhesives: Gap-filling construction adhesive for bonding wood structural panels to wood-based floor system framing; complying with ASTM D3498.
- F. Construction Adhesives: Adhesives complying with ASTM C557 or ASTM D3498.
 1. Manufacturers:
 - a. Meet requirements of 'APA-The Engineered Wood Association' Specification AFG-01 or ASTM D3498.
 - b. Use phenol-resorcinol type for use on pressure treated wood products.

PART 3 EXECUTION

3.01 PREPARATION

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

3.02 INSTALLATION - GENERAL

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

3.03 FRAMING INSTALLATION

- A. Roof and Ceiling Framing:
 1. Place with crown side up.
 2. Install structural blocking and bridging as necessary and as described in Contract Drawings.
 3. Special Requirements:
 - a. Roof and Ceiling Joists: Lap joints 4 inches minimum and secure with code approved framing anchors.
 - b. Roof Rafters and Outlookers:
 - 1) Cut level at wall plate and provide at least 2-1/2 inches bearing where applicable. Spike securely to plate with three 10d nails.
 - 2) Attach to trusses or other end supports with framing anchors described in Contract Drawings.
 - 3) Provide for bracing at bearing partitions.
- B. Wall Framing:
 1. Openings: Single, bearing stud supporting header and on adjacent (king) stud continuous between top and bottom plates, unless show otherwise.
 2. Corners And Partition Intersections: Triple Studs.
 3. Top Plates in Bearing Partitions/Walls: Doubled or tripled and lapped, unless shown otherwise. Stagger joints at least 48 inches.
- C. Firestops:
 1. Horizontal or vertical concealed spaces in walls, light coves, soffits, drop ceilings, and other features over 10 feet in length or height, and at stairs, ceiling levels, floor levels, and other junctures of horizontal to vertical concealed spaces.
 2. Within concealed spaces of exterior wall finishes and exterior architectural elements, such as trims, cornices or projections, at maximum intervals of 20 feet, length or height.
- D. Sill Plates:

1. Shear Walls and Bearing Walls (structural walls):
 - a. Provide specified anchor 12 inches maximum and 4 inches minimum from each end of each plate.
 - b. Fasten with anchor bolts embedded in concrete or with post-installed anchors as noted in Contract Drawings.
 2. Non-Structural Walls: Fasten with powder actuated fasteners.
 3. In addition to requirements of paragraphs '1' and '2' above, set sill plates of interior walls measuring less than 36 inches in length in solid bed of specified construction adhesive, except where sill sealer is used.
 4. Install specified seal sealer under sill plates of exterior walls and of acoustically insulated interior walls.
- E. Nailing:
1. Use nails and nail spacings required by Contract Drawings and:
 - a. Top plates: Spiked together, 16d, 16 inches on center.
 - b. Top plates: Laps, lap members 48 inches minimum and nail with 16d nails 4 inches on center
 - c. Top plates: Intersections, three 16d
 - d. Backing and blocking: Three 8d, each end.
 - e. Corner studs and angles: 16d, 16 inches on center.
- F. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members.
- G. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.
- H. Install structural members full length without splices unless otherwise specifically detailed.
- I. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes, AWC (WFCM) Wood Frame Construction Manual.
- J. Install horizontal spanning members with crown edge up and not less than 1-1/2 inches of bearing at each end.
- K. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.
- L. Provide bridging at joists in excess of 8 feet span as detailed. Fit solid blocking at ends of members.
- M. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.

3.04 BLOCKING, NAILERS, AND SUPPORTS

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.
- B. In framed assemblies that have concealed spaces, provide solid wood fire blocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to code authorities may be used in lieu of solid wood blocking.
- C. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.
- D. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.
- E. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

F. Provide the following specific nonstructural framing and blocking:

1. Cabinets and shelf supports.
2. Wall brackets.
3. Handrails.
4. Grab bars.
5. Towel and bath accessories.
6. Wall-mounted door stops.
7. Chalkboards and marker boards.
8. Wall paneling and trim.
9. Joints of rigid wall coverings that occur between studs.

3.05 ROOF-RELATED CARPENTRY

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

3.06 INSTALLATION OF CONSTRUCTION PANELS (WOOD SHEATHING)

- A. Roof Sheathing: Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.
 1. At long edges use sheathing clips ("H" clips) where joints occur between roof framing members.
 2. At long edges provide solid edge blocking where joints occur between roof framing members where roof is blocked. Refer to Contract Drawings.
 3. Nail panels to framing; staples are not permitted.
 4. Placing:
 - a. Lay face grain at right angles to supports. Provide blocking for support if framing turns at roof overhang.
 - b. Provide 1/8 inch (3 mm) space between sheets at end and side joints.
 - c. Stagger panel end joints.
 - d. Sheathing shall be continuous of two spans minimum.
 5. Edge Bearing and Blocking:
 - a. As indicated on Contract Drawings.
 6. Nail Spacing:
 - a. As indicated on Contract Drawings.
 - b. Place nails at least 3/8 inch (9.5 mm) in from edge.
 7. Thickness:
 - a. As indicated on Contract Drawings.
 8. Do not install any piece of roof sheathing with shortest dimension of less than 24 inches (600 mm) unless support is provided under all edges.

3.07 TOLERANCES

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

END OF SECTION

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**SECTION 06 2000
FINISH CARPENTRY****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Finish carpentry items.
- B. Wood door frames, glazed frames.
- C. Wood shelving.
- D. Wood casings and moldings.
- E. Miscellaneous plastic fabrications.
- F. Hardware and attachment accessories.
- G. Fire-rated door frames.

1.02 RELATED REQUIREMENTS

- A. Section 06 6116 - Solid Surfacing Fabrications - Countertops
- B. Section 09 9113 - Exterior Painting: Painting of finish carpentry items.
- C. Section 09 9123 - Interior Painting: Painting of finish carpentry items.
- D. Section 09 9300 - Staining and Transparent Finishing: Staining and transparent finishing of finish carpentry items.

1.03 REFERENCE STANDARDS

- A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).
- B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.
- C. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; 2016.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the work with plumbing rough-in, electrical rough-in, and installation of associated and adjacent components.
- B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

1.05 SUBMITTALS

- A. Product Data:
 - 1. Provide manufacturer's product data, color selection, storage and handling instructions for factory-fabricated units.
 - 2. Provide data on fire retardant treatment materials and application instructions.
 - 3. Provide instructions for attachment hardware and finish hardware.
- B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
 - 1. Scale of Drawings: 1-1/2 inch to 1 foot, minimum.
 - 2. Provide information as required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).
- C. Samples:
 - 1. Interior Hardwood for Transparent Finish:
 - a. 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.
 - b. Design Criteria:
 - 1) Provide 8 inch by 10 inch (200 mm by 255 mm) sample of Red Oak to match Owner provided stain color selected for Project.

- 2) Control Sample will be used as performance standard for evaluating finish provided.
2. Source Quality Control Submittals:
 - a. Samples:
 - 1) Interior Hardwood for Transparent Finish:
 - (a) Owner will provide Control Sample for finish.

1.06 QUALITY ASSURANCE

- A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
 1. Company with at least one project within the past 5 years with value of woodwork within 20 percent of cost of woodwork for this project.
 2. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.
 3. Single Source Responsibility: Provide and install this work from single fabricator.

1.07 WARRANTY

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

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Protect from moisture damage.

PART 2 PRODUCTS

2.01 DESIGN CRITERIA

- 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.
 - (b) One defect per additional 150 sq inches 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 in diameter. No loose knots permitted.
 - (b) Patches (dutchmen) not apparent after finishing when viewed beyond 18 inches.
 - (c) Checks or splits not exceeding 1/32 inch by 3 inches and not visible after finishing when viewed beyond 18 inches.
 - (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 without joints. No joints shall occur closer than 72 inches in straight runs exceeding 18 feet. Runs between 18 feet and 10 feet may have no more than one joint. No joints shall occur within 72 inches of outside corners nor within 18 inches of inside corners.

- 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 maximum.
 - d. Sanding Cross Scratches: 1/4 inch maximum.
 - e. Plug screw holes. Screw locations not to be visible beyond 18 inches.
 3. Fabricate work in accordance with measurements taken on job site.
 4. 'Ease' sharp corners and edges of exposed members 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.
 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.

2.02 FINISH CARPENTRY ITEMS

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS), unless noted otherwise.
- B. Interior Woodwork Items:
1. Moldings, Bases, Casings, and Miscellaneous Trim: Clear white pine; prepare for paint finish.
 2. Fixed shelving not part of casework.
 3. Wood trim at ceiling trim.

2.03 LUMBER MATERIALS

- A. 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.
- B. Architectural Woodwork Wood Trim:
1. Interior Hardwood For Transparent Finish:
 2. Design Criteria:
 - a. Solid wood shall be plain sawn Red Oak.
 - b. Paneling shall be panel product with plain sliced Red Oak veneer.
 - c. Finish to match Owner selected sample as specified in Section 09 9300.
 - 1) Color:
 - (a) Color Oak 95.
- C. Interior Wood For Opaque, Painted Finish:
1. Applies to ceiling trim only.
 2. Solid wood shall be any species allowed by AWS Custom grade.

2.04 SHEET MATERIALS

- A. Hardwood Plywood: Face species as indicated, plain sawn, book matched, medium density fiberboard core; HPVA HP-1 Front Face Grade AA, Back Face Grade 1, glue type as recommended for application.
 - 1. For Transparent Finish:
 - a. Paneling shall be panel product with plain sliced Red Oak veneer.
 - 1) Color Oak 95.

2.05 FASTENINGS

- A. Adhesive for Purposes Other Than Laminate Installation: Suitable for the purpose; not containing formaldehyde or other volatile organic compounds.

2.06 HARDWARE

- A. Manufacturer Contact List:
 - 1. Blum Inc, Stanley, NC www.blum.com.
 - 2. Bommer Industries, Landrum, SC www.bommer.com.
 - 3. ClosetMaid, a division of Emerson Electric, Ocala, Florida www.closetmaid.com.
 - 4. CompX National, Mauldin, SC www.nclnet.com.
 - 5. Dow Chemical, Midland, MI www.dow.com.
 - 6. Flynn & Enslow, San Francisco, CA www.flynnenslow.com.
 - 7. Grass America Inc, Kernersville, NC www.grassusa.com.
 - 8. Hafele America Co., Archdale, NC hafele.com.
 - 9. Hillside Wire Cloth Co., Inc., Bloomfield, NJ www.hillsidewirecloth.com.
 - 10. Ives, Indianapolis, IN www.iveshardware.com.
 - 11. Knappe & Vogt, Grand Rapids, MI www.knappeandvogt.com or Knappe & Vogt Canada, Mississauga, ON (905) 676-8972.
 - 12. Olympus Lock Co, Seattle, WA www.olympus-lock.com.
 - 13. Owens Corning, Toledo, OH www.owens-corning.com.
 - 14. Salice America Inc, Charlotte, NC www.saliceamerica.com.
 - 15. SOSS Door Hardware (Division of Universal Industrial Products Company) Pioneer OH www.soss.com.
 - 16. Stanley, New Britain, CT www.stanleyhardware.com or Oakville, ON (800) 441-1759.
 - 17. TWP Inc., Berkley, CA www.twpinc.com.
 - 18. Wire Cloth Manufacturers Inc., Mine Hill, NJ www.wireclothman.com.
- B. Shelf Standards: 87WH extra heavy duty standard by Knappe & Vogt.
- C. Shelf Brackets: 187WH extra heavy duty brackets by Knappe & Vogt. Size according to shelf width, end of bracket to be within 2 inches (50 mm) of front edge of shelf.

2.07 FABRICATION

- A. Shop assemble work for delivery to site, permitting passage through building openings.
- 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 minimum Cabinet Screws. Attach wall cabinets with screws equally spaced horizontally not to exceed 12 inches O.C. with 3 inch maximum spacing at cabinet edges.
- C. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.
- D. Shelves:

1. Design Criteria:
 - a. Conform to applicable requirements of Sections 06 4001.
 - b. Fabricate the work of this section to AWS 'Custom Grade'.
 - c. Species as acceptable for AWS 'Custom Grade'.
2. Material:
 - a. Panel Product:
 - 1) Glues (adhesives) used in manufacture and fabrication of panel products shall be Type I or II.
 - 2) Moisture content shall be same as specified for lumber.
 - 3) Cores:
 - (a) All Other: Industrial grade particle board with minimum density of 45 lbs per cu ft.
 - 4) Facings:
 - (a) All facings shall be Melamine or Kortron.
 - 5) Thickness:
 - (a) 30 Inch Span And Less: 3/4 inch thick.
 - (b) Spans Over 30 Inches To 42 Inches: One inch thick.
 - (c) Spans Over 42 inches: One inch thick and provide equal center supports.
 - b. Edgings:
 - 1) Use 3/4 inch Kortron or Melamine faced Panel Product with hot glued 3 mm thick PVC with eased edges. Apply banding on all four edges of adjustable shelving and on exposed edges of fixed shelving, with one-inch return onto unexposed edges.
 - 2) Edge banding color to match Panel Product.
 - c. Shelf Supports In Storage Building: 1x4 solid stock Pine, C or better, S4S.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify adequacy of backing and support framing.
- B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.02 INSTALLATION

- A. AWS Custom Grade is minimum acceptable standard, except where explicitly specified otherwise, for installation of architectural woodwork.
- B. Install custom fabrications in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.
- C. Install hardware in accordance with manufacturer's written instructions.

3.03 SITE APPLIED WOOD TREATMENT

- A. Apply preservative treatment in accordance with manufacturer's instructions.

3.04 PREPARATION FOR SITE FINISHING

- A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.
- B. Site Finishing: See Section 09 9113 and 09 9123.
- C. Before installation, prime paint surfaces of items or assemblies to be in contact with cementitious materials.

3.05 TOLERANCES

- A. Maximum Variation from True Position: 1/16 inch.
- B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION 06 2000

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**SECTION 06 4100
ARCHITECTURAL WOOD CASEWORK**

PART 1 GENERAL**1.01 SECTION INCLUDES**

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

1.02 RELATED REQUIREMENTS

- A. Section 06 6116 - Solid Surfacing Fabrications

1.03 REFERENCE STANDARDS

- A. ANSI/BHMA A156.11 - Cabinet Locks; 2019.
- B. ASTM E162 - Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source; 2022.
- C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).
- D. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.
- E. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; 2016.
- F. WDMA I.S. 6A - Interior Architectural Wood Stile and Rail Doors; 2013.

1.04 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.
 - 4. Coordinate order, delivery, and installation of all casework

1.05 SUBMITTALS

- A. Certificates:
 - 1. Provide Manufacturer's certification of compliance to ANSI/NEMA LD 3.
- B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
 - 1. Scale of Drawings: 1-1/2 inch to 1 foot, minimum.
 - a. Include plan and elevation views, materials used, standing and running trim profiles, assembly methods, joint details, fastening methods, accessories, and hardware.
 - 2. Provide the information required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).
 - 3. Fabricator First Submittal:
 - a. Provide 1/4 inch (or larger) scale building layout and/or description of required room walls required for field dimension for Field Quality Control Submittal. Provide submittal before rough framing is completed.
 - 4. Fabricator Second Submittal:
 - a. Provide shop drawings for cabinet and casework that are included for project showing details, casework locations and layout and required dimensions based on Field Quality Control Submittals for compliance to Contract Drawings for approval to Project Architect.
- C. Product Data: Provide data for hardware accessories.
- D. Samples: Submit actual samples of architectural cabinet construction, minimum 12 inches square, illustrating proposed cabinet, countertop, and shelf unit substrate and finish.

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

1.06 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Fire-Test-Response Characteristics: Provide plastic laminate with surface burning characteristics as determined by testing identical products by qualified testing agency.
 - a. Surface-Burning Characteristics:
 - 2. Plastic Laminate shall have Class A flame spread rating in accordance with ASTM E84 or UL 723 Type 1.
 - a. Class A (Flame spread index 0-25; Smoke-developed index 0-450).
 - b. Flash point: None.
- B. Fabricator Qualifications
 - 1. Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
 - 2. Company with at least one project in the past 5 years with value of woodwork within 20 percent of cost of woodwork for this Project.
 - 3. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.
 - 4. Firm experience in supplying products indicated for this Project.
 - 5. Firm with sufficient production capacity to produce required units.
 - 6. Firm will comply with specifications and Contract Documents for this Project.
 - 7. Minimum five (5) years experience in Woodwork installations.
 - 8. Minimum five (5) satisfactorily completed installations in past three (3) years of projects similar in size, scope, and installation procedures required for this project before bidding.
 - 9. Upon request by Architect or Owner, submit documentation.

1.07 DELIVERY, STORAGE, AND HANDLING

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

1.08 WARRANTY

- A. Manufacturer Extended Warranty:

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

PART 2 PRODUCTS

2.01 DESIGN CRITERIA

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.
 - (b) One defect per additional 150 sq inches 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 in diameter. No loose knots permitted.
 - (b) Patches (dutchmen) not apparent after finishing when viewed beyond 18 inches.
 - (c) Checks or splits not exceeding 1/32 inch by 3 inches and not visible after finishing when viewed beyond 18 inches.
 - (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 without joints. No joints shall occur closer than 72 inches in straight runs exceeding 18 feet. Runs between 18 feet and 10 feet may have no more than one joint. No joints shall occur within 72 inches of outside corners nor within 18 inches of inside corners.
 - 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 maximum.
 - d. Sanding Cross Scratches: 1/4 inch maximum.
 - e. Plug screw holes. Screw locations not to be visible beyond 18 inches.
3. Fabricate work in accordance with measurements taken on job site.
4. 'Ease' sharp corners and edges of exposed members 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.
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.

2.02 COMPONENTS

A. Design Criteria:

1. General:

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

2. Solid Stock:

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

3. 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.
 - 2) All Other: Industrial grade particle board with minimum density of 45 lbs per cu ft.
- d. Facings:
 - 1) Hardwood veneer facings shall be plain sliced Red Oak AWS Grade A, or equal by HPVA, WDMA, or APA.
 - 2) All other facings shall be Melamine or Kortron.
- e. Edgings:
 - 1) Cabinet Doors And Drawer Fronts Higher Than 8 Inches (200 mm):
 - (a) 3/4 inch by 1/8 to 1/4 inch (19 mm by 3 to 6 mm) edge-banding of wood species matching hardwood face veneer.
 - 2) Shelves And Exposed Panel Product Edges:
 - (a) Hot-glued, 3 mm thick, PVC edge-banding. Wood-grain, except color matching Melamine or Kortron surface at shelf edges.
 - 3) Semi-Exposed Panel Product Edges:
 - (a) Hot-glued, 3 mm thick, wood grained PVC edge-banding.

4. Casework Doors:

- a. Face Veneer:
 - 1) Design Criteria:
 - (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.
- b. Doors under 1-3/8 inch (35 mm) thick: Panel Product.
- c. Doors 1-3/8 inch (35 mm) or more thick:
 - 1) Door Grade: AWS Custom hollow-core.
 - 2) Stiles:

- (a) 1-1/4 inches (32 mm) deep minimum before fitting.
- (b) 1/4 inch (6 mm) minimum of stile face to be hardwood matching face veneer material.
- 3) Rails:
 - (a) 1-1/8 inches (28.5 mm).
 - (b) Mill option material.

2.03 CABINETS

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B. Components:
 - 1. Design Criteria:
 - a. General:
 - 1) Except as noted otherwise, fabricate the work of this section according to AWS 'Custom Grade'.
 - (a) Cabinet door wood grain direction shall run vertically and all doors shall be set matched.
 - 2) Casework Construction Type:
 - (a) Type B: Face-frame construction where front edge of cabinet body components are overlaid with frame.
 - 3) Door interface style:
 - (a) Type B Construction: Flush Overlay.
 - b. Solid Stock:
 - 1) Exposed: Plain sawn Red Oak.
 - 2) Semi-exposed And Concealed: Species as acceptable for AWS 'Custom Grade'.
 - c. Panel Product:
 - 1) Glues (adhesives) used in manufacture and fabrication of panel products shall be Type I or II.
 - 2) Moisture content shall be same as specified for lumber.
 - 3) Cores:
 - (a) Cabinet Doors: Medium density fiberboard (MDF) with minimum density of 48 lbs per cu ft (769 kg per cu meter).
 - (b) All Other: Industrial grade particle board with minimum density of 45 lbs per cu ft (721 kg per cu meter).
 - 4) Facings:
 - (a) Hardwood veneer facings shall be plain sliced Red Oak AWS Grade A, or equal by HPVA, WDMA, or APA.
 - (b) All other facings shall be Melamine or Kortron.
 - 5) Edgings:
 - (a) Cabinet Doors And Drawer Fronts Higher Than 8 Inches (200 mm):
 - (1) 3/4 inch by 1/8 to 1/4 inch (19 mm by 3 to 6 mm) edge-banding of wood species matching hardwood face veneer.
 - 2. Shelves And Exposed Panel Product Edges:
 - (1) Hot-glued, 3 mm thick, PVC edge-banding. Wood-grain, except color matching Melamine or Kortron surface at shelf edges.
 - (b) Semi-Exposed Panel Product Edges:
 - (1) Hot-glued, 3 mm thick, wood grained PVC edge-banding.
 - b. Casework Doors:
 - 1) Face Veneer:
 - (a) Design Criteria:
 - (1) Plain sliced Red Oak meeting requirements of AWS Grade A, 1/50 inch (0.5 mm) thick minimum immediately before finishing.
 - (2) Face veneers shall be running book matched.

- 2) Doors under 1-3/8 inch (35 mm) thick: Panel Product.
 - 3) Doors 1-3/8 inch (35 mm) or more thick:
 - (a) Door Grade: AWS Custom hollow-core.
 - (b) Stiles:
 - (1) 1-1/4 inches (32 mm) deep minimum before fitting.
 - (2) 1/4 inch (6 mm) minimum of stile face to be hardwood matching face veneer material.
 - (c) Rails:
 - (1) 1-1/8 inches (28.5 mm).
 - (2) Mill option material.
- C. Fabrication:
- 1. Fabricators:
 - a. Approved Fabricators. See Section 06 4001 for Category Three Approved Fabricators.
 - 2. Cabinet Body:
 - a. Use AWS Flush Overlay construction on cabinet bodies.
 - b. If used, install Rail System adjustable shelf supports recessed.
 - 3. Drawers:
 - a. Fabricate with separate, screw-attached drawer front.
 - b. Joints shall be dowel and pressure-glued, or lock shoulder, glued, and pin nailed.
 - c. Set bottoms into sides, backs, and subfront with 1/4 inch (6 mm) deep groove with 3/8 inch (9.5 mm) minimum standing shoulder.
 - d. Every drawer shall have specified drawer guides and pull installed. Install drawer guides with 'Euroscrews', and pulls with through-bolts passing through both front and sub-front.
 - 4. Cabinet Doors:
 - a. Full height, panel product cabinet doors may be fabricated in two pieces and joined on back with metal backplate. Backplate shall match interior door surface color.
 - b. Hinges: Install hinges using plastic insertion dowels for hinges and 'Euroscrews' for baseplates.
 - c. Every cabinet door shall have specified pull installed.
 - 5. Cabinet Component Thickness And Material:
 - a. Use hardwood veneer facing on panel product, except on following surfaces:
 - 1) Where Kortron or Melamine shall be used.
 - 2) Cabinet exposed interiors surfaces (not including cabinet doors) and shelving faces behind cabinet doors in all rooms.
 - 3) Cabinet semi-exposed surfaces.
 - 4) Cabinet concealed surfaces.
 - 5) Cabinet exposed exteriors permanently concealed (not exposed to view).
 - 6) Drawer sides, backs, bottoms, and subfronts.
 - b. Ends, Divisions, Bottoms, Tops: 3/4 inch (19 mm) thick panel product.
 - c. Rails: 3/4 inch (19 mm) thick panel product.
 - d. Shelves:
 - 1) Panel product.
 - 2) Thickness:
 - (a) 30 Inch (750 mm) Span And Less: 3/4 inch (19 mm) thick.
 - (b) Spans Over 30 Inches (750 mm) To 42 Inches (1 050 mm): One inch (25 mm) thick.
 - (c) Spans Over 42 inches (1 050 mm): One inch (25 mm) thick and provide Hafele or equal center supports.
 - e. Backs: 1/4 inch (6 mm) thick panel product.
 - f. Doors: 3/4 inch (19 mm) thick panel product.

- g. Drawer Sides, Backs, And Subfronts: 1/2 inch (12.7 mm) thick minimum panel product.
- h. Drawer Bottoms: 1/4 inch (6 mm) thick panel product.
- i. Separate Drawer Front:
 - 1) 8 Inches (200 mm) High And Less: 3/4 inch (19 mm) thick solid hardwood.
 - 2) More Than 8 Inches (200 mm) High: 3/4 inch (19 mm) panel product.
- j. Hardboard Dividers: 1/4 inch (6 mm) thick panel product.
- k. Hardboard Shelves: 1/8 inch (3 mm) thick hardboard, smooth both sides.
- 6. Cabinet and Drawer Locks:
 - a. Install only on cabinets and drawers as shown on Contract Documents.
- 7. Install plastic grommets in cable access holes in countertops located as located on Contract Documents.
- D. Finishes:
 - 1. Factory Finishing:
 - a. Design Criteria:
 - 1) Applied before leaving factory.
 - 2) Factory-finish to match Owner selected sample as specified in Section 09 9324.
 - b. Color:
 - 1) OAK 95.

2.04 COUNTERTOPS

- A. Design criteria of countertops: See Section 06 6116, Solid Surfacing Fabrications

2.05 ACCESSORIES

- A. Manufacturer Contact List for Accessories:
 - 1. Accuride, Santa Fe Springs, CA www accuride.com.
 - 2. Anybumper, Amite, LA www Anybumper.com.
 - 3. Blum Inc, Stanley, NC www blum.com.
 - 4. CompX National, Mauldin, SC www nclnet.com.
 - 5. Flynn & Enslow, San Francisco, CA www flynnenslow.com.
 - 6. Glynn Johnson, Chicago, IL www glynn-johnson.com.
 - 7. Grass America Inc, Kernerville, NC www grassusa.com.
 - 8. Hafele America Co., Archdale, NC hafele.com.
 - 9. Hillside Wire Cloth Co., Inc., Bloomfield, NJ www hillsidewirecloth.com.
 - 10. Ives, Indianapolis, IN www iveshardware.com.
 - 11. Knappe & Vogt, Grand Rapids, MI www knapeandvogt.com or Knappe & Vogt Canada, Mississauga, ON (905) 676-8972.
 - 12. Salice America Inc, Charlotte, NC www saliceamerica.com.
 - 13. Stanley, New Britain, CT www stanleyhardware.com.
 - 14. TWP Inc., Berkley, CA www twpinc.com.
 - 15. Wire Cloth Manufacturers, Inc., Mine Hill, NJ www wireclothman.com.
- B. Support Post:
 - 1. Acceptable Product:
 - a. Model TL28R-390 by Doug Mockett & Company, Inc. Torrance, CA www mockett.com.
 - b. Description:
 - 1) Round support post for removable countertop as shown in Contract Documents.
 - c. Design Criteria:
 - 1) Size: 28-1/2 inch (724 mm) table leg, 3 inch (76 mm) diameter.
 - 2) Recessed glide leveler.
 - 3) Cold rolled steel.
 - 4) Polished and painted.
 - 5) Color: Polished chrome.

- d. Equal as approved by Architect before installation. See Section 01 6000.

2.06 HARDWARE

- A. Cabinet Hardware:
1. Cabinet And Drawer Pulls:
 - a. Satin Chromium Plated brass / bronze core bow handles, 4 inches (100 mm) long minimum.
 - b. Acceptable Products:
 - 1) 4484 by Stanley.
 2. Cabinet And Drawer Locks:
 - a. General:
 - 1) Pin tumbler type suitable for location.
 - 2) Keying: Key each cabinet and drawer individually as shown on Contract Documents except as follows:
 - (a) Key each cabinet and drawer within each Office alike.
 - (b) Crosskey knife drawer in Serving Area so all other cabinet and drawer keys will open drawer.
 - 3) Stamp keys with Room number and cabinet designation as shown on Signage Plan of Contract Drawings.
 - 4) Provide six (6) keys per cabinet.
 - b. Design Criteria:
 - 1) Barrel diameter: 7/8 inch (22 mm).
 - 2) Cylinder length: 7/8 inch (22 mm).
 - 3) Key removable in locked or unlocked position.
 - 4) Meet ANSI/BHMA A156.11 Grade 2 requirements.
 - c. Acceptable Manufacturers:
 - 1) Advantage Plus cam lock by CompX National Lock.
 - 2) 100DR/200DW N Series door and drawer lock by Olympus Lock Inc.
 - 3) Equal as approved by Architect before installation. See Section 01 6200.
 3. Cabinet Adjustable Shelf Supports:
 - a. Either of following systems are acceptable, at Fabricator's option:
 - 1) 32mm System: Casework Fabricator's standard.
 - 2) Traditional System:
 - (a) Quality Standards: 255 and 256 by Knap & 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. Acceptable Products:
 - a. WS-34 Cylindrical Soft Durometer Cabinet Bumper by Anybumper.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 INSTALLATION

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

3.03 ADJUSTING

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

3.04 CLEANING

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

END OF SECTION 06 4100

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**SECTION 06 6116
SOLID SURFACING FABRICATIONS**

PART 1 - GENERAL**1.01 SUMMARY**

- A. Section Includes: Provide solid surfacing fabrications including but not limited to following:
 - 1. Millwork countertops with sinks and cove backsplashes.
- B. Related Sections: Following description of work is included for reference only and shall not be presumed complete:
 - 1. Waste management and disposal requirements: Section 01 74 19, Waste Management and Disposal.
 - 2. Provision of indoor air quality requirements: Section 01 81 19, Indoor Air Quality Requirements.
 - 3. Provision of finish carpentry: Section 06 20 00, Finish Carpentry.
 - 4. Provision of architectural woodwork: Section 06 41 00, Architectural Woodwork.
 - 5. Provision of elastomeric joint sealants: Section 07 92 00, Joint Sealants.
 - 6. Provision of plumbing and plumbing fixtures: Division 22, Plumbing.

1.02 REFERENCES

- A. Abbreviations and Acronyms:
 - 1. MDF: Medium Density Fiberboard.
 - 2. SCAQMD: South Coast Air Quality Management District; www.aqmd.gov
 - 3. VOC: Volatile Organic Compound.
- B. Definitions:
 - 1. Solid Surface: Non-porous, homogeneous material maintaining the same composition throughout the part with a composition of acrylic polymer, aluminum trihydrate filler and pigment.

C. REFERENCE STANDARDS:

- 1. ANSI/NPA A208.2-09 - Medium Density Fiberboard (MDF) For Interior Applications
- 2. ASTM C920-14a - Standard Specification for Elastomeric Joint Sealants
- 3. ASTM D638-10 - Standard Test Method for Tensile Properties of Plastics
- 4. ASTM D785-08 - Standard Test Method for Rockwell Hardness of Plastics and Electrical Insulating Materials
- 5. ASTM D790-10 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
- 6. ASTM D5420-10 - Standard Test Method for Impact Resistance of Flat, Rigid, Plastic Specimen by Means of a Striker Impacted by a Falling Weight (Gardner Impact)
- 7. ASTM E84-14 - Standard Test Method for Surface Burning Characteristics of Building Materials
- 8. ASTM E228-11 - Standard Test Method for Linear Thermal Expansion of Solid Materials with a Push-Rod Dilatometer
- 9. ASTM G21-13 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi
- 10. ASTM G22-76(96) - Standard Practice for Determining Resistance of Plastics to Bacteria
- 11. NFPA 255-06 - Standard Method of Test of Surface Burning Characteristics of Building Materials
- 12. NSF/ANSI 51-07 - Food Equipment Materials

13. SCAQMD Rule 1168 - Adhesive and Sealant Applications (amended January 2005)
14. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials
15. UL Environment/ GREENGUARD/ UL 2818 - Standard for Chemical Emissions for Building Materials, Finishes and Furnishings, Section 7.1
16. UL Environment/ GREENGUARD/ UL 2818 - Gold Standard for Chemical Emissions for Building Materials, Finishes and Furnishings, Section 7.1 and 7.2
17. UL 2824 - GREENGUARD Certification Program, Method for Measuring Microbial Resistance from Various Sources Using Static Environmental Chambers

1.03 ADMINISTRATIVE REQUIREMENTS

A. Pre-installation Meetings: Arrange pre-installation meeting 1 week prior to commencing work with all parties associated with trade as designated in Contract Documents or as requested by Architect. Presided over by Contractor, include Architect who may attend, Subcontractor performing work of this trade, Owner's representative, testing company's representative and consultants of applicable discipline. Review Contract Documents for work included under this trade and determine complete understanding of requirements and responsibilities relative to work included, storage and handling of materials, materials to be used, installation of materials, sequence and quality control, Project staffing, restrictions on areas of work and other matters affecting construction, to permit compliance with intent of work of this Section.

1.04 SUBMITTALS

A. Product Data: Indicate Product description including solid surface sheets, sinks, bowls and illustrating full range of standard colors, fabrication information and compliance with specified performance requirements. Submit Product data with resistance to list of chemicals.

B. Shop Drawings: Submit Shop Drawings for work of this Section in accordance with Section 01 30 00. Indicate plans, sections, dimensions, component sizes, edge details, thermosetting requirements, fabrication details, attachment provisions, sizes of furring, blocking, including concealed blocking and coordination requirements with adjacent work. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, waste receptacles and other items installed in solid surface.

C. Coordination Drawings: Submit coordination drawings indicating plumbing and miscellaneous steel work indicating locations of wall rated or non-rated, blocking requirements, locations and recessed wall items and similar items.

D. Samples: Submit samples in accordance with Section 01 30 00. Submit minimum 6" x 6" samples. Cut sample and seam together for representation of inconspicuous seam. Indicate full range of color and pattern variation. Approved samples will be retained as standards for work.

E. Test and evaluation reports: submit flammability test reports and food preparation zone certifications/listing confirming compliance with NSF/ANSI 51. Refer to www.nsf.org for the latest compliance to NSF/ANSI 51 for food zone — all food types.

1.05 CLOSEOUT SUBMITTALS

A. OPERATIONAL AND MAINTENANCE DATA:

1. Submit manufacturer's care and maintenance data, including repair and cleaning instructions. Include in Project closeout documents.
2. Provide a commercial care and maintenance kit and video. Review maintenance procedures and warranty details with Owner upon completion.

1.06 QUALITY ASSURANCE

A. QUALIFICATIONS:

1. Installers: Provide work of this Section executed by competent installers with a minimum 5 years of experience in the application of Products, systems and assemblies specified and with approval and training of the Product manufacturers.

1.07 DELIVERY, STORAGE AND HANDLING

A. DELIVERY AND ACCEPTANCE REQUIREMENTS:

1. Deliver no components to Project site until areas are ready for installation.

B. STORAGE AND HANDLING REQUIREMENTS:

1. Store components indoors prior to installation.
2. Handle materials to prevent damage to finished surfaces.

1.08 WARRANTY

A. MANUFACTURER WARRANTY:

1. Provide manufacturer's standard warranty for material only for period of 10 years against defects and/or deficiencies in accordance with General Conditions of the Contract. Promptly correct any defects or deficiencies which become apparent within warranty period, to satisfaction of Architect and at no expense to Owner.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturer List: Products of following manufacturers are acceptable subject to conformance to requirements of Drawings, Schedules and Specifications:

1. Corian® by DuPont; www.corian.com
2. Wilsonart; www.wilsonart.com
3. Formica (Everform Solid Surface); www.formica.com
4. Hanex; www.hanex.com

- B. Approved Color Quality Standards. See Section 01 6200 for definition of Categories:

1. Clerks' Office, Resource Center, Sacrament Preparation, and Serving Area: (Select color that best coordinates with the flooring and millwork combination selected for project.)
 - a. Corian: Bone
 - b. Wilsonart: Antique White 1572SL
 - c. Formica: 103 Frost
 - d. Hanex: Ivory S-004

2.02 MATERIALS

A. DESCRIPTION:

1. Sustainability Characteristics:
 - a. EQc4.1: Provide adhesives and sealants with VOC quantities lower than stated in SCAQMD Rule 1168. Ensure VOC quantities for sealants do not exceed 250 g/l under any circumstances.

B. PERFORMANCE/DESIGN CRITERIA:

PROPERTY		REQUIREMENT (MIN OR MAX)	TEST PROCEDURE
1. Solid Surface Based Products:			
a.	Tensile Strength	6000 psi min	ASTM D638
b.	Tensile Modulus	1.5 x 10 ⁶ psi min	ASTM D638
c.	Tensile Elongation	0.4% min.	ASTM D638
d.	Flexural Strength	10000 psi min	ASTM D790
e.	Flexural Modulus	1.2 x 10 ⁶ psi min	ASTM D790
f.	Hardness	>85-Rockwell "M" scale min.	ASTM D785
g.	Thermal Expansion	2.2 x 10 ⁻⁵ in./in./°F	ASTM E228
h.	Fungi and Bacteria	Does not support microbial growth	ASTM G21 & G22
i.	Microbial Resistance	Highly resistant to mold growth	UL 2824
j.	Ball Impact	No fracture - 1/2 lb. Ball: 6 mm slab - 36" drop 12 mm slab - 144" drop	NEMA LD 3, Method 3.8
k.	Weatherability	ΔE*94<5 in 1,000 hrs	ASTM G155
l.	Flammability		ASTM E84, NFPA 255 & UL 723
All Colors			
		6 mm	12 mm
m.	Flame Spread	<25	<25
n.	Smoke Developed	<25	<25
o.	Class	A	A
NFPA 101®, Life Safety Code			

C. SOLID SURFACE MATERIAL:

- Non-porous, homogeneous material maintaining the same composition throughout the part with a composition of acrylic polymer, aluminum trihydrate filler and pigment; not coated, laminated or of composite construction; meeting following criteria:
- Flammability: Class 1 and A when tested to UL 723.
- Food Equipment Material Compliance: Food Zone to NSF/ANSI 51.
 - Ensure material has minimum physical and performance properties specified under "Performance/Design Criteria".
 - Ensure superficial damage to a depth of 0.010" is repairable by sanding and polishing.
- Adhesive for Bonding to Other Products: One component silicone to ASTM C920.
- Sealant: A standard mildew-resistant, FDA/UL® and NSF/ANSI 51 compliant in Food Zone area, recognized silicone color matched sealant or clear silicone sealants.
- Heat Reflecting Tape: Manufacturer's standard aluminum foil tape, with required thickness, for use with cutouts near heat sources.
- Insulating Nomex® Fabric: Manufacturer's standard for use with conductive tape in insulating solid surface material from adjacent heat source.

2.03 COMPONENTS

- Counter Perimeter Frame: Ensure 1/2" or 3/4" thick, moisture resistant cores for counter tops in wet areas having sinks or lavatories are 3/4" thick exterior grade plywood with waterproof adhesive, Fir or Poplar plywood, veneer core only. **Front apron = 1 1/2" thick**

B. Fabrication

1. Fabricate components in shop to greatest extent practical to sizes and shapes indicated, in accordance with approved Shop Drawings and solid polymer manufacturer requirements. Form joints between components using manufacturer's standard joint adhesive without conspicuous joints. Provide factory cutouts for plumbing fittings and bath accessories as indicated on Drawings.
2. Where indicated, thermoform corners and edges or other objects to shapes and sizes indicated on Drawings, prior to seaming and joining. Cut components larger than finished dimensions and sand edges to remove nicks and scratches. Heat entire component uniformly prior to forming.
3. Ensure no blistering, whitening and cracking of components during forming.
4. Fabricate backsplashes from solid surfacing material with optional radius cove where counter and backsplashes meet as indicated on Drawings. Backsplashes for most colors may be fabricated by traditional means discussed in K-25294 Backsplashes. Colors with metallic/mica particle or veined colors creating directional aesthetics (K-26833 Directional Aesthetics) may require the techniques in Technical Bulletin K-28235 Thermoformed Backsplash.
5. Fabricate joints between components using manufacturer's standard joint adhesive. Ensure joints are inconspicuous in appearance and without voids. Attach 1.97 inch wide reinforcing strip of solid polymer material under each joint.
6. Provide holes and cutouts for plumbing and bath accessories as indicated on Drawings.
7. Rout and finish component edges to a smooth, uniform finish. Rout cutouts, then sand edges smooth. Repair or reject defective or inaccurate work.
8. Finish: Ensure surfaces have uniform finish:
 - a. Matte, with a 60° gloss rating of 5 - 20.
9. Fabrication Tolerances:
 - a. Variation in Component Size: +/-1/8".
 - b. Location of Openings: +/-1/8" from indicated location.

PART 3 - EXECUTION**3.01 EXAMINATION**

- A. Verification of Conditions:
 1. Examine substrates and conditions, with fabricator present for compliance with requirements for installation tolerances and other conditions affecting performance of work. Proceed with installation only after unsatisfactory conditions have been corrected.
 2. Verify actual site dimensions and location of adjacent materials prior to commencing work.
 3. Examine cabinets upon which counter tops are to be installed. Verify cabinets are level to within 1/8" in 10' - 0".
 4. Notify Architect in writing of any conditions which would be detrimental to installation.
 5. Evaluation and Assessment: Commencement of work implies acceptance of previously completed work.

3.02 INSTALLATION

- A. Install components plumb, level, rigid, scribed to adjacent finishes in accordance with reviewed Shop Drawings and Product installation details.
- B. Fabricate field joints using manufacturer's recommended adhesive, with joints being inconspicuous in finished work. Exposed joints/seams are not permitted. Keep components and hands clean when making joints. Reinforce field joints as specified herein. Cut and finish component edges with clean, sharp returns.

- C. Route radii and contours to template. Anchor securely to base component or other supports. Align adjacent components and form seams to comply with manufacturer's written recommendations using adhesive in color to match work. Carefully dress joints smooth, remove surface scratches and clean entire surface.
- D. Install countertops with no more than 1/8" sag, bow or other variation from a straight line.
- E. Adhere undermount/sub-mount/bevel mount sinks/bowls to countertops using manufacturer's recommended adhesive and mounting hardware.
- F. Adhere top-mount sinks/bowls to countertops using manufacturer recommended adhesives and color-coordinated silicone sealant. Secure seam mount bowls and sinks to counter tops using color matched joint adhesive.
- G. Seal between wall and components with joint sealant as specified herein and in Section 07 92 00, as applicable.
- H. Provide backsplashes and endsplashes as indicated on Drawings. Adhere to countertops using a standard color-coordinated silicone sealant. Adhere applied sidesplashes to countertops using a standard color-matched silicone sealant. Provide coved backsplashes and sidesplashes at walls and adjacent millwork. Fabricate radius cove at intersection of counters with backsplashes to dimensions shown on reviewed Shop Drawings. Adhere to countertops using manufacturer's standard color-coordinated joint adhesive.
- I. Keep components and hands clean during installation. Remove adhesives, sealants and other stains. Ensure components are clean on date of Substantial Completion of the Work.
- J. Coordinate connections of plumbing fixtures with Division 22. Make plumbing connections to sinks in accordance with Division 22.

3.03 REPAIR

- A. Repair minor imperfections and cracked seams and replace areas of severely damaged surfaces in accordance with manufacturer's "Technical Bulletins".

3.04 SITE QUALITY CONTROL

- A. Non-Conforming Work: Replace damaged work which cannot be satisfactorily repaired, restored or cleaned, to satisfaction of Architect at no cost to Owner.

3.05 CLEANING

- A. Remove excess adhesive and sealant from visible surfaces.
- B. Clean surfaces in accordance with manufacturer's "Care and Maintenance Instructions".

3.06 PROTECTION

- A. Provide protective coverings to prevent physical damage or staining following installation for duration of Project.
- B. Protect surfaces from damage until date of Substantial Completion of the Work.

END OF SECTION 06 6116

**SECTION 07 2100
THERMAL INSULATION****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Batt insulation.

1.02 REFERENCE STANDARDS

- A. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing 2017.
- B. ASTM C764 - Standard Specification for Mineral Fiber Loose-Fill Thermal Insulation 2019.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2022.
- D. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 °C 2022.

1.03 SUBMITTALS

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

PART 2 PRODUCTS**2.01 MANUFACTURERS**

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

2.02 MINERAL FIBER BLANKET INSULATION MATERIALS

- A. Order insulation by 'R' value rather than 'U' value, rating, or thickness, either 16 or 24 inches wide according to framing spacing.
- B. Flexible Glass Fiber Blanket Thermal Insulation: Preformed insulation, complying with ASTM C665; friction fit.
 - 1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
 - 2. Smoke Developed Index: 50 or less, when tested in accordance with ASTM E84.
 - 3. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
 - 4. Thermal Resistance: R-value in accordance with the following:
 - a. Acoustically Insulated Ceilings:
 - 1) Unenclosed Spaces above Offices and Restrooms: R-30.
 - b. Metal Wall Stud Framing:
 - 1) (R-11) 3-1/2 inches deep
 - 2) (R-13) 3-5/8 inches deep
 - 3) (R-19) 5-1/2 inches deep
 - 5. Unfaced Insulation: Meet requirements of ASTM C665, Type I.

PART 3 EXECUTION**3.01 EXAMINATION**

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

3.02 BATT INSTALLATION

- A. Install insulation in accordance with manufacturer's instructions.
- B. If two layers of insulation are used to attain required 'R' value, only layer towards interior of building shall have facing.
- C. Provide minimum clearance around recessed lighting fixtures as approved by local code.
- D. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.
- E. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
- F. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.
- G. Staple or nail facing flanges in place at maximum 6 inches on center.
- H. Retain insulation batts in place with spindle fasteners at 12 inches on center.
- I. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.
- J. At wood framing, place vapor retarder on warm side of insulation by stapling at 6 inches on center. Lap and seal sheet retarder joints over face of member.
- K. At metal framing, place vapor retarder on warm side of insulation; lap and seal sheet retarder joints over face of member

3.03 FIELD QUALITY CONTROL

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

3.04 PROTECTION

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

END OF SECTION

SECTION 07 5419
POLYVINYL-CHLORIDE ROOFING: PVC

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. PVC roofing membrane with flashings and other components to comprise total roofing system as described in Contract Documents including:
 - 1. 80 mil Single-ply membrane.
 - 2. Gypsum Cover Board
 - 3. Poly-isocyanurate tapered insulation system with crickets (tapered where shown on Contract Drawings). R-30 minimum thermal requirement at all areas.
 - 4. Vapor Retarder / Air Barrier.
 - 5. 5/8" Gypsum thermal barrier.
- B. Metal flashing.

1.02 RELATED REQUIREMENTS

- A. Section 06 0573 - Wood Treatment
- B. Section 06 1000 - Rough Carpentry
- C. Section 07 6200 - Sheet Metal Flashing and Trim
- D. Divisions 22,23,26 for plumbing, mechanical, and electrical equipment, penetrations, curbs, and related work.

1.03 REFERENCES

- A. Association Publications:
 - 1. American National Standards Institute / Single Ply Roofing Industry:
 - a. ANSI/SPRI/FM 4435/ES-1 2003, 'Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems'.
 - b. ANSI/SPRI WD-1 'Wind Design Standard for Roofing Assemblies'.
 - 2. FM Global Resource Catalogue by FM Global, Norwood, MA www.fmglobal.com.
 - a. Approval Guide:
 - 1) Factory Mutual Standard 4470 - Approval Standard for Class 1 Roof Covers.
 - b. Property Loss Prevention Data Sheet 1-28, 'Wind Design' (latest edition).
 - c. Property Loss Prevention Data Sheet 1-29, 'Roof Deck Securement and Above-Deck Components' (latest edition).
 - d. Property Loss Prevention Data Sheet 1-49, 'Perimeter Flashing' (latest edition).
- B. Definitions:
 - 1. Flame Spread Classification: Categories as per ASTM E84/UL 723 or ULC 102:
 - a. Class A: Highest fire-resistance rating for roofing as per ASTM E108. Indicated roofing is able to withstand severe exposure to fire exposure to fire originating from sources outside building.
 - b. Class B: Fire-resistance rating indicating roofing materials are able to withstand moderate exposure to fire originating from sources outside of building.
 - c. Class C: Fire-resistance rating indicating roofing materials are able to withstand light exposure to fire originating from sources outside of building.
- C. Reference Standards:
 - 1. ASTM International:
 - a. ASTM C1289-18a, 'Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board'.
 - b. ASTM C1303/C1303M-15, 'Standard Test Method for Predicting Long-Term Thermal Resistance of Closed-Cell Foam Insulation'.
- D. ASTM D4434/D4434M-15, 'Standard Specification for Polyvinyl Chloride Sheet Roofing'.

- a. ASTM E84-18b, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
 - b. ASTM E108-17, 'Standard Test Methods for Fire Tests of Roof Coverings'.
- 2. International Building Code (IBC) (2021 edition or latest edition adopted by AHJ):
 - a. Chapter 15, 'Roof Assemblies And Rooftop Structures':
 - b. Section 1507, 'Requirements for Roof Coverings':
 - 1) 1507.13, 'Thermoplastic single-ply Roofing'.
- 3. National Fire Protection Association:
 - a. NFPA 101: 'Life Safety Code' (2018 or most recent edition adopted by AHJ).
- E. Underwriters Laboratories (UL):
 - 1. UL 580: 'Tests for Uplift Resistance of Roof Assemblies' (5th Edition).
 - 2. UL 723, 'Tests for Safety Test for Surface Burning Characteristics of Building Materials' (11th Edition).
 - 3. UL 790, 'Standard Test Methods for Fire Tests of Roof Coverings' (8th Edition).
 - 4. UL 1897-04, 'Uplift Tests for Roof Covering Systems' (7th Edition).
 - 5. UL 2218, 'Standard for Impact Resistance of Prepared Roof Coverings Materials' (2nd Edition).

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Action Submittals:
 - 1. Product Data:
 - a. Manufacturer's literature or cut sheet for each element of system.
 - b. Manufacturer's preparation and installation instructions and recommendations.
 - 2. Shop Drawings:
 - a. Prepared by Roofing Installer and approved by Roofing Membrane Manufacturer and include following:
 - 1) Base flashings.
 - 2) Location and type of penetrations.
 - 3) Membrane terminations.
 - 4) Outline of roof and roof size.
 - 5) Perimeter and penetration details.
 - 6) Roof insulation:
 - (a) Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
 - (b) Taper insulation, including slopes.
 - 7) Special details and materials.
 - b. Confirm that specified FM Class and UL Class assembly is appropriate for Project location.
 - c. Include approved copy of Manufacturer's Notice of Award or Assembly Letter.
 - 3. Samples:
 - a. Manufacturer's 4 inch (100 mm) square minimum sample representing actual color, membrane and thickness.
- C. Informational Submittals:
 - 1. Certificates:
 - a. Installer's signed certificate stating roofing system complies with Contract Documents performance requirements and work only performed by trained and authorized personnel in those procedures.
 - b. Manufacturer's signed certificate that roof system has been inspected by Technical Service Representative and stating no deviation from system specified or approved shop drawings without written approval by Owner Representative and Manufacturer.
 - 2. Test And Evaluation Reports: Submit evidence that roof system has been tested and approved or listed as follows:

- a. Submit evidence that roof system has been tested and approved or listed to meet Factory Mutual Research Corporation (FM) Classification required for this Project.
 - b. Submit evidence that roof system has been tested to meet UL Class requirement required for fire-resistance rating for this Project.
- 3. Manufacturer Instructions:
 - a. Two (2) copies of Roofing Manufacturer's published instructions for Architect and maintain one (1) at job-site.
- 4. Special Procedure Submittals:
 - a. Installer to fill out 'Roof Manufacturer' Installer Workmanship Warranty' and 'Manufacturer System Warranty' from information provided in the Attachment 'Roofing Manufacturer's Information For Architect' from Manufacturer and from Architect. Warranties are to be included in Closeout Submittals.
- 5. Qualification Statement:
 - a. Roofing Manufacturer's certification of Installer.
- D. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Warranty Documentation:
 - 1) Final, executed copy of 'Roofing Manufacturer System Warranty' including wind speed coverage and required Owner mandatory information.
 - 2) Final, executed copy of 'Roof Installer Workmanship Warranty' including required Owner mandatory information.
 - 3) Verify mandatory information as specified in Special Procedure Submittal has been included in Final Warranty.
 - b. Record Documentation:
 - 1) Manufacturers Documentation:
 - (a) Record Shop Drawings if requested. Record shop drawings shall be given shop drawing number by Roofing Manufacturer.
 - (b) Certificate: Manufacturer Inspection report by Technical Service Representative.
 - (c) Certificate: Installer statement of compliance for performance requirements.
 - (d) Test And Evaluation Report: UL fire-resistance rating test report.
 - (e) Test And Evaluation Report: Factory Mutual Research Classification approval.

1.05 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Requirements:
 - 1. Roof system will meet requirements of all federal, state, and local codes having jurisdiction (AHJ).
 - 2. Fire Characteristics Performance Requirement:
 - a. Roof system will achieve UL Class A rating when tested in accordance with ASTM E108 or UL-790:
 - 1) Materials shall be identified with appropriate markings of applicable testing agency.
 - 3. Thermal Performance Requirement:
 - a. Roof system will achieve minimum R value not less than 30.
 - b. Canopy areas open below roof to not require a minimum R value.
 - 4. Wind Criteria as per ASCE 7-10:
 - a. Basic wind speed (V): 120 mph (Risk Category III)
 - b. Wind exposure and importance factor (Iw): B
 - c. Wind Design Pressure (p):
 - 31.1 (roof area field)
 - 52.2 (roof area perimeter)
 - 78.5 (roof area corners)

5. Perimeter Edge Requirements:
 - a. Zone 2 (roof edge perimeter, vertical load direction): 52.2 pounds per square foot
 - b. Zone 3 (roof edge corners, vertical load direction): 78.5 pounds per square foot
 - c. Zone 4 (wall edge perimeter, horizontal load direction): 33.7 pounds per square foot
 - d. Zone 5 (wall edge corners, horizontal load direction): 41.6 pounds per square foot
- B. Qualifications:
 1. Installers Qualifications:
 - a. Provide documentation if requested by Architect:
 - b. Roofing Installer shall be approved and authorized by Roofing System Manufacturer to install Manufacturer's product and eligible to receive Manufacturer's special warranty before bid.
 - c. Roofing Installer shall be able to document roofing membrane installation for five (5) year minimum.
 - d. Roofing Installer must have current license for the city, county, and state where project is located.
 - e. Roofing Installer must have license for specific type of roofing work to be preformed.
 - f. Roofing Installer's foreman shall be skilled in his trade and qualified to lay out and supervise the Work.
 - g. Membrane and flashing installation shall be performed by personnel trained and authorized by Roofing Manufacturer.
 - h. Welding equipment shall be provided by or approved by Roofing Manufacturer. Mechanics intending to use equipment shall have successfully completed training course provided by Manufacturer's Technical Representative before welding.
 2. Manufacturer Qualifications:
 - a. Manufacturer shall manufacture membrane material for five (5) consecutive years.
 - 1) No product with documented failure will be allowed.
 - b. Manufacturer that is UL listed for membrane roofing system used for this Project.
 - c. Source Limitations:
 - 1) Provide roof components including roof insulation and fasteners for roofing system from same Manufacturer as membrane roofing or approved by Roofing Membrane Manufacturer.
- C. Pre-Installation Conferences:
 1. Participate in MANDATORY pre-installation conference.
 - a. Roofing Installer's Foreman and those responsible for installation of roofing to be in attendance. Include Roofing Manufacturer's Representative if available.
 2. Schedule pre-installation conference at project site after installation of roof deck including pipe and flue penetrations, but before application of any roofing system component.
 3. In addition to agenda items specified in Section 01 3100, review following:
 - a. Review Manufacturer's written instructions.
 - b. Review if Project is in high wind area.
 - c. Review delivery, storage, and handling requirements.
 - d. Review ambient conditions requirements.
 - e. Review roofing installation requirements including flashing and penetrations.
 - f. Review roofing drainage requirements.
 - g. Review temporary protections for roofing system.
 - h. Review cleaning and disposal requirements.
 - i. Review Special Procedure Submittal for Warranty Information to be given to Manufacturer before Manufacture will issue Roof Warranty by Installer.
 - j. Review safety issues.
 - k. Review field inspections and non-conforming work requirements.
 - l. Review protection of membrane by other trades after installation of membrane.

1.06 FIELD CONDITIONS

A. Ambient Conditions:

1. Temperature ranges shall be within tolerances allowed for material being used.
 - a. Roof surface shall be free of ponding water, ice, and snow.
 - b. Cold temperature:
 - 1) Follow Manufacturer's written instructions for cold temperature requirements before applying membrane adhesive:
 - (a) Follow specified precautions.
 - (b) Expose only enough adhesive to be used as directed by membrane manufacturer:
 - (c) Low VOC restrictions (if required by local AHJ): Temperatures to be 40 deg F and rising before applying.
 - c. Hot temperature:
 - 1) Do not expose membrane and accessories to constant temperature in excess of 180 deg F.
2. Proceed with roofing work when existing and forecasted weather conditions permit.

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

1. Make no deliveries to Project until installation is about to commence, or until approved storage area is provided.
2. Deliver products job site in original unopened containers or wrappings bearing all seals and approvals.
3. Deliver materials in sufficient quantities to allow continuity of work.
4. Remove any material not approved from job site.

B. Storage And Handling Requirements:

1. General:
 - a. Follow Manufacturer's instructions and precautions for storage of materials.
 - b. Handle and store roofing materials and place equipment in manner to avoid permanent deflection of roof decking.
 - c. Material Safety Data Sheets (MSDS) must be on location always during transportation, storage and application of materials.
2. Storage Requirements:
 - a. Protection:
 - 1) Protect roof materials from physical damage, moisture, soiling, and other sources in a clean, dry, protected location and with temperature range required by Manufacturer. Protect from direct sunlight.
 - 2) Provide continuous protection of materials against moisture absorption (Manufacturer's/Supplier's shrink wrap is not accepted waterproofing).
 - 3) Store membrane rolls lying down on pallets fully protected from weather with clean canvas tarpaulins.
 - b. Roof Insulation:
 - 1) Comply with insulation Manufacturer's written instructions for handling, storing, and protection during installation.
 - c. Safety:
 - 1) Store flammable materials in cool, dry area away from sparks, open flames, or excessive heat. Follow precautions outlined on containers or supplied by material manufacturer/supplier.
 - 2) Liquid materials such as solvents and adhesives shall be stored off site and installed away from open flames, sparks, and excessive heat.
 - 3) Site storage is acceptable if liquid materials are placed in a locked, sealed storage container.
 - 4) Situate equipment and materials so as to preclude danger, disturbance, or interference to public safety and traffic, and to not constitute fire hazard.
 - d. Temperature:

- 1) Store adhesives at temperatures above 40 deg F and below 180 deg F.
- e. Unacceptable Material:
 - 1) Remove from job site materials that are determined to be damaged by Architect or by Roofing Manufacturer and replace at no additional cost to Owner.
 - 2) Remove all wet and damaged materials from site.
 - 3) Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
- 3. Handling Requirements:
 - a. Select and Handle operating equipment so as not to damage existing construction or new roofing system, or to overload structural system.
 - b. Handle rolled goods so as to prevent damage to edge or ends.

1.08 WARRANTY

- A. Manufacturer Warranty:
 - 1. Roofing Membrane Manufacturer's Special Warranty for:
 - a. Thirty (30) year no dollar limit (NDL) material and labor warranty covering roofing system, including insulation, components of membrane roofing system and flashing degradation and workmanship.
 - b. Accidental Puncture Warranty:
 - 1) Membrane Manufacturer's written Accidental Puncture Warranty for up to sixteen (16) hours of Labor to repair punctures after final inspection.
 - c. Warranty shall include wind speed coverage to 99 mph.
- B. Roof Installer Workmanship Warranty:
 - 1. Written five (5) year guarantee covering workmanship and repairs or replacement of work without cost to Owner, counter-signed by Installer and General Contractor from date of installation:
 - a. Roof Installer Workmanship Warranty must include information required in Attachment 'Warranty Information'.

PART 2 PRODUCTS

2.01 SYSTEM

- A. Approved Manufacturers.
 - 1. Sika Sarnafil, Canton, MA (800) 576-2358 or (781) 828-5400. www.sikacorp.com.
 - a. Primary Contact: Steve Moosman, Strategic Accounts, office (801) 575-8648 x7551 cell (801) 201-6269 moosman.steve@us.sika.com.
 - b. Secondary Contact: Jason Maxwell, Sika National Accounts, (801) 910-9905, maxwell.jason@us.sika.com
 - c. Secondary Contact: Gary Leavitt, leavitt.gary@us.sika.com
 - d. Secondary Contact: Don Weston, Weston Group: office (801) 503-4276 don@weston-group.com
- B. Design Criteria:
 - 1. General:
 - a. Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction.
 - b. Membrane roofing and base flashings shall remain watertight.
 - 2. Drainage Requirement:
 - a. Roof system to provide positive drainage where all standing water dissipates within forty-eight (48) hours after precipitation ends.
 - 3. Material Compatibility:
 - a. Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane Roofing Membrane Manufacturer based on testing and field experience.

4. Metal details, fabrication practices, and installation methods shall conform to applicable requirements of following:
 - a. Factory Mutual Loss Prevention Data Sheet 1-49, 'Perimeter Flashing' (latest issue).
 - b. Sheet Metal and Air Conditioning Contractors National Association Inc, 5th edition.
- C. Components:
 1. Membrane:
 - a. Adhered:
 - 1) Meet requirements of ASTM D4434/D4434M, Type III.
 - 2) Approved Products.
 - (a) Sika Sarnafil: S327 polyester reinforced membrane:
 - (1) Rhinobond attached system.
 - b. Thickness:
 - 1) Field membrane: Thickness: 80 mil (2.03 mm) by optimum width and length determined by job conditions.
 - 2) Flashing membrane: Thickness: 0.60 mil (1.52 mm) by optimum width and length determined by job conditions.
 - c. Safety Stripe:
 - 1) Provide continuous 4 inch (100 mm) wide yellow membrane safety stripe.
 - d. Surface Color:
 - 1) White.
 2. Tapered Insulation:
 - a. FM and UL approved.
 - b. If required by Manufacturer for warranty, provide approved facer.
 - c. Polyisocyanurate Foam Insulation Board:
 - 1) Meet requirements of ASTM C1289.
 - 2) Insulation boards shall be Factory Mutual approved for classification selected for project.
 - 3) Facer:
 - (a) Fiber reinforced paper facer or coated-glass fiber mat facer.
 - 4) Insulation panels directly under roofing membrane and roof system cover board shall not exceed 48 inches by 96 inches (1 200 mm by 2 400 mm).
 - 5) Insulation panels to be 2 inches (50 mm) maximum thickness for each layer. Insulation shall be multiple layers and achieve minimum 'R' value of 30. Tapered layer shall slope at 1/4 in per ft (20 mm per meter).
 3. Roof System Cover Board (Recovery/Hard Board) Over Insulation:
 - a. Non-Fire Rated:
 - 1) 'Mechanically Attached' application:
 - (a) Minimum thickness to be determined by roofing system Manufacturer based upon Warranty term and Wind Warranty requirements.
 - (b) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (1) 1/2 inch (12.7 mm) thick minimum Dens-Deck Prime Roof Board by G-P Gypsum.
 - (2) 1/2 inch 1/2 inch (12.7 mm) thick minimum Securock by USG.
 - b. Fire Rating:
 - 1) Fire Protection Board On Deck:
 - (a) Approved Products:
 - (1) 5/8 inch (16 mm) thick minimum Dens-Deck Fireguard Roof Board by G-P Gypsum.
 4. Vapor Retarder / Air Barrier:
 - a. Temporary Roof Membrane (if required to protect interior building):
 - 1) Self Adhered retarder:
 - 2) May be used as temporary roof membrane up to ninety (90) day exposure.

- 3) Approved Products. See Section 01 6200 for definitions of Categories:
 - (a) Sika Sarnafil:
 - (1) Sarnavap air and vapor barrier with primers and sealants as required.

2.02 ACCESSORIES

A. Adhesives, Sealants and Sealer:

1. General:
 - a. Supplied by Roofing Membrane Manufacture Meet uplift and VOC requirements required for Project for specific application method and in compliance with all local codes and restrictions provided by Roofing Membrane Manufacture.
 - b. As accepted by Roofing Manufacturer under specified warranty.
2. 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.
3. Pourable Sealer:
 - a. Approved by Roofing Membrane Manufacturer for specified roof system.
4. Membrane:
 - a. Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Sika Sarnafil:
 - (a) Sarnacol 2170: Solvent based membrane adhesive.
5. Insulation:
 - a. Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Sika Sarnafil:
 - (a) Sarnacol 2163/AD/OM: Low rise polyurethane foam adhesive.
- 6.

B. Coated Metal:

1. Colors:
 - a. Not Seen From Ground: Color to match selected roof membrane.
 - b. Seen From Ground: Manufacturer's standard color as selected by Architect to match membrane surface color chosen for project.
 - 1) Edge metal color to be selected during submittal reviews.
 - c. Approved Products:
 - 1) Sika Sarnafil:
 - (a) 25 ga (0.56 mm) G90 galvanized sheet metal laminated with 0.020 inch (0.55 mm) thick membrane:
 - (b) Sarnclad membrane cover strips:
 - (1) 0.060 inch (1.5 mm) thick.
 - (2) Color to match selected Sarnaclad.

C. Counterflashing:

1. Formed to meet design requirements and match existing metals and aesthetics, furnished by Membrane Manufacturer.

D. Mechanical Attachment Accessories:

1. Rhinobond Plates:
 - a. Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Sika Sarnafil:
 - (a) Plates engineered as companion assembly with Sarnafasteners.
 - (b) Used to secure insulation, hardboard, and membrane as required by Membrane Manufacturer.
2. Bars And Plates:
 - a. Approved Products:
 - 1) Sika Sarnafil:
 - (a) Bars and plates engineered as companion assembly with Sarnafasteners. Used to secure membrane and/or flashing as required by Membrane Manufacturer.

- E. Miscellaneous Fasteners and Anchors:
 - 1. Fasteners, anchors, nails, straps, bars, etc. shall be of post-galvanized zinc or cadmium-plated steel, aluminum, or stainless steel. Mixing metal types and methods of contact shall be in such manner as to avoid galvanic corrosion.
 - 2. Compatible with substrates and flashings to be anchored:
 - a. Fasteners for attachment of metal to masonry shall be expansion type fasteners with stainless steel pins.
 - b. Concrete fasteners and anchors shall have minimum embedment of 1-1/4 inch (32 mm) and shall be approved for such use by Fastener Manufacturer.
 - c. Wood fasteners and anchors shall have embedment of one inch (25 mm) minimum and be approved for such use by Fastener Manufacturer.
- F. Prefabricated Flashing Accessories: Membrane corners and pipe stacks as supplied by Membrane manufacturer.
- G. Traffic Surface:
 - 1. Walkway Rolls:
 - a. Description:
 - 1) Traffic surface used to protect roof membrane with limited slip surface.
 - 2) Loose laid walk roll.
 - 3) Warranted for 90 mph (145 kph).
 - b. Approved Products:
 - 1) Sika Sarnafil:
 - (a) Sarnatred textured walkway traffic surface:
 - (b) Roof slope above 1 in 12 roof pitch.
- H. Wood Nailers:
 - 1. Treat wood nailers as per Section 06 0573.13 for preservative wood treatment and Section 06 0573.33 for fire-retardant wood treatment. Creosote or asphaltic-treated wood is not acceptable.
 - 2. Wood nailers shall conform to Factory Mutual's Loss Prevention Data Sheet 1-49.
 - 3. Wood shall have maximum moisture content of 19 percent by weight on dry weight basis.

PART 3 EXECUTION

3.01 APPROVED INSTALLERS

- A. Approved Manufacturer's Roofing Installers:
 - 1. Sika Sarnafil:
 - a. All Weather Waterproofing, John Moon, (801) 633-7509, jmoon@allweatherwaterproofing.com
 - b. Clark's Quality Roofing, Carl Clark, (801) 520-3700, carl@clarkroof.com
 - c. Flynn BEC LP, Kristin Wenzel, (509) 204-8448, kristin.wenzel@flynncompanies.com
 - d. Heritage Roofing, Jim Smith, (801) 910-3712, jim@heritageroofinglc.com
 - e. Layton Roofing, Jeremy Searle, (385) 266-7455, jeremy@layton-roofing.com
 - f. Utah Tile and Roofing (UTR), JC Hill, (801) 266-9694, jchill@utri.com

3.02 EXAMINATION

- A. Verification Of Conditions:
 - 1. Examine substrate and conditions. Verify substrate is suitable for installation of roofing system membrane before starting work of this Section.
 - 2. Inspect for defects such as excessive surface roughness, contamination, structural inadequacy, or any other condition that will adversely affect quality of work.
 - 3. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and nailers match thicknesses of insulation to be installed.
 - 4. Notify Architect of unsuitable conditions in writing:
 - a. Commencement of Work by installer is considered acceptance of substrate.

- b. Stop work immediately if any unusual or concealed condition is discovered and immediately notify Architect in writing, with letter copy to Roofing Manufacturer.
- c. Proceed with installation only after unsatisfactory conditions have been corrected.

3.03 PREPARATION

A. General Requirements:

- 1. Nailers:
 - a. Install continuous treated wood nailers at perimeter of entire roof and around roof projections and penetrations as described on Project Drawings. Replace existing wood nailers shown to remain, if they contain rot or are otherwise damaged.
 - 1) Anchor nailers to resist minimum force of 300 lbs (136 kg) per lineal foot (300 mm) in any direction:
 - (a) Provide 1/2 inch (13 mm) space between nailer lengths.
 - (b) Individual nailer lengths shall not be less than 36 inches (900 mm) long.
 - (c) Nailer fastener spacing shall be at 12 inches (300 mm) on center, or 16 inches (400 mm) if necessary, to match structural framing.
 - (d) Stagger fasteners 1/3 nailer width and install within 6 inches (150 mm) of each end.
 - (e) Meet requirements current Factory Mutual Loss Prevention Data Sheet 1-49.
 - 2) Thickness shall match substrate or insulation/hardboard height.
 - 3) Anchor existing woodwork that is to remain so as to resist minimum force of 300 lbs (136 kg) per lineal foot (300 mm) in any direction. Reuse only woodwork designated to be reused in detail drawings.
- 2. Prevent interior leakage, materials falling into interior, and other such Occurrences.
- 3. Install temporary roof membrane (Sarnavap SA as called out in Part 2 of this specification section) to prevent interior leakage and soiling/staining of new roof membrane. Temporary roofing can remain exposed for maximum of 90 days.
- 4. Install temporary water cut-offs at completion of each day's work and completely remove upon resumption of work.
 - a. Waterstops shall not emit dangerous or unsafe fumes and shall not remain in contact with finished roof as installation progresses.
 - b. Replace contaminated membrane at no additional cost to Owner.
- 5. Provide temporary walkways and work platforms as necessary to complete work under this section with no damage to existing surfaces, surfaces exposed during work, and to new materials applied.
- 6. Coordinate application of membrane to provide protection of underlying materials from wetting or other damage by the elements on a continuous basis.
- 7. Sheet metal sleeves, caps, and enclosures shall be completely installed on daily basis.

B. Surface Preparation:

- 1. Surfaces to receive new materials shall be clean, smooth, dry (free of moisture), free of flaws, sharp edges, loose and foreign material, dirt, oil and grease.
 - a. Mechanically scrape exposed surfaces, if necessary, to remove projections.
 - b. Roofing shall not start until defects have been corrected.
- 2. Verify that surfaces receiving new materials have no defects or errors which would result in poor application or cause latent defects in workmanship.
- 3. Inspect anchoring of wood members for conformance to specified requirements. Upgrade nonconforming fasteners to meet specified requirements.
- 4. Reset or replace fasteners that are loose, deformed, damaged, or corroded.
- 5. Fit joints of insulation tightly together.
- 6. Prevent interior leakage, materials falling into interior, and other such Occurrences.
- 7. Install temporary water cut-offs at completion of each day's work and completely remove upon resumption of work.

- a. Waterstops shall not emit dangerous or unsafe fumes and shall not remain in contact with finished roof as installation progresses.
 - b. Replace contaminated membrane at no additional cost to Owner.
8. Provide temporary walkways and work platforms as necessary to complete work under this section with no damage to existing surfaces exposed during work, and to new materials applied.
9. Coordinate application of membrane to provide protection of underlying materials from wetting or other damage by the elements on a continuous basis.
10. Sheet metal sleeves, caps, and enclosures shall be completely installed on daily basis.
11. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.
12. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast.
13. Remove and discard temporary seals before beginning work on adjoining roofing.

3.04 INSTALLATION

A. Interface With Other Work:

1. Coordinate with Installers whose work penetrates roof deck or requires men and equipment to traverse roof deck.

B. General:

1. Installation shall be in conformance with latest edition of manufacturer's specification except where Contract Documents are more restrictive.
2. Roof surfaces shall be free of water, ice and snow. Surfaces to receive new insulation, membrane, or flashings shall be dry. Should surface moisture occur, provide equipment necessary to dry surface before application.
3. Secure new and temporary construction, including equipment and accessories, so as to preclude wind blow-off and subsequent roof or equipment damage.
4. Install only as much roofing as can be made weathertight each day, including flashing and detail work. Clean seams and heat-weld before leaving jobsite.
5. Schedule and execute work without exposing interior building areas to effects of inclement weather. Protect existing building and its contents against all risks.
6. Install uninterrupted waterstops at end of each day's work and completely remove before proceeding with next day's work:
 - a. Waterstops shall not emit dangerous or unsafe fumes and shall not remain in contact with finished roof as installation progresses.
 - b. Replace contaminated membrane at no additional cost to Owner.
7. Avoid use of newly constructed roofing as walking surface or for equipment movement and storage:
 - a. Where such access is required, provide necessary protection and barriers to segregate work area and to prevent damage to adjacent areas.
 - b. Provide protection layer consisting of roof sheathing over insulation board and roofing membrane for new and existing roof areas which receive rooftop traffic during construction.
8. Before and during application, remove dirt, debris, and dust from surfaces either by vacuuming, sweeping, blowing with compressed air, or similar methods.
9. Report rooftop contamination that is anticipated or that is occurring to Roofing Manufacturer to determine corrective steps to be taken.

C. Insulation:

1. Neatly cut insulation cut to fit around penetrations and projections.
2. Install tapered insulation in accordance with insulation manufacturer's shop drawings.
3. Install tapered insulation around drains creating a drain sump.

4. Do not install more insulation board than can be covered with roofing membrane by end of day's work or onset of inclement weather.
5. 'Mechanically Attached' Attachment:
 - a. Fasten to deck with approved fasteners and plates in accordance with Insulation Manufacturer, Factory Mutual, and Roofing Manufacturer recommendations for fastening rates and patterns.
 - b. Quantity and locations of fasteners and plates shall also result in insulation boards resting evenly on roof deck/substrate so there are no large cavities or air spaces between boards and substrate.
 - c. Install fasteners in accordance with fastener manufacturer's recommendations:
 - 1) Fasteners are to have minimum penetration into structural deck as recommended by Fastener Manufacturer and Roofing Manufacturer.
- D. Roof System Cover Board / Fire Guard Board:
 1. Install 5/8" cover board as required by manufacturer for wind speed and warranty requirements and thermal barrier.
 2. Offset roof system cover board joints 24 inches (600 mm) minimum from joints in underlying substrate or insulation.
 3. Wood Roof Decks:
 - a. Non-visible installation:
 - 1) Secure roof system cover board using insulation plates and fasteners spaced as required by Membrane Manufacturer's warranty requirements.
 - b. Visible (from ground/surrounding buildings) installation:
 - 1) Secure roof system cover board using low profile attachment plates and fasteners spaced as required by Membrane Manufacturer's warranty requirements.
 - c. Verify and install number and spacing of fasteners (attachment rate) as required by manufacturer's performance and warranty requirements.
- E. Membrane:
 1. Inspection:
 - a. Inspect surface of insulation or substrate before installation of roof membrane.
 - b. Substrate shall be clean, dry and smooth with no excessive surface roughness, contaminated surfaces or unsound surfaces such as broken, delaminated, or damaged insulation boards.
 - c. All sharp projections shall be removed by sweeping, blowing or vacuum cleaning.
 2. Adhesive:
 - a. Follow ambient conditions as specified in Part 1 of this specification.
 - b. Follow Manufacturer's written application instructions including adhesive coverage rate requirements. Apply no adhesive in seam areas.
 - 1) Installer Option A):
 - (a) Apply adhesive using solvent-resistant nap paint rollers.
 - 2) Installer Option B):
 - (a) Apply adhesive using wet lay-in adhesive application.
 3. Hot-Air Welding Of Lap Areas:
 - a. General:
 - 1) Seams shall be hot air welded. Seam overlaps shall be 3 inches (75 mm) wide minimum when automatic machine welding, and 4 inches (100 mm) wide when hand welding.
 - 2) Membrane to be welded shall be clean and dry. No adhesive shall be in seam.
 - 3) Hand Welding:
 - (a) Hand welded seams shall be completed in three stages. Allow hot-air welding equipment to warm up for one (1) minute minimum before welding.
 - 4) Seam shall be tack-welded every 36 inches (900 mm) to hold membrane in place.

- 5) Weld back edge of seam with narrow but continuous weld to prevent loss of hot air during final welding.
 - 6) Insert nozzle into seam at 45 degree angle. Once proper welding temperature has been reached and membrane begins to 'flow', position hand roller perpendicular to nozzle and press lightly. For straight seams, use 1-1/2 inch (38 mm) wide nozzle. Use 3/4 inch (19 mm) wide nozzle for corners and compound connections.
 - b. Machine Welding: Follow Roofing Manufacturer's instructions and use recommended equipment.
 - c. Quality Control of Welded Seams:
 - 1) Check welded seams for continuity using rounded screwdriver. Make on-site evaluation of welded seams daily at locations directed by Owner's Representative or representative of Roofing Manufacturer.
 - 2) Take one inch (25 mm) wide cross-section samples of welded seams at least three times a day. Patch each test cut at no additional cost to Owner.
- F. Flashings:
1. General:
 - a. Install flashings concurrently with roof membrane. No temporary flashings will be allowed without prior written approval of Owner's Representative and Roofing Manufacturer. Approval shall only be for specific locations on specific dates.
 - b. If water is allowed to enter under newly completed roofing, remove and replace affected area no additional cost to Owner.
 - c. Adhere flashings to compatible, dry, smooth, and solvent-resistant surfaces.
 2. Membrane Flashings:
 - a. Adhesive Application for Flashings:
 - 1) Adhere flashing membranes to solvent resistant substrates. Cut interior and exterior corners and miters and hot-air weld into place. No bitumen shall be in contact with membrane.
 - 2) Apply adhesive using solvent-resistant 3/4 inch (19 mm) nap paint rollers. Apply adhesive in smooth, even coatings with no holidays, globs, or similar irregularities. Coat only area that can be completely covered in same day's operations. Allow surface with adhesive coating to dry completely prior to installing flashing membrane.
 - 3) When surface is dry, cut flashing membrane to workable length and evenly coat underside with adhesive apply at Manufacturer's adhesive coverage rate requirements.
 - 4) When adhesive has dried sufficiently to produce strings when touched with a dry finger, roll coated membrane onto previously coated substrate being careful to avoid wrinkles. Do not allow adhesive on underside of membrane to completely dry. Overlap adjacent sheets 3 inches (75 mm). Flashings shall extend 4 inches (100 mm) onto roofing membrane. Press bonded sheet firmly in place with hand roller.
 - 5) Apply no adhesive in seam areas that are to be welded.
 - b. Install fasteners and membrane fastenings plates at 12 inches (300 mm) on center with acceptable fasteners into structural deck at the base of parapets, walls, and curbs. Also install Sarnastop at the base of tapered edge strips and at transitions, peaks, and valleys according to Roofing Manufacturer's details:
 - 1) Hurricane Bar:
 - a) Provide inside 4 ft (1.20 m) perimeter peel stop (Hurricane Bar) required by Owner for all projects in all wind speed coverage areas.
 - c. Extend flashings 8 inches (200 mm) minimum above roofing level unless otherwise accepted in writing by Owner's representative and Roofing Manufacturer.
 - d. Terminate flashings according to Roofing Manufacturer's recommended details.

- e. Adhere flashing membranes to solvent resistant substrates. Cut interior and exterior corners and miters and hot-air weld into place. No bitumen shall be in contact with membrane.
- 3. Metal Flashings:
 - a. Complete metal work in conjunction with roofing and flashings so that watertight condition exists daily.
 - b. Install metal to provide adequate resistance to bending and allow for normal thermal expansion and contraction.
 - c. Metal joints shall be watertight.
 - d. Securely fasten metal flashings into solid wood blocking. Fasteners shall penetrate wood nailer one inch (25 mm) minimum.
 - e. Airtight and continuous metal hook strips are required behind metal fascias. Fasten hook strips 12 inches (300 mm) on center into wood nailer or masonry wall.
 - f. Counterflashings shall overlap base flashings 4 inches (100 mm) minimum.
 - g. Metal Base Flashings:
 - 1) Space adjacent sheets 1/4 inch (6 mm) apart.
 - 2) Fasten ends of metal 6 inches (150 mm) on center.
 - 3) Cover joint with 2 inch (50 mm) wide aluminum tape.
 - 4) Hot-air weld 4 inch (100 mm) wide strip of flashing membrane over joint.
 - h. Metal Edge Flashing:
 - 1) Install as per requirements of ANSI/SPRI/FM 4435/ES-1, 'Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems'.
 - 2) Fasten metal edge flashings with two rows of post-galvanized flat head annular ring nails, 4 inches (100 mm) on center staggered.
 - 3) Space adjacent sheets of metal 1/4 inch (6 mm) apart.
 - 4) Cover joint with 2 inch (50 mm) wide aluminum tape.
 - 5) Carlisle Sure Flex PVC coated metal:
 - (a) Hot air weld 6 inch (150 mm) wide strip of non - reinforced PVC flashing over coated metal joint.
 - 6) Sika Sarnafil Sarnaclad:
 - (a) Hot-air weld 4 inch (100 mm) wide strip of flashing membrane over joint.
- G. Temporary Cut-Off:
 - 1. Construct temporary waterstops to provide one hundred (100) percent watertight seal:
 - a. Make stagger of insulation joints even by installing partial panels of insulation.
 - b. Carry new membrane into waterstop.
 - c. Seal waterstop to deck or substrate so water will not travel under new or existing roofing.
 - d. Seal edge of membrane in continuous heavy application of sealant as described above.
 - e. When work resumes, cut-out contaminated membrane and dispose of off-site.
 - 2. If inclement weather occurs while temporary waterstop is in place, provide labor necessary to monitor situation to maintain watertight condition.
 - 3. If water is allowed to enter under newly completed roofing, remove affected area and replace at no additional cost to Owner.
- H. Walkway Rolls:
 - 1. Cross Grip:
 - a. Trim walkway to lay on roof surface where identified on Drawings.
 - b. Use Cross Grip clips to secure sections together. Use Cross Grip ramps where identified by Architect.
 - c. Roof slope above 1 in 12 roof pitch:
 - 1) Provide Manufacturers attachment recommendations.

3.05 FIELD QUALITY CONTROL

- A. Field Inspection:
 - 1. Before Manufacturer's inspection for warranty, Installer must perform pre-inspection to review work and to verify flashing has been completed as well as application of caulking.
 - 2. Final Roof Inspection:
 - a. Arrange for Roofing Membrane Manufacturer's technical personnel to inspect roofing installation on completion.
 - 3. Upon completion of roof inspection, provide certification that installation has been performed in accordance with Contract Document and Roofing Manufacturer requirements.
- B. Non-Conforming Work:
 - 1. Correct all work not in compliance to Contract Documents at no additional cost to Owner.
 - a. Repair or remove and replace components of membrane roofing system where inspections indicate that they do not comply with specified requirements.
 - b. Replace contaminated membrane.
 - 2. Additional inspections will be performed to determine compliance of replaced or additional work with specified requirements at no additional cost to Owner.
 - 3. Repair landscaped areas damaged by construction activities at no additional cost to Owner.

3.06 CLEANING

- A. Waste Management:
 - 1. Perform daily clean-up to collect wrappings, empty container, paper, and other roofing waste debris from project site.
 - 2. Upon completion, roofing waste materials must be disposed from site to dumping area legally authorized to receive such materials.
 - 3. Complete site cleanup, including both interior and exterior building areas that have been affected by construction, to Owner's satisfaction.

3.07 PROTECTION

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

END OF SECTION 07 5419

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**SECTION 07 9200
JOINT SEALANTS****PART 1 GENERAL****1.01 SUMMARY**

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

1.02 REFERENCES

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

1.03 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency current edition.
- B. ASTM C1193 - Standard Guide for Use of Joint Sealants 2016.
- C. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants 2018.
- D. ASTM C1481 - Standard Guide for Use of Joint Sealants with Exterior Insulation and Finish Systems (EIFS) 2012.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2022.
- F. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements 2009 (Reapproved 2016).
- G. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.
- H. ASTM C834 - Standard Specification for Latex Sealants 2017.
- I. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications 2022.
- J. ASTM C920 - Standard Specification for Elastomeric Joint Sealants 2018.

1.04 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.

1.05 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:

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

1.06 QUALITY ASSURANCE

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

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Acceptance Requirements:
 - 1. Deliver and keep in original containers until ready for use.
 - 2. Inspect for damage or deteriorated materials.
- B. Storage and Handling Requirements:
 - 1. Handle, store, and apply materials in compliance with applicable regulations and material safety data sheets (MSDS).
 - 2. Handle to prevent inclusion of foreign matter, damage by water, or breakage.
 - 3. Store in a cool dry location, but never under 40 deg F (4 deg C) or subjected to sustained temperatures exceeding 80 deg F (27 deg C) or as per Manufacturer's written recommendations.
 - 4. Do not use sealants that have exceeded shelf life of product.

1.08 FIELD CONDITIONS

- A. Ambient Conditions:

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

1.09 WARRANTY

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

PART 2 PRODUCTS

2.01 SYSTEMS

- A. Manufacturers:
 1. Manufacturer Contact List:
 - a. Dow Corning Corp., Midland, MI www.dowcorning.com.
 - b. Franklin International, Inc. Columbus, OH www.titebond.com.
 - c. GE Sealants & Adhesives (see Momentive Performance Materials Inc.).
 - d. Laticrete International Inc., Bethany, CT www.laticrete.com.
 - e. Momentive Performance Materials Inc. (formally GE Sealants & Adhesives), Huntersville, NC www.ge.com/silicones.
 - f. Sherwin-Williams, Cleveland, OH www.sherwin-williams.com.
 - g. Sika Corporation, Lyndhurst, NJ www.sikaconstruction.com or Sika Canada Inc, Pointe Claire, QC www.sika.ca.
 - h. Tremco, Beachwood, OH www.tremcosealants.com or Tremco Ltd, Toronto, ON (800) 363-3213.
- B. Materials:
 1. Design Criteria:
 - a. Compliance: Meet or exceed requirements of these standards:
 - 1) ASTM C920: Elastomeric joint sealant performance standard.
 - 2) ASTM D5893/D5893M: Silicone Joint Sealant for Concrete Pavements.
 - b. Comply with Manufacturer's ambient condition requirements.
 - c. Sealants must meet Manufacturer's shelf-life requirements.
 - d. Sealants must adhere to and be compatible with specified substrates.
 - e. Sealants shall be stable when exposed to UV, joint movements, and environment prevailing at project location.
 - f. Primers (Concrete, stone, masonry, and other nonporous surfaces typically do not require a primer. Aluminum and other nonporous surfaces except glass require use of a primer. Installer Option to use Adhesion Test to determine if primer is required or use primer called out in related sections):
 - 1) Adhesion Test:
 - (a) Apply silicone sealant to small area and perform adhesion test to determine if primer is required to achieve adequate adhesion. If necessary, apply primer at rate and in accordance with Manufacturer's instructions. See 'Field Quality Control' in Part 3 of this specification for Adhesive Test.
 - 2) If Primer required, shall not stain and shall be compatible with substrates.
 - 3) Allow primer to dry before applying sealant.
 2. Sealants At Exterior Building Elements:
 - a. Description:
 - 1) Weathersealing expansion, contraction, perimeter, and other movement joints which may include all or part of the following for project:

- (a) Aluminum entrance perimeters and thresholds.
 - (b) Columns.
 - (c) Connections.
 - (d) Curtainwalls.
 - (e) Door frames.
 - (f) EIFS to metal joints.
 - (g) Joints and cracks around windows.
 - (h) Louvers.
 - (i) Masonry.
 - (j) Parapet caps.
 - (k) Wall penetrations.
 - (l) Other joints necessary to seal off building from outside air and moisture.
 - b. Design Criteria:
 - 1) Meet following standards for Sealant:
 - (a) ASTM C920: Type S, Grade NS, Class 50 Use NT, M, G, A.
 - 2) Limitations:
 - (a) Do not use below-grade applications.
 - (b) Do not use on surfaces that are continuously immersed or in contact with water.
 - (c) Do not use on wet, damp, frozen or contaminated surfaces.
 - (d) Do not use on building materials that bleed oils, plasticizers or solvents, green or partially vulcanized rubber gaskets or tapes.
 - 3) Color:
 - (a) Architect to select from Manufacturer's standard colors.
 - (b) Match building elements instead of window (do not use white that shows dirt easily).
 - c. Approved Products. See Section 01 6000:
 - 1) Dow Corning:
 - (a) Primer: 1200 Prime Coat.
 - (b) Sealant: 791 Silicone Weatherproofing Sealant.
 - 2) Momentive Performance Materials (formerly, GE Sealants & Adhesives):
 - (a) Primer: SS4044 Primer.
 - (b) Sealant: GE SCS2000 SilPruf Silicone Sealant & Adhesive.
 - 3) Tremco:
 - (a) Primer:
 - (1) Metal surface: No. 20 primer.
 - (2) Porous surfaces: No. 23 primer.
 - (b) Sealant: Spectrum 1 Silicone Sealant.
- 3. Sealants At Exterior Sheet Metal And Miscellaneous:
 - a. Description:
 - 1) Weathersealing expansion, contraction, perimeter, and other movement joints which may include all or part of the following for project:
 - (a) Flashings.
 - (b) Gutters.
 - (c) Penetrations in soffits and fascias.
 - (d) Roof vents and flues.
 - (e) Lightning protection components.
 - b. Design Criteria:
 - 1) Meet following standards for Sealant:
 - (a) ASTM C920: Type S Grade NS, Class 25 (min) Use NT, M, G, A and O.
 - 2) Limitations:
 - (a) Do not use below-grade applications.

- (b) Do not use on surfaces that are continuously immersed or in contact with water.
 - (c) Do not use on wet, damp, frozen or contaminated surfaces.
 - (d) Do not use on building materials that bleed oils, plasticizers or solvents, green or partially vulcanized rubber gaskets or tapes.
 - c. Approved Products. See Section 01 6000:
 - 1) Dow Corning: 790 Silicone Building Sealant.
 - 2) Momentive Performance Materials (formerly, GE Sealants & Adhesives): GE SCS2350 Silicone Elastomeric Sealant.
 - 3) Tremco: Tremsil 600 Silicone Sealant.
- 4. General Interior Sealants:
 - a. General:
 - 1) Inside jambs and heads of exterior door frames.
 - 2) Both sides of interior door frames.
 - 3) Inside perimeters of windows.
 - 4) Miscellaneous gaps between substrates.
 - b. Design Criteria:
 - 1) Meet ASTM C920, Type S, Grade NS, NT, and Class 25 test requirements.
 - 2) 100 percent silicone sealant.
 - c. VOC Content of Interior Sealants:
 - 1) Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - (a) Architectural Sealants: 250 g/L.
 - (b) Sealant Primers for Nonporous Substrates: 250 g/L.
 - (c) Sealant Primers for Porous Substrates: 775 g/L.
 - d. Non-Paintable Sealant (Installer Option A):
 - 1) Approved Product. See Section 01 6000:
 - (a) Dow Corning: Tub, Tile, And Ceramic Silicone Sealant.
 - (b) Laticrete: 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.
 - e. Paintable Sealant (Installer Option B):
 - 1) Approved Product. See Section 01 6000:
 - (a) Momentive Performance Materials (formerly, GE Sealants & Adhesives): GE SCS7000 Paintable Silicone Sealant.
- 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 9200 and installed in Section 09 3000 - Tiling including the following:
 - 1) Ceramic tile inside corners.
 - 2) Ceramic tile and paver tile joints.
 - 3) Termination joints in font.
 - 4) Termination joints in showers and font.
 - c. Description:

- 1) One-part acetoxycure silicone sealant with fungicides to resist mold and mildew.
- d. Design Criteria:
 - 1) Meet ASTM C920, Type S, Grade NS, NT, and Class 25 test requirements.
 - 2) 100 percent silicone sealant.
- e. VOC Content of Interior Sealants:
 - 1) Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - (a) Architectural Sealants: 250 g/L.
 - (b) Sealant Primers for Nonporous Substrates: 250 g/L.
 - (c) Sealant Primers for Porous Substrates: 775 g/L.
- f. Color: As selected by Architect from Manufacturer's standard colors.
- g. Approved Products. See Section 01 6000:
 - 1) Dow Corning: Tub, Tile, And Ceramic Silicone Sealant.
 - 2) Laticrete: Latasil Tile and Stone Silicone Sealant.
 - 3) Momentive Performance Materials (formerly, GE Sealants & Adhesives): GE SCS1700 Sanitary Silicone Sealant.
 - 4) Tremco: Tremsil 200 Silicone Sealant.
- C. Acoustical Joint Sealants:
 - 1. Design Criteria:
 - a. Meet requirements of ASTM C834.
 - b. Meet Class A flame spread rating.
 - 2. Approved Products. See Section 01 6000:
 - a. OSI Pro-Series SC-175 Draft & Acoustical Sound Sealant by OSI Sealants Inc, Mentor, OH www.osisealants.com.
 - b. QuietZone Acoustic Caulk by Owens Corning, Toledo, OH www.owenscorning.com.
 - c. Acoustical Sealant by Tremco, Beachwood, OH www.tremcosealants.com or Toronto, ON (800) 363-3213.
 - d. Acoustical Sound Sealant by Titebond.
 - e. Acoustical Sealant by U S Gypsum, Chicago, IL www.usg.com.

2.02 ACCESSORIES

- A. Bond Breaker Tape:
 - 1. Pressure sensitive tape as by Sealant Manufacturer to suit application.
 - 2. Provide tape to prevent adhesion to joint fillers or joint surfaces at back of joint and allow sealant movement.
- B. Joint Backing:
 - 1. Comply with ASTM C1330.
 - 2. Flexible closed cell, non-gassing polyurethane or polyolefin rod or bond breaker tape as recommended by Sealant Manufacturer for joints being sealed.
 - 3. Oversized 25 to 50 percent larger than joint width.
- C. Joint Cleaner:
 - 1. Non-corrosive and non-staining type as recommended by Sealant Manufacturer, compatible with joint forming materials.
- D. Masking Tape:
 - 1. Non-staining, non-absorbent tape product compatible with joint sealants and adjacent joint surfaces.

PART 3 EXECUTION

3.01 EXAMINATION

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

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

3.02 PREPARATION

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

3.03 APPLICATION

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

- e. Structural glazing and adhesive.
- f. Surfaces to be immersed in water for prolonged time.
- B. Joint Backing:
 - 1. Install joint backing to maintain sealant joint ratios recommended by Manufacturer.
 - 2. Install without gaps, twisting, stretching, or puncturing backing material. Use gage to ensure uniform depth to achieve correct profile, coverage, and performance.
 - 3. Rod for open joints shall be at least 1-1/2 times width of open joint and of thickness to give solid backing. Backing shall fill up joint so depth of sealant bite is no more than 3/8 inch (9.5 mm) deep.
- C. Bond Breaker:
 - 1. Install bond breaker where joint backing is not used or where backing is not feasible.
 - a. Apply bond-breaker tape in shallow joints as recommended by Sealant Manufacturer.
- D. Sealant:
 - 1. Apply sealant with hand-caulking gun with nozzle of proper size to fit joints. Use sufficient pressure to insure full contact to both sides of joint to full depth of joint. Apply sealants in vertical joints from bottom to top.
 - 2. Fill joint opening to full and proper configuration.
 - 3. Apply in continuous operation.
 - 4. Tool joints immediately after application of sealant if required to achieve full bedding to substrate or to achieve smooth sealant surface. Tool joints in opposite direction from application direction, i.e., in vertical joints, from the top down. Do not 'wet tool' sealants.
 - 5. Depth of sealant bite shall be 1/4 inch (6 mm) minimum and 1/2 inch (12.7 mm) maximum, but never more than one half or less than one fourth joint width.
- E. Install at perimeter joints and mechanical and electrical penetrations in sound insulated rooms. Apply sealant with hand-caulking gun with nozzle of proper size to fit joints. Use sufficient pressure to insure full contact to both sides of joint to full depth of joint.
- F. Tool joints immediately after application of sealant if required to achieve full bedding to substrate or to achieve smooth sealant surface.
- G. Caulk gaps between painted or coated substrates and unfinished or pre-finished substrates. Caulk gaps larger than 3/16 inch (5 mm) between painted or coated substrates.

3.04 TOLERANCES

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

3.05 FIELD QUALITY CONTROL

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

2. Sealants failing adhesion test shall be removed, substrates cleaned, sealants re-installed, and re-testing performed.
3. Maintain test log and submit report to Architect indicating tests, locations, dates, results, and remedial actions.

3.06 CLEANING

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

END OF SECTION

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

PART 1 GENERAL**1.01 SUMMARY**

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

1.02 REFERENCES

- A. Definitions:
1. Builders Hardware Manufacturer's Association (BHMA) Hardware Functions:
 - a. 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. F84 Classroom Deadlock: Dead locking latch bolt operated by lever from either side, except when outside lever is locked, latch bolt is operated by key in outside lever or by rotating inside lever.
 - 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. F91 Store Door Lock: Deadlocking latch operated by either lever. Key in either lever locks / unlocks both levers.
 - f. 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.
 - g. E2142 Deadbolt: Dead bolt operated by key from either side. Bolt automatically dead locks when fully thrown.
 - h. E2152 Deadbolt: Dead bolt operated by key from outside and turn unit from inside. Bolt automatically dead locks when fully thrown.

1.03 DELIVERY, STORAGE, AND HANDLING

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

PART 2 HARDWARE GROUPS**2.01 EXTERIOR DOORS**

- A. Group 2:
1. 1 set: Weatherstrip.
 2. 1 each: Closer.
 3. 1 each: Emergency Egress Exit Device (no exterior hardware or dogging capability).
 4. 3 each: Hinges.
 5. 1 each: Stop.

2.02 INTERIOR DOORS

- A. Group 20:
1. 1 set: Smoke Gaskets.
 2. 3 each: Hinges.
 3. 1 each: Latchset Function F75.
- B. Group 22:
1. 1 set: Smoke Gaskets.
 2. 3 each: Hinges.
 3. 1 each: Lockset Function F86.

- C. Group 26:
 - 1. 1 set: Smoke Gaskets.
 - 2. 1 each: Acoustic Seal.
 - 3. 3 each: Hinges.
 - 4. 1 each: Lockset Function F109.
 - 5. 1 each: Stop.
- D. Group 26A:
 - 1. 1 set: Smoke Gaskets.
 - 2. 1 each: Acoustic Seal.
 - 3. 3 each: Hinges (existing).
 - 4. 1 each: Lockset Function F109.
 - 5. 1 each: Stop (existing).
- E. Group 32:
 - 1. 1 set: Smoke Gaskets.
 - 2. 1 each: Closer.
 - 3. 3 each: Hinges.
 - 4. 1 each: Lockset, Function F76.
- F. Group 51:
 - 1. General:
 - a. 1 set: Smoke Gaskets.
 - 2. Active Leaf:
 - a. 3 each: Hinges.
 - b. 1 each: Lockset Function F86.
 - c. 1 each: Stop.
 - 3. Inactive Leaf:
 - a. 1 each: Flush Bolt.
 - b. 3 each: Hinges.
- G. Group 52:
 - 1. General:
 - a. 1 set: Smoke Gaskets.
 - 2. Active Leaf:
 - a. 1 each: Closer with hold open function.
 - b. 3 each: Hinges.
 - c. 1 each: Pull.
 - d. 1 each: Push.
 - e. 1 each: Kick Plate.
 - f. 1 each: Stop.
 - 3. Inactive Leaf:
 - a. 1 each: Closer with hold open function.
 - b. 3 each: Hinges.
 - c. 1 each: Kick Plate.
 - d. 1 each: Pull.
 - e. 1 each: Push.
 - f. 1 each: Stop.

END OF SECTION 08 0671

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

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Non-fire-rated hollow metal doors and frames.
- B. Hollow metal frames for wood doors.
- C. Thermally insulated hollow metal doors with frames.

1.02 DEFINITIONS

- A. 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.
- B. 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.

1.03 REFERENCE STANDARDS

- A. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors 2018.
- B. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames 2020.
- C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100) 2017.
- D. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames 2020.
- E. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames 2022.
- F. ASTM A568/A568M - Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for 2019a.
- G. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2022.
- H. ASTM C1036 - Standard Specification for Flat Glass 2021.
- I. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass 2018.
- J. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2022.
- K. NAAMM HMMA 810 - Hollow Metal Doors 2009.
- L. NAAMM HMMA 840 - Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames 2017.
- M. NAAMM HMMA 860 - Guide Specifications for Hollow Metal Doors and Frames 2018.
- N. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames 2014.
- O. NFPA 80 - Standard for Fire Doors and Other Opening Protectives 2022.
- P. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies 2022.
- Q. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames 2019.
- R. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies Current Edition, Including All Revisions.

1.04 SUBMITTALS

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

1.05 QUALITY ASSURANCE

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

1.06 DELIVERY, STORAGE, AND HANDLING

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

PART 2 PRODUCTS

2.01 SUPPLIERS

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

2.02 MANUFACTURERS

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

2.03 PERFORMANCE REQUIREMENTS

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

2.04 HOLLOW METAL DOORS

- A. Doors:
 - 1. Meet one of following requirements:

- a. Meet requirements of Steel Door Institute ANSI / SDI A250.8.
 - b. Commercial grade steel meeting requirements of ASTM A568/A568M, Class 1:
 - 1) Grade II for interior doors, Grade III for exterior doors.
 - 2) Model 1 Full Flush or Model 2 Seamless designs at Manufacturer's option.
 - 3) Type F and G as required.
 - 4) Finish:
 - (a) Interior doors primed or galvanized as per ASTM A653/A653M.
 - (b) Exterior doors galvanized and primed as per ASTM A653/A653M.
- B. Exterior Doors: Thermally insulated.
 - 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 2 - Heavy-duty.
 - b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 1 - Full Flush or 2 - Seamless.
 - d. Zinc Coating: A60/ZF180 galvanized coating; ASTM A653/A653M.
 - 2. Door Core Material: Polystyrene 1 lbs/cu ft minimum density.
 - a. Foam Plastic Insulation: Manufacturer's standard board insulation with maximum flame spread index (FSI) of 75, and maximum smoke developed index (SDI) of 450 in accordance with ASTM E84, and completely enclosed within interior of door.
 - 3. Door Thermal Resistance: R-Value of 6.0 minimum, for installed thickness of polystyrene.
 - 4. Door Face Sheets: Flush.
 - 5. Door Finish: Factory primed and field finished.
- C. Interior Doors, Non-Fire-Rated:
 - 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 1 - Standard-duty.
 - b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 1 - Full Flush.
- D. Fabrication:
 - 1. General:
 - a. Mortise and reinforce doors for hinges and locks.
 - b. Reinforce doors for closers and other surface applied hardware.
 - c. Drill and tap on job.
 - d. Seams along vertical edges of door need not be filled.
 - e. Do not extend hinge cut out full width of door unless fill strip is inserted, weld filled, and ground smooth so no seam appears on back face plate.
 - f. Double doors shall have overlapping rolled steel astragal.
 - g. Fire Doors:
 - 1) Fire-rated doors shall be provided for those openings requiring fire protection and temperature rise ratings, as determined and scheduled by Architect.
 - 2) Construct UL fire doors and frames to meet UL's specific approval according to current procedure for door rating involved, Procedure No. R-3791 and R-3821 as listed by UL.
 - (a) Labeling shall be in accordance with NFPA 80, the listing authority's policies and label materials, and shall identify Manufacturer.

2.05 HOLLOW METAL FRAMES

- A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.
- B. Exterior Door Frames: Full profile/continuously welded type. Cold rolled furniture steel
 - 1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvanized) in accordance with ASTM A653/A653M, with A40/ZF120 coating.
 - 2. Frame Metal Thickness: 14 gage, 0.067 inch, minimum.
 - 3. Frame Finish: Factory primed and field finished.

4. Provide labeled frame to match fire rating of door.
 5. Anchors: 16 US ga (1.6 mm) minimum meeting UL or other code acceptable requirements for door rating involved.
- C. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type. Cold rolled furniture steel
1. Prime surfaces with rust inhibiting primer.
 2. Frame Metal Thickness: 16 gage, 0.053 inch, minimum.
 3. Frame Finish: Factory primed and field finished.
 4. Provide labeled frame to match fire rating of door.
 5. Anchors: 16 US ga (1.6 mm) minimum meeting UL or other code acceptable requirements for door rating involved.
- D. Frames for Wood Doors: Comply with frame requirements in accordance with corresponding door.
- E. Mullions for Pairs of Doors: Fixed, with profile similar to jambs.
- F. Transom Bars: Fixed, of profile same as jamb and head.
- G. Frames Wider than 48 inches: Reinforce with steel channel fitted tightly into frame head, flush with top.
- H. Fabrication:
1. General Requirements:
 - a. Provide temporary spreader on each welded frame.
 - b. Provide Manufacturer's gauge label for each item.
 - c. Make breaks, arrises, and angles uniform, straight, and true. Accurately fit corners.
 2. Frame width dimension:
 - a. Fabricate frame 1/8 inch wider than finished wall thickness as described in Contract Documents.
 3. Provide mortar guards at strikes and hinges.
 4. Anchors:
 - a. Provide three jamb anchors minimum for each jamb. On hinge side, install one anchor at each hinge location. On strike side, install one anchor at strike level and anchors at same level as top and bottom hinges. Tack weld anchors on frames intended for installation in framed walls.
 - b. Frames installed before walls are constructed shall be provided with extended base anchors in addition to other specified anchors.
 - c. Anchor types and configurations shall meet wall conditions.

2.06 FINISHES

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

2.07 ACCESSORIES

- A. Factory Glazing at Non-Rated Openings Narrow Light: Clear sheet glass, tempered glazing meeting requirements of ASTM C1048, Kind FT, Condition A, Type I, Class I, Quality Q3, 1/4-inch thick, factory installed.
- B. Glazing at fire-rated openings: Factory installed fire rated glazing which allows door to maintain rating indicated with size of lite indicated. Thickness: 1/4 (6mm).

2.08 SOURCE QUALITY CONTROL

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

PART 3 EXECUTION**3.01 EXAMINATION**

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

3.02 PREPARATION

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

3.03 INSTALLATION

- A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.
- B. Install prefinished frames after painting and wall finishes are complete.
- C. Install fire rated units in accordance with NFPA 80.
- D. Coordinate frame anchor placement with wall construction.
- E. Set frame in location and level head.
 - 1. Use of crowbar or other prying device to set door frame into wall opening will damage door frames and are not permitted to be used.
- F. Equalize with adjustable floor anchor.
- G. Set spreaders and fasten jambs to floor and wall.
 - 1. Wood spreaders shall be square, fabricated from lumber one inch minimum thick, be same length as door opening at header, and same depth as frame.
 - 2. Cut notches for frame stops.
 - 3. Do not remove spreaders until frames are permanently anchored in wall.
 - 4. Use one spreader at base of frame and another at strike level.
 - 5. Do not use temporary spreaders welded to base of jambs during installation of frame.
- H. Fill gap between frame and framing with urethane foam or tightly-packed fiberglass insulation. If urethane foam is used, foam interior of frames before installing frame. Trim excess before installation of frame.
- I. Caulking:
 - 1. Caulk around both sides of frames of doors receiving acoustical seals with specified sealant.
 - 2. Caulk around both sides of frames installed in exposed masonry walls with specified sealant.
- J. Install door hardware as specified in Section 08 7100.
 - 1. Comply with recommended practice for hardware placement of doors and frames in accordance with ANSI/SDI A250.6 or NAAMM HMMA 861.
- K. Comply with glazing installation requirements of Section 08 8000.
- L. Coordinate installation of electrical connections to electrical hardware items.
- M. Touch up damaged factory finishes.

3.04 TOLERANCES

- A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.
- B. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.
- C. Site Tolerances:
 - 1. Squareness: 1/16 inch from top edge to opposite top edge.
 - 2. Plumbness: 1/16 inch from top of jamb to bottom of jamb.

3. Alignment: 1/16 inch from plane of left side face of jamb to right side face of jamb.
4. Twist: 1/16 inch across throat of jamb plane measured across each face to plane of opposite jamb throat.
5. Finished Clearance Between Door And Frame:
 - a. 1/16 inch at head and hinge jamb plus 1/16 inch maximum 2) 1/8 inch at strike jamb plus or minus 1/16 inch maximum.
 - b. 1/2 inch to top of finished floor surface or 1/4 inch to top of threshold, plus or minus 1/16 inch maximum.

3.05 ADJUSTING

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

3.06 FIELD QUALITY CONTROL

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

3.07 CLOSEOUT ACTIVITIES

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

3.08 SCHEDULE

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

END OF SECTION

**SECTION 08 1416
FLUSH WOOD DOORS**

PART 1 GENERAL**1.01 SECTION INCLUDES**

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

1.02 RELATED REQUIREMENTS

- A. Section 08 1113 - Hollow Metal Doors and Frames.
B. Section 08 7100 - Door Hardware.
C. Section 08 8000 - Glazing.

1.03 REFERENCE STANDARDS

- A. References
B. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for Windows, Doors, and Skylights 2017.
C. ASTM C1036 - Standard Specification for Flat Glass 2021.
D. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition 2014, with Errata (2016).
E. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards 2021, with Errata.
F. CPA (Composit Panel Association) - Standard Publications 2016.
G. CPSC (Consumer Products Safety Commission - Safety Standard for Architectural Glazing Materials 16 CFR, Part 1201 CAT 1 and 11.
H. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood 2020.
I. NFPA 101-2018 - Life Safety Code 2018.
J. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies 2022.
K. UL 10B - Standard for Fire Tests of Door Assemblies Current Edition, Including All Revisions.
L. UL 9 - Standard for Fire Tests of Window Assemblies Current Edition, Including All Revisions.

M. Definitions

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

1.04 ADMINISTRATIVE REQUIREMENTS

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

1.05 SUBMITTALS

- A. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.
- B. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.
 - 1. Provide information as required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).
 - 2. Indicate factory finish color and type.
- C. Certificate: Submit labels and certificates required by quality assurance and quality control programs.
- D. Samples:
 - 1. Interior Hardwood for Transparent Finish:
 - a. Approval subject to Annual Review:
 - 1) 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.
 - 2) Approval of sample by Owner will establish performance standard of stain to be used until next annual review.
 - b. Design Criteria:
 - 1) Provide 8 inch by 10 inch (200 mm by 255 mm) sample of Red Oak to match stain Control Sample provided by Owner.
- E. Manufacturer's Installation Instructions: Indicate special installation instructions.
- F. Manufacturer's qualification statement.
- G. Warranty executed in Owner's name.
- H. Closeout Submittals:
 - 1. Include following information in Operations And Maintenance Manuals specified in Section 01 7800:
 - a. Record Documentation:
 - 1) Manufacturers Documentation:
 - (a) Manufacturer's product literature on doors and factory finish.
 - (b) Maintenance and repair instructions.

1.06 DELIVERY, STORAGE, AND HANDLING

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

- E. Accept doors on site in manufacturer's packaging and inspect for damage.
- F. Store flat on a level surface in a dry, well ventilated building.
- G. Cover to keep clean but allow air circulation.
- H. Handle with clean gloves and do not drag doors across one another or across other surfaces.
- I. Do not subject doors to abnormal heat, dryness, or humidity or sudden changes therein.
- J. Condition doors to average prevailing humidity of locality before hanging.

1.07 WARRANTY

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

PART 2 PRODUCTS

2.01 SUPPLIERS

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

2.02 APPROVED MANUFACTURERS

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

2.03 DOORS

- A. Wood Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
 - 1. Type: AWS PC-5ME or FD-5ME.
 - 2. Grade: AWS Premium, except face veneer.
 - 3. Fully Type I Construction: Adhere all glue lines with Type I adhesive, including veneer lay-up.
 - 4. Face Veneer:
 - a. 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.
- B. Core:
 - 1. Fully bonded to stiles and rails and sanded as a unit before applying veneers.
 - 2. Non-Rated:
 - a. 32 lb density meeting requirements of ANSI A208.1 Mat Formed Wood Particle Board, Grade 1-L-1 minimum.
 - b. Stiles:
 - 1) 1-3/8 inches deep minimum before fitting.

- 2) Stile face to be hardwood matching face veneer material, thickness manufacturer's standard.
- c. Rails:
 - 1) 1-1/8 inches
 - 2) Manufacturer's option.
- C. Glazing Configurations:
 - 1. Glazing (non-fire-rated openings): Tempered glazing meeting requirements of ASTM C1048, Kind FT, Condition A, Type I, Class I, Quality q3. Thickness 1/4 inch.
 - 2. Lite Kit:
 - a. Design Criteria: Pre-finished wood or wood veneer frames.
 - 3. Dimensions:
 - a. See Drawings.
 - 4. Approved Product:
 - a. Profile M6G by Graham.
 - b. Profile W6 by Marshfield.
 - c. Profile VT1 by VT Industries.

2.04 DOOR CONSTRUCTION

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

2.05 FINISHES - WOOD VENEER DOORS

- A. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
 - 1. Transparent:
 - a. Applied by Door Manufacturer before leaving factory.
 - b. Stain: To match control sample:
 - 1) OAK 95.

2.06 SOURCE QUALITY CONTROL

- A. Inspections:
 - 1. Verification of Performance:
 - a. Doors shall have following information permanently affixed on top of door:
 - 1) Manufacturer:
 - 2) Door designation or model.
 - 3) Veneer species.
 - 4) Factory finish.
 - 2. Clear Finished Hardwood:
 - a. Color matches Owner provided sample in Section 09 9300.

- b. Conform to National Fire Protection Standards, NFPA 80, for fire-rated doors.
 - 1) Required fire-rated doors shall bear approved labels of UL, Warnock Hersey International, or other code acceptable agency.
 - 2) Machining for hardware shall be complete before application of label.

PART 3 EXECUTION

3.01 CLOSEOUT ACTIVITIES

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

END OF SECTION

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**SECTION 08 7100
DOOR HARDWARE****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Hardware for wood and hollow metal doors.
- B. Lock cylinders for doors that hardware is specified in other sections.
- C. Thresholds.
- D. Weatherstripping and gasketing.

1.02 RELATED REQUIREMENTS

- A. Section 07 9200 - Joint Sealants: Sealants for setting exterior door thresholds.
- B. Section 08 0671 - Door Hardware Schedule: Schedule of door hardware sets.

1.03 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. BHMA A156.2 - Bored and Preassembled Locks and Latches; 2017.
- C. BHMA A156.16 - Auxiliary Hardware; 2018.
- D. BHMA A156.28 - Standard for Recommended Practices for Mechanical Keying Systems; 2018.
- E. DHI (H&S) - Sequence and Format for the Hardware Schedule; 2019.
- F. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2022.
- G. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives; 2022.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the manufacture, fabrication, and installation of products that door hardware is installed on.
- B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.
- C. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.
- D. Provide hardware templates to Sections 08 1213, 08 1313, and 08 1429 within fourteen (14) days after Architect approves hardware schedule.
- E. Supply necessary hardware installation templates to Section 06 2024 before pre-installation conference.
- F. Keying Requirements Meeting:
 - 1. Schedule meeting at project site prior to Contractor occupancy.
 - 2. Architect will schedule meeting at project site prior to Contractor occupancy.
 - 3. Owner will schedule meeting at project site prior to Contractor occupancy.
 - 4. Attendance Required:
 - a. Contractor.
 - b. Owner.
 - c. Architect.
 - d. Installer's Architectural Hardware Consultant (AHC).
 - e. Hardware Installer.
 - f. Owner's Security Consultant.
 - 5. Agenda:
 - a. Establish keying requirements.
 - b. Verify locksets and locking hardware are functionally correct for project requirements.
 - c. Verify that keying and programming complies with project requirements.
 - d. Establish keying submittal schedule and update requirements.

6. Incorporate "Keying Requirements Meeting" decisions into keying submittal upon review of door hardware keying system including, but not limited to, the following:
 - a. Access control requirements.
 - b. Key control system requirements.
 - c. Schematic diagram of preliminary key system.
 - d. Flow of traffic and extent of security required.
7. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.
8. Deliver established keying requirements to manufacturers.

1.05 SUBMITTALS

- A. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.
 1. Manufacturer's cut sheets.
 2. Two (2) copies of Manufacturer's installation, adjustment, and maintenance instructions for each piece of hardware. Include one (1) set in 'Operations And Maintenance Manual' and send one (1) set with hardware when delivered.
 3. Copy of hardware schedule.
 4. Written copy of keying system explanation.
- B. Shop Drawings - Door Hardware Schedule: Submit detailed listing that includes each item of hardware to be installed on each door. Use door numbering scheme as included in Contract Documents.
 1. Submit hardware schedule indicating hardware to be supplied.
 2. Schedule shall indicate details such as proper type of strikeplates, spindle lengths, hand, backset, and bevel of locks, hand and degree opening of closer, length of kickplates, length of rods and flushbolts, type of door stop, and other necessary information necessary to determine exact hardware requirements.
 3. Prepared by or under supervision of Architectural Hardware Consultant (AHC).
 4. Comply with DHI (H&S) using door numbers and hardware set numbers as indicated in construction documents.
 - a. Submit in vertical format; see Section 08 0671.
 5. List groups and suffixes in proper sequence.
 6. Provide complete description for each door listed.
 7. Provide manufacturer name, product names, and catalog numbers; include functions, types, styles, sizes and finishes of each item.
 8. Include account of abbreviations and symbols used in schedule.
- C. Shop Drawings - Electrified Door Hardware: Submit diagrams for power, signal, and control wiring for electrified door hardware that include details of interface with building safety and security systems. Provide elevations and diagrams for each electrified door opening as follows:
 1. Prepared by or under supervision of Architectural Hardware Consultant (AHC) and Electrified Hardware Consultant (EHC).
 2. Elevations: Submit front and back elevations of each door opening showing electrified devices with connections installed and an operations narrative describing how opening operates from either side at any given time.
 3. Diagrams: Submit point-to-point wiring diagram that shows each device in door opening system with related colored wire connections to each device.
- D. Closeout Submittals:
 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Operations and Maintenance Data:
 - 1) Manufacturer's installation, adjustment, and maintenance instructions for each piece of hardware.
 - b. Record Documentation:

- 1) Manufacturers documentation:
 - (a) Manufacturer's literature and/or cut sheets.
 - (b) Include keying plan and bitting schedule.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing work of the type specified for commercial door hardware with at least three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Neatly and securely package hardware items by hardware group and identify for individual door with specified group number and set number used on Supplier's hardware schedule.
- B. Include fasteners and accessories necessary for installation and operation of finish hardware in same package.

PART 2 PRODUCTS

2.01 SUPPLIERS

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

2.02 DESIGN AND PERFORMANCE CRITERIA

- A. Fasteners:
 1. Provide fasteners of proper type, size, quantity, and finish that comply with commercially recognized standards for proposed applications.
 - a. Aluminum fasteners are not permitted.
 - b. Provide phillips flat-head screws with heads finished to match door surface hardware unless otherwise indicated.
 2. Provide machine screws for attachment to reinforced hollow metal and aluminum frames.
 - a. Self-drilling (Tek) type screws are not permitted.
 3. Provide stainless steel machine screws and lead expansion shields for concrete and masonry substrates.
 4. Provide wall grip inserts for hollow wall construction.
 5. Provide spacers or sex bolts with sleeves for through bolting of hollow metal doors and frames.
 6. Fire-Rated Applications: Comply with NFPA 80.
 - a. Provide wood or machine screws for hinges mortised to doors or frames, strike plates to frames, and closers to doors and frames.
 - b. Provide steel through bolts for attachment of surface mounted closers, hinges, or exit devices to door panels unless proper door blocking is provided.
 7. Concealed Fasteners: Do not use through or sex bolt type fasteners on door panel sides indicated as concealed fastener locations, unless otherwise indicated.

2.03 FINISHES

- A. Hardware Finishes:
 1. 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.

2.04 HINGES

- A. Manufacturer Contact List:
 1. Hager Companies, St Louis, MO www.hagerhinge.com.
 2. Ives, New Haven, CT www.iveshardware.com.
 3. McKinney, Scranton, PA www.mckinneyhinge.com.
 4. PBB, Ontario, CA www.pbbinc.com.
 5. BEST (dormakaba Americas), Indianapolis IN www.BESTaccess.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.
 - (b) 1-3/8 inch 35 mm wood or metal doors: 3-1/2 inches by 3-1/2 inches.
 - 2) Fire-Rated Doors:
 - (a) 1-3/4 inch fire-rated doors in metal frames:
 - (b) Standard: 4-1/2 inches by 4-1/2 inches.
 - (c) Wide Throw: 4-1/2 inches by width required.
 2. Use non-removable pins on exterior opening doors.
 3. Hinges on exterior doors shall be solid brass, plated to achieve specified finish.
 4. Approved Products.
 - a. Interior:
 - 1) Hager: BB 1279.
 - 2) Ives: 5BBI.
 - 3) McKinney: TA 2714.
 - 4) MacPro / McKinney: MPB79.
 - 5) PBB: BB81.
 - 6) BEST: FBB 179.
 - b. Exterior:
 - 1) Hager: BB 1191.
 - 2) Ives: 5BBI.
 - 3) McKinney: TA 2314.
 - 4) PBB: BB21.
 - 5) BEST: FBB 191.

2.05 SECURING DEVICES

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

- a. Precision Hardware, Romulus, MI www.precisionhardware.com.
 - b. Rockwood, Manufacturing Co, Rockwood, PA www.rockwoodmfg.com.
 - c. Sargent, New Haven, CT www.sargentlock.com.
 - d. Schlage, Colorado Springs, CO www.schlage.com.
 - e. Von Duprin, Indianapolis, IN www.vonduprin.com.
 - f. Yale Commercial Locks, Lenoir City, TN www.yalecommercial.com.
- C. General:
- 1. Backsets shall be 2-3/4 inches (70 mm).
- D. Locksets And Latchsets:
- 1. Design Criteria:
 - a. Grade 1 Heavy Duty Key-In Lever Cylindrical Lockset:
 - 1) ANSI/BHMA A156.2 Series 4000 Grade 1.
 - 2) Meet UL 3 hour fire rating.
 - 3) Meet ADA Compliant ANSI A117.1 Accessibility Code.
 - 4) Door Lever:
 - (a) Meet California code for 1/2 inch (12.7 mm) or less return to door.
 - (b) Vandal-Resistant Lever with clutch.
 - 5) Deadlocking Latchbolt.
 - b. Grade 1 Heavy Duty Key-In Lever Cylindrical Locksets (Used only in Meetinghouse Module doors with CES Seminary and Institute additions):
 - 1) ANSI/BHMA A156.2 Series 4000 Grade 1.
 - 2) Meet UL 3 hour fire rating.
 - 3) Meet ADA Compliant ANSI A117.1 Accessibility Code.
 - 4) Door Lever:
 - (a) Meet California code for 1/2 inch (12.7 mm) or less return to door.
 - (b) Vandal-Resistant Lever with clutch.
 - 5) Deadlocking Latchbolt.
 - c. Grade 2 Standard Duty Key-In Lever Cylindrical Lockset:
 - 1) ANSI/BHMA A156.2 Series 4000 Grade 2.
 - 2) Meet UL 3 hour fire rating.
 - 3) Meet ADA Compliant ANSI A117.1 Accessibility Code.
 - 4) Door Lever:
 - (a) Meet California code for 1/2 inch (12.7 mm) or less return to door.
 - 2. Lever Operated:
 - a. Approved Products. See Section 01 6200:
 - 1) Grade 1 Heavy Duty Key-In Lever Cylindrical Locksets (Used only in Meetinghouse Module doors with CES Seminary and Institute additions):
 - (a) 9K Series Best Lock with 15D Lever by BEST Access Solutions standard cylinders - (I/C cores may be used when authorized by AEC).
 - (b) 195 Series with American Lever by Marks USA.
 - (c) 10 Line Series with L Lever by Sargent.
 - (d) ND Series with Rhodes (RHO) Lever by Schlage.
 - 2) Grade 1 Heavy Duty Key-In Lever Cylindrical Locksets (Used only in Meetinghouse Module doors with CES Seminary and Institute additions):
 - (a) 9K Series Best Lock with 15D Lever by BEST Access Solutions standard cylinders - (I/C cores may be used when authorized by AEC).
 - (b) 195 Series with American Lever by Marks USA.
 - (c) 10 Line Series with L Lever by Sargent.
 - (d) ND Series with Rhodes (RHO) Lever by Schlage.
 - 3) Grade 2 Standard Duty Key-In Lever Cylindrical Locksets:
 - (a) 7K Series Best Lock with 15D Lever by BEST Access Solutions 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. Standard Cylinders:
 - 1. Provide cylinders for interior exit devices requiring cylinders.
- F. Exit Devices:
 - 1. Use operable lever trim.
 - 2. Provide labeled hardware where required by local code authority.
 - 3. Approved Products.
 - a. 2000 Series by BEST Precision.
 - b. 80 Series by Sargent.
 - c. 99 or 98 Series by Von Duprin.
 - d. 7100 Series by Yale.

2.06 DOOR PULLS AND PUSH BARS

- A. Standard Door Push / Pulls:
 - 1. Size: 15 inches (380 mm) by 3-1/2 inch (89 mm).
 - 2. Acceptable Products:
 - a. PS3515, PL3515 / 80301 by Glynn-Johnson, Indianapolis, IN www.glynn-johnson.com.
 - b. 39E, 30S by Hager, St Louis, MO www.hagerhinge.com.
 - c. 8200, 8302 by Ives, Wallingford, CT www.iveshardware.com.
 - d. 70B, 105x70B by Rockwood Manufacturing Co, Rockwood, PA www.rockwoodmfg.com.
 - e. Equal as approved by Architect before installation. See Section 01 6000.

2.07 CLOSERS

- A. Approved Manufacturers.
 - 1. 8900 Series by Dorma Architectural Hardware, Reamstown, PA www.dorma.com/usa.
 - 2. 1461 Series by LCN Closers, Princeton, IL www.lcnclosers.com.
 - 3. 8501 Series by Norton Door Controls, Charlotte, NC www.nortondoorcontrols.com.
 - 4. 1431 Series by Sargent, New Haven, CT www.sargentlock.com.
 - 5. HD7000 Series by BEST (dormakaba Americas), Indianapolis IN www.BESTAccess.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. Door Closers on doors that swing 180 degree as shown on Contract Documents:
 - a. Closers shall allow for 180 degree opening without engaging stop function. Wall stop or Floor stop is specified in Door Schedule and Section 08 7108, 'Stops And Holders'.
 - b. Closers shall have following features:
 - 1) Adjustable sweep speed.
 - 2) Adjustable backcheck.
 - 3) Non-handed, non-sized.
 - 4) Hold open arm function (Friction Hold Open) (Non-Fire-Rated Corridors).
 - 5) Delayed action closing where noted on Door Schedule.
 - 4. Door Closers on doors that swing 90 degree as shown on Contract Documents:
 - a. Closers shall allow for 100 degree opening with engaging stop function.
 - b. Closers shall have following features:
 - 1) Adjustable sweep speed.
 - 2) Adjustable backcheck.
 - 3) Non-handed, non-sized.

- 4) Hold open arm function with thumb turn or handle control (Cush And Hold) (Non-Fire- Rated Corridors).
- 5) Delayed action closing where noted on Door Schedule.

2.08 KICK PLATES

- A. Acceptable Manufacturers:
 1. Glynn-Johnson, Indianapolis, IN www.glynn-johnson.com.
 2. Hager, St Louis, MO (800) 255-3590 or (314) 772-4400 www.hagerhinge.com.
 3. Ives, Wallingford, CT www.iveshardware.com.
 4. Rockwood Manufacturing Co, Rockwood, PA www.rockwoodmfg.com.
- B. Kick Plates: Provide along bottom edge of push side of every door with closer, except aluminum storefront and glass entry doors, unless otherwise indicated.
 1. Material: 0.050 inch thick stainless steel.
 2. Size: 10 inch high by 2 inch less door width (LDW) on push side of door.

2.09 STOPS AND HOLDERS

- A. Manufacturers:
 1. Manufacturer Contact List:
 - a. Glynn-Johnson, Indianapolis, IN www.glynn-johnson.com.
 - b. Hager, St Louis, MO www.hagerhinge.com.
 - c. Ives, Wallingford, CT www.iveshardware.com.
 - d. Rockwood Manufacturing Co, Rockwood, PA www.rockwoodmfg.com.
 - e. Sargent, New Haven, CT (800) 906-6606 or (203) 562-2151 www.sargentlock.com.
- B. Stops:
 1. Use wall type stops unless indicated otherwise on Door Schedule.
 2. Provide model appropriate for substrate. Wall stops may be either cast or wrought.
 3. Acceptable Products:
 - a. Interior Wall Exterior Wall Floor Mount Overhead.
 - b. Hager 236W 255W 243F
 - c. Ives WS407CCV WS447 FS438
 - d. Rockwood 409 474 / 475 440 / 441
 - e. Glynn Johnson GJ 90S
 - f. Sargent 590S Series

2.10 ACCESSORIES

- A. Manufacturers:
 1. Manufacturer Contact List:
 - a. Hager, St Louis, MO www.hagerhinge.com.
 - b. Ives, Wallingford, CT www.iveshardware.com.
 - c. NGP - National Guard Products, Memphis, TN www.ngpinc.com.
 - d. Pemko Manufacturing, Ventura, CA www.pemko.com.
- B. Acoustical Seals:
 1. Color as selected by Architect.
 2. Acceptable Products:
 - a. Door Bottom Shoe for Wood Door:
 - 1) 13VDkB by NGP.
 - 2) 211DV by Pemko.
 - b. Door Bottom Shoe for Metal Door:
 - 1) 779S-A by Hager.
 - 2) 35EV by NGP.
 - 3) 217AV by Pemko.
- C. Smoke Gaskets:
 1. Color as selected by Architect.

2. Acceptable Products:
 - a. 726 by Hager.
 - b. 5050 by NGP.
 - c. PK 55 by Pemko.
- D. Sweepstrip (metal door bottom):
 1. Clear anodized aluminum with black neoprene insert.
 2. Reduce infiltration of air, wind, dust, rain, and snow.
 3. Meet UL requirements.
 4. For use with saddle thresholds.
 5. Acceptable Products:
 - a. 750S CLR by Hager.
 - b. 198N A by NGP.
 - c. 321 CN by Pemko.
 - d. Equal as approved by Architect before bidding. See Section 01 6000.
- E. Thresholds:
 1. Acceptable Products:
 - a. Design Criteria:
 - 1) Meet handicap accessibility requirements (ADA):
 - b. Interior Doors at Acoustic Seals, Approved Products:
 - 1) Carpet threshold (carpet to carpet):
 - (a) 505S DBA by Hager.
 - (b) 414 DKB by NGP.
 - (c) 236 D by Pemko.
 - c. Out swinging metal exterior doors (from occupied rooms such as Serving Areas or Classrooms):
 - 1) 8426 by NGP.
 - 2) 253 x 3 FG by Pemko.
- F. Latch Guards
 1. Acceptable products
 - a. LG12 by Ives
 - b. NLP-110 by Donjo
- G. 154 Stabilizers
 1. Acceptable Products
 - a. Von Duprin Model MT54

2.11 WEATHERSTRIPPING AND GASKETING

- A. Weatherstripping:
 1. Acceptable Products:
 - a. Finish: clear anodized aluminum.
 - b. Perimeter:
 - 1) 800S by Hager.
 - 2) A625 A by NGP.
 - 3) 35041 CP by Pemko.
 - c. Equal as approved by Architect before bidding. See Section 01 6000.
 - d. Bottom (see Sweepstrip).

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that doors and frames are ready to receive this work; labeled, fire-rated doors and frames are properly installed, and dimensions are as indicated on shop drawings.
- B. Verify that electric power is available to power operated devices and of correct characteristics.

3.02 INSTALLATION

- A. Install hardware in accordance with manufacturer's instructions and applicable codes.
- B. Install hardware on fire-rated doors and frames in accordance with applicable codes and NFPA 80.
- C. Install hardware for smoke and draft control doors in accordance with NFPA 105.
- D. Use templates provided by hardware item manufacturer.
- E. Do not install surface mounted items until application of finishes to substrate are fully completed.
- F. Door Hardware Mounting Heights: Distance from finished floor to center line of hardware item. As indicated in following list; unless noted otherwise in Door Hardware Schedule or on drawings.
 - 1. Mounting heights in compliance with ADA Standards:
 - a. Locksets: 40-5/16 inch.
 - b. Push Plates/Pull Bars: 42 inch.
 - c. Deadlocks (Deadbolts): 48 inch.
 - d. Exit Devices: 40-5/16 inch.
 - e. Door Viewer: 43 inch; standard height 60 inch.
- G. Install smoke gaskets and acoustical seals in manner to give continuous air-tight fit.
 - 1. Install smoke gaskets as per Manufacturer's installation requirements:
 - a. Hinge Jamb: Install smoke gaskets on jamb face of door frame so door will compress smoke gasket.
 - b. Header and Strike Jamb: Install smoke gaskets on face of stop of door frame so door will compress smoke gasket.
 - 2. Install acoustical seal with seal under door.
- H. Set exterior door thresholds with full-width bead of elastomeric sealant at each point of contact with floor providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws.
 - 1. See Section 07 9200 for additional requirements.
- I. Turn key cabinet over to Owner's designated representative at Substantial Completion with all keys required for every locking device on Project identified by tags and on hooks. Owner will be responsible for installation.

3.03 FIELD QUALITY CONTROL

- A. Provide an Architectural Hardware Consultant (AHC) to inspect installation and certify that hardware and installation has been furnished and installed in accordance with manufacturer's instructions and as specified.
- B. Owner's Instructions:
 - 1. Before Final Acceptance Meeting, send master keys to [Insert Person to Receive Keys].

3.04 ADJUSTING

- A. Adjust hardware for smooth operation.
- B. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.
- C. Adjust closers to provide maximum opening force as required by governing code authority and proper backcheck and sweep speed.

3.05 CLEANING

- A. Clean finished hardware in accordance with manufacturer's written instructions after final adjustments have been made.
- B. Clean adjacent surfaces soiled by hardware installation.
- C. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.

3.06 PROTECTION

- A. Do not permit adjacent work to damage hardware or finish.

END OF SECTION 08 7100

**SECTION 08 8000
GLAZING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Glazing units.

1.02 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials Current Edition.
- B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test 2015 (Reaffirmed 2020).
- C. ASTM C1036 - Standard Specification for Flat Glass 2021.
- D. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass 2018.
- E. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass 2019.
- F. ASTM C1193 - Standard Guide for Use of Joint Sealants 2016.
- G. ASTM C1281 - Standard Specification for Preformed Tape Sealants for Glazing Applications 2016.
- H. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass 2021a.
- I. GANA (GM) - GANA Glazing Manual 2008.
- J. GANA (SM) - GANA Sealant Manual 2008.
- K. GANA (LGRM) - Laminated Glazing Reference Manual 2019.
- L. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use 1990 (2016).

1.03 SUBMITTALS

- A. Product Data on Glazing Unit and Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.
- B. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.
- C. Samples: Submit two samples 12 by 12 inch in size of glass units.
- D. Installer's qualification statement.
- E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

- A. Perform Work in accordance with GANA (GM), GANA (SM), GANA (LGRM), IGMA TM-3000, for glazing installation methods. Maintain one copy on site.
- B. Installer Qualifications:
 - 1. Installer: Requirements of Section 01 4301 applies, but not limited to following:
 - a. Satisfactorily completed at least three (3) installations of similar size, scope, and complexity in each of past two (2) years and be approved by glass product Manufacturer before bidding.
 - b. Upon request, submit documentation.
- C. Certifications:
 - 1. Labels showing strength, grade, thickness, type, and quality are required on each piece of glass.

2. Manufacturers/Fabricators certifying products furnished comply with project requirements.
3. Insulating-Glass Certification Program: Indicate compliance with requirements of Insulating Glass Certification Council on applicable glazing products.

1.05 DELIVERY, STORAGE, AND HANDLING

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

1.06 FIELD CONDITIONS

- A. Do not install glazing when ambient temperature is less than 40 degrees F.
- B. Do not proceed with glazing when ambient and substrate temperature conditions are outside the limits permitted by glazing material manufacturer or when joint substrates are wet due to rain, frost, condensation or other causes.

1.07 WARRANTY

- A. Insulating Glass Units: Provide a ten (10) year manufacturer warranty, signed by insulating-glass Manufacturer/Fabricator, agreeing to replace insulating-glass units to include coverage for seal failure, moisture, interpane dusting or misting, including providing products to replace failed units from date of installation.
- B. Laminated Glass: Provide a ten (10) year manufacturer warranty to include coverage for delamination, including providing products to replace failed units from date of installation.
- C. Installer's Warranty:
 1. Form acceptable to Owner, signed by glass product Installer, agreeing to replace glass products that deteriorate, or that exhibit damage or deterioration of glass or glazing products due to faulty installation, for two (2) years from date of installation.
- D. Heat Soaked Tempered Glass: Provide a five (5) year manufacturer warranty to include coverage for spontaneous breakage of fully tempered glass caused by nickel sulfide (NiS) inclusions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturer Contact List for Low E Glazing:
 1. AGC Flat glass North America, Kingsport, TN www.us.agc.com.
 2. Carlex (subsidiary of Central Glass Co., Ltd., Nashville, TN www.carlex.com.
 3. Guardian Industries Corp., Auburn Hills, MI www.guardian.com.
 4. Oldcastle Building Envelope, Santa Monica, CA www.oldcastlebe.com
 5. Pilkington North America Inc., Toledo, OH www.pilkington.com.
 6. Vitro Architectural Glass (formerly PPG glass), Cheswick, PA www.ppgglass.com or PPG Canada Ltd, Glass Division, Toronto, ON (416) 789-3331.

2.02 ACCESSORIES

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

- C. 3M Sun Control Window Film Night Vision NV-25: -DI retail windows and vestibule windows only by Owner approval.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

- A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.
- B. Verify that the minimum required face and edge clearances are being provided.
- C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.
- D. Verify that sealing between joints of glass framing members has been completed effectively.
- E. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.
- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION, GENERAL

- A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.
- B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.
- C. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.
- D. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.
- E. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.
- F. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, etc.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements for additional requirements.
- B. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.
- C. Monitor and report installation procedures and unacceptable conditions.

3.05 CLEANING

- A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.
- B. Remove nonpermanent labels immediately after glazing installation is complete.
- C. Clean glass and adjacent surfaces after sealants are fully cured.

3.06 PROTECTION

- A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

- B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

**SECTION 09 2116
GYPSUM BOARD ASSEMBLIES**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Performance criteria for gypsum board assemblies.
- B. Metal stud wall framing.
- C. Metal channel ceiling framing.
- D. Resilient sound isolation clips.
- E. Acoustic insulation.
- F. Gypsum wallboard.
- G. Joint treatment and accessories.
- H. Textured finish system.

1.02 RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Building framing and sheathing.
- B. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.

1.03 REFERENCE STANDARDS

- A. ASTM C11 - Standard Terminology Relating to Gypsum and Related Building Materials and Systems 2018b.
- B. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board 2017 (Reapproved 2022).
- C. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing 2017.
- D. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products 2020.
- E. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board 2020.
- F. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications 2022.
- G. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness 2022.
- H. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs 2022.
- I. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base 2019.
- J. ASTM C1178/C1178M - Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel 2018.
- K. ASTM C1396/C1396M - Standard Specification for Gypsum Board 2017.
- L. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2022.
- M. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements 2009 (Reapproved 2016).
- N. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials 2022.
- O. ASTM E413 - Classification for Rating Sound Insulation 2022.

- P. GA-214 - Levels of Finish for Gypsum Panel Products 2021.
- Q. GA-216 - Application and Finishing of Gypsum Panel Products 2021.
- R. GA-600 - Fire Resistance and Sound Control Design Manual 2021.
- S. GA-801 - Handling and Storage of Gypsum Panel Products: A Guide for Distributors, Retailers, and Contractors 2017.
- T. UL 263 - Standard for Fire Tests of Building Construction and Materials Current Edition, Including All Revisions.
- U. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.
 - 1. Schedule MANDATORY pre-installation conference immediately before installation of gypsum wallboard.
 - 2. In addition to agenda items specified in Section 01 3000, review following:
 - a. Finish requirements necessary for installation of finish materials over gypsum wallboard, and location and installation of ceramic tile backerboard.

1.05 SUBMITTALS

- A. Product Data:
- B. Test Reports: For stud framing products that do not comply with ASTM C645 or ASTM C754, provide independent laboratory reports showing maximum stud heights at required spacings and deflections. Also provide fire test results or assembly diagrams and numbers confirming products used will provide required fire ratings with installation configurations used.
- C. Samples: Submit two samples of predecorated gypsum board, 12 by 12 inches in size, illustrating finish color and texture.
 - 1. Holy Smooth Texture:
 - a. 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.
- D. Field Samples:
 - 1. Before performing work of this Section, prepare control samples.
 - 2. Architect will inspect control sample at pre-installation conference following preparation of control sample. When sample is approved, work of this Section may proceed. Approved samples will be kept at site at all times work of this section is being performed.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to project site in unopened containers clearly labeled with manufacturer's name and identification of contents.
- B. Follow recommendations of GA-801 Guide for Handling and Storage of Gypsum Panel Products unless local, state or federal laws or agency rules differing from the recommendations shall take precedence.
- C. Store materials in dry and clean location until needed for installation. During installation, handle in a manner that will prevent marring and soiling of finished surfaces.
- D. Store material under roof and keep dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack gypsum board flat to prevent sagging.

1.07 FIELD CONDITIONS

- A. Ambient Conditions:

1. Comply with ASTM C840 or GA-216 requirements, whichever are more stringent:
 - a. Do not install interior products until installation areas are enclosed and conditioned.
 - 1) Temperature shall be 50 deg F (10 deg C) and 95 deg F (35 deg C) maximum day and night during entire joint operation and until execution of Certificate of Substantial Completion.
 - 2) Provide ventilation to eliminate excessive moisture.
 - 3) Avoid hot air drafts that will cause too rapid drying.
 - b. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

- A. Provide completed assemblies complying with ASTM C840 and GA-216.

1. See PART 3 for finishing requirements.

2.02 BOARD MATERIALS

- A. Manufacturers - Gypsum-Based Board:
 1. American Gypsum Company: www.americangypsum.com/#sle.
 2. CertainTeed Corporation: www.certainteed.com/#sle.
 3. Georgia-Pacific Gypsum: www.gpgypsum.com/#sle.
 4. National Gypsum Company: www.nationalgypsum.com/#sle.
 5. PABCO Gypsum: www.pabcogypsum.com/#sle.
 6. USG Corporation: www.usg.com/#sle.
- B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut, long edges tapered.
 1. General:
 - a. Size:
 - 1) Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.
 - b. Quality Standard:
 - 1) Core: Fire-resistant rated gypsum core.
 - 2) Complies with Type X requirements of ASTM C1396/C1396M (Section 5).
 - 3) Surface paper: Face paper suitable for painting.
 - 4) Long edge: Tapered edge.
 2. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
 3. At Assemblies Indicated with Fire-Resistance Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
 4. Thickness:
 - a. Vertical Surfaces: 5/8 inch.
 - b. Ceilings: 5/8 inch.
 5. Paper-Faced Products:
 - a. American Gypsum Company; LightRoc Gypsum Wallboard: www.americangypsum.com/#sle.
 - b. American Gypsum Company; FireBloc Type X Gypsum Wallboard: www.americangypsum.com/#sle.
 - c. CertainTeed Corporation; Type X Drywall: www.certainteed.com/#sle.
 - d. Georgia-Pacific Gypsum; ToughRock: www.gpgypsum.com/#sle.
 - e. Georgia-Pacific Gypsum; ToughRock Fireguard X: www.gpgypsum.com/#sle.
 - f. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond Fire-Shield Gypsum Board: www.goldbondbuilding.com/#sle.

2.03 GYPSUM BOARD ACCESSORIES

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Kinetics Noise Control, Dublin, OH www.kineticsnoise.com.
 - b. Magnum Products, Lenaxa, KS www.levelcoat.com.
 - c. National Gypsum, Charlotte, NC www.nationalgypsum.com.
 - d. Soundproofing Co, San Marcos, CA www.soundproofing.org.
 - e. United States Gypsum Co, Chicago, IL www.usg.com.
 - f. Westpac Materials Inc, Orange, CA www.westpacmaterials.com.
 - g. Wm. Zinsser & Co, Somerset, NJ www.zinsser.com.
- B. Corner And Edge Trim:
 - 1. Metal, paper-faced metal, paper-faced plastic, or solid vinyl meeting requirements of ASTM C1047. Surfaces to receive bedding cement treated for maximum bonding.
- C. Control Joint:
 - 1. Bent zinc sheet with V-shaped slot, perforated flanges, covered with plastic tape meeting requirements of ASTM C1047.
- D. Furring Channels:
 - 1. Quality Standards:
 - a. Walls: Galvanized DWFC-25.
 - b. Ceilings: Galvanized DWFC-20.
 - 2. Accessories as required by Manufacturer's fire tests to provide necessary fire ratings.
- E. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced. Thickness: 2 inch.
- F. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant. Supplied and installed in accordance with ASTM Standards. Including but not limited to ASTM C919-19; do not use solvent-based non-curing butyl sealant.
- G. Finishing Accessories: ASTM C1047, extruded aluminum alloy (6063 T5) or galvanized steel sheet ASTM A924/A924M G90, unless noted otherwise.
 - 1. Types: As detailed or required for finished appearance.
 - 2. Special Shapes: In addition to conventional corner bead and control joints, provide U-bead at exposed panel edges.
- H. Beads, Joint Accessories, and Other Trim: ASTM C1047, rigid plastic, galvanized steel, or rolled zinc, unless noted otherwise.
 - 1. Expansion Joints:
 - a. Type: V-shaped metal with factory-installed protective tape.
- I. Joint Materials: Best grade or ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
 - 1. Paper Tape: 2 inch wide, creased paper tape for joints and corners, except as otherwise indicated.
 - 2. Joint Reinforcing:
 - a. Paper reinforcing tape acceptable to Gypsum Board Manufacturer.
 - 3. Joint Compound: Drying type, vinyl-based, ready-mixed. Best grade or type recommended by Board Manufacturer and meeting requirements of ASTM C475/C475M.
 - a. Use Taping Compound for first coat to embed tape and accessories.
 - b. Use Taping Compound or All-Purpose Compound for subsequent coats except final coat.
 - c. Use Finishing Compound for final coat and for skim coat.
- J. Finishing Compound: Surface coat and primer, takes the place of skim coating.
- K. High Build Drywall Surfer: Vinyl acrylic latex-based coating for spray application, designed to take the place of skim coating and separate paint primer in achieving Level 5 finish.

1. Products:
 - a. Sheetrock First Coat by USG.
 - b. Prep Coat by Westpac Materials.
 - c. Level Coat by Magnum Products.
 - d. Equal as approved by Architect before bidding. See Section 01 6200.
- L. Primer / Surfacers On Surfaces To Receive Texturing:
 1. Acceptable Products:
 - a. Sheetrock First Coat by USG.
 - b. Prep Coat by Westpac Materials.
 - c. Level Coat by Magnum Products.
 - d. Equal as approved by Architect before bidding. See Section 01 6200.
- M. Textured Finish Materials: Latex-based compound; plain.
 1. Products:
 - a. ProForm Perfect Spray EM/HF by National Gypsum.
 - b. Sheetrock Wall & Ceiling Texture by US Gypsum.
- N. Fasteners:
 1. Bugle head screws meeting requirements of ASTM C1002:
 - a. Gypsum Board:
 - 1) Type W: For fastening gypsum board to wood members, of length to penetrate wood framing 5/8 inch (15.9 mm) minimum.
 - 2) Type S: For fastening gypsum board to steel framing and ceiling suspension members, of length to penetrate steel framing 3/8 inch (9.5 mm) minimum.
- O. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.
- P. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion-resistant.
- Q. Screws for Fastening Gypsum Sheathing: Bugle head screws as recommended by Sheathing Manufacturer and meeting requirements of ASTM C1002, corrosion resistant treated.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that project conditions are appropriate for work of this section to commence.
- B. Examine gypsum board before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Notify Architect of unsuitable conditions in writing.
 1. Do not install board over unsuitable conditions.
- D. Commencement of Work by installer is considered acceptance of substrate.

3.02 ACOUSTIC ACCESSORIES INSTALLATION

- A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.
- B. Sound Isolation Tape: Apply to vertical studs and top and bottom tracks/runners in accordance with manufacturer's instructions.
- C. Acoustic Sealant: Install in accordance with manufacturer's instructions.
 1. Place one bead continuously on substrate before installation of perimeter framing members.
 2. Place continuous bead at perimeter of each layer of gypsum board.

- 3. Seal around all penetrations by conduit, pipe, ducts, and rough-in boxes, except where firestopping is provided.
- D. Acoustical Shielding: Install in accordance with manufacturer's instructions for application between studs and gypsum board.
- E. Installation shall comply with ASTM C919-19

3.03 BOARD INSTALLATION

- A. Interface With Other Work:
 - 1. Coordinate with Division 06 for location of backblocking for edges and ends of gypsum board and for blocking required for installation of equipment and building specialties.
 - 2. Do not install gypsum board until required blocking is in place.
- B. General: Install and finish as recommended in ASTM C840 or GA-216 unless specified otherwise in this Section.
- C. Mounting Accessories:
 - 1. Furring Channels: Apply with screws through flanges into each framing member.
- D. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.
- E. Single-Layer Nonrated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.
 - 1. Exception: Tapered edges to receive joint treatment at right angles to framing.
- F. Fire-Resistance-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.
- G. Exposed Gypsum Board in Interior Wet Areas: Seal joints, cut edges, and holes with water-resistant sealant.
- H. Interior Gypsum Board:
 - 1. General:
 - a. Install so trim and reinforcing tape are fully backed by gypsum board. No hollow spaces between pieces of gypsum board over 1/8 inch (3 mm) wide before taping are acceptable.
 - b. Rout out backside of gypsum board to accommodate items that extend beyond face of framing, but do not penetrate face of gypsum board, such as metal door frame mounting brackets, etc.
 - c. On walls over 108 inches (2 700 mm) high, apply board perpendicular to support.
 - d. Butt edges in moderate contact. Do not force in place. Shim to level.
 - e. Leave facings true with joint, finishing flush. Vertical work shall be plumb and ceiling surfaces level.
 - f. Scribe work closely:
 - 1) Keep joints as far from openings as possible.
 - 2) If joints occur near an opening, apply board so vertical joints are centered over openings.
 - 3) No vertical joints shall occur within 8 inches (200 mm) of external corners or openings.
 - g. Install board tight against support with joints even and true. Tighten loose screws.
 - h. Caulk perimeter joints in sound insulated rooms with specified acoustical sealant.
 - 2. Ceilings:
 - a. Apply ceilings first using minimum of two (2) men.
 - b. Use board of length to give minimum number of joints.
 - c. Apply board perpendicular to support.
 - d. Chapel and Cultural Hall:

- 1) Single Layer Application:
 - (a) Stagger end joints:
 - (1) End and edge joints of board applied on ceilings shall occur over framing members or be back blocked with 2x4 (38 mm by 89 mm) blocking.
 - (2) Edge joints of board vertically applied on walls shall occur over framing members.
 - (3) 2x4 (38 mm by 89 mm) blocking is required at wall to ceiling transitions and at top of ceiling vault transitions.
3. Fastening:
 - a. Apply from center of board towards ends and edges.
 - b. Apply screws 3/8 inch (9.5 mm) minimum from ends and edges, one inch (25 mm) maximum from edges, and 1/2 inch (13 mm) maximum from ends.
 - c. Spacing:
 - 1) Ends: Screws not over 7 inches (175 mm) on center at edges where blocking or framing occurs.
 - 2) Wood Framed Walls And Ceilings: Screws 7 inches (175 mm) on center in panel field.
 - 3) Metal Framed Walls: Screws 12 inches (300 mm) on center in panel field.
 - d. Set screw heads 1/32 inch (0.8 mm) below plane of board, but do not break face paper. If face is accidentally broken, apply additional screw 2 inches (50 mm) away.
 - e. Screws on adjacent ends or edges shall be opposite each other.
 - f. Drive screws with shank perpendicular to face of board.
4. Trim:
 - a. Corner Beads:
 - 1) Attach corner beads to outside corners.
 - (a) Attach metal corner bead with staples spaced 4 inches (100 mm) on center maximum and flat taped over edges of corner bead. Also, apply screw through edge of corner bead where wood trim will overlay corner bead.
 - (b) Set paper-faced trim in solid bed of taping compound.
 - b. Edge Trim: Apply where gypsum board abuts dissimilar material. Hold channel and 'L' trim back from exterior window and door frames 1/8 inch (3 mm) to allow for caulking.
- I. Installation on Metal Framing: Use screws for attachment of gypsum board except face layer of nonrated double-layer assemblies, which may be installed by means of adhesive lamination.
- J. Installation on Wood Framing: For rated assemblies, comply with requirements of listing authority. For nonrated assemblies, install as follows:
 1. Single-Layer Applications: Screw attachment.

3.04 INSTALLATION OF TRIM AND ACCESSORIES

- A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
 1. Not more than 30 feet apart on walls and ceilings over 50 feet long.
 2. At exterior soffits, not more than 30 feet apart in both directions.
- B. Corner Beads: Install at external corners, using longest practical lengths.
- C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.
- D. Decorative Trim: Install at locations shown on drawings and in accordance with manufacturer's instructions.
- E. Exterior Soffit Vents: Install according to manufacturer's written instructions and in locations indicated on drawings. Provide vent area specified.

3.05 JOINT TREATMENT

- A. Glass Mat Faced Gypsum Board and Exterior Glass Mat Faced Sheathing: Use fiberglass joint tape, embed and finish with setting type joint compound.
- B. Paper Faced Gypsum Board: Use paper joint tape, embed with drying type joint compound and finish with drying type joint compound.
- C. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
 - 1. Gypsum Board Surfaces not painted or finished:
 - a. GA-214 Level 1: 'All joints and interior angles shall have tape set in joint compound. Surface shall be free of excess joint compound. Tool marks and ridges are acceptable'.
 - 2. Gypsum Board Surfaces to Receive: Painted Texturing - Section 09 9413: 'Interior Textured Finishing':
 - a. GA-214 Level 4: 'All and interior angles shall have tape embedded in joint compound and two separate coats of joint compound applied over all flat joints and one separate coat of joint compound applied over interior angles. Fastener heads and accessories shall be covered with three separate coats of joint compound. All joint compound shall be smooth and free of tool marks and ridges. Coat prepared surface with specified primer'.
 - 3. Gypsum Board Surfaces to Receive: Smooth Gypsum Board Surfaces:
 - a. GA-214 Level 4: 'All and interior angles shall have tape embedded in joint compound and two separate coats of joint compound applied over all flat joints and one separate coat of joint compound applied over interior angles. Fastener heads and accessories shall be covered with three separate coats of joint compound. All joint compound shall be smooth and free of tool marks and ridges. Coat prepared surface with specified primer'.
- D. Finishing:
 - 1. General:
 - a. Tape and finish joints and corners throughout building as specified below to correspond with final finish material to be applied to gypsum board. When sanding, do not raise nap of gypsum board face paper or paper-faced trim.
 - b. First Coat:
 - 1) Apply tape over center of joint in complete, uniform bed of specified taping compound and wipe with a joint knife leaving a thin coating of joint compound. If metal corner bead is used, apply reinforcing tape over flange of metal corner bead and trim so half of tape width is on flange and half is on gypsum board.
 - 2) Completely fill gouges, dents, and fastener dimples.
 - 3) Allow to dry and sand lightly if necessary to eliminate high spots or excessive compound.
 - c. Second Coat:
 - 1) Apply coat of specified joint compound over embedded tape extending 3-1/2 inches (88 mm) on both sides of joint center. Use finishing compound only if applied coat is intended as final coat.
 - 2) Re-coat gouges, dents, and fastener dimples.
 - 3) Allow to dry and sand lightly to eliminate high spots or excessive compound.
 - d. Third Coat: Apply same as second coat except extend application 6 inches (150 mm) on both sides of joint center. Allow to dry and sand with fine sandpaper or wipe with damp sponge.
 - e. Fourth Coat: Apply same as second coat except extend application 9 inches (425 mm) on both sides of joint center. Allow to dry and sand with fine sandpaper or wipe with damp sponge.

3.06 TEXTURE FINISH

- A. Apply finish texture coating in accordance with manufacturer's instructions and to match approved sample.
- B. Location:
 - 1. Walls:
 - a. Holy Smooth Texture (or as approved by architect):
 - 1) All areas except those listed in following paragraph.
 - b. Smooth:
 - 1) Mechanical Rooms, Storage Rooms, and other Utility Areas.
 - 2. Ceilings:
 - a. Smooth Texture (or as approved by architect):
- C. Finishing:
 - 1. Texture:
 - a. After gypsum board is taped, sanded, and primed, apply texture. Closely match samples accepted by Architect.
 - 1) 1) After wall has been textured, apply priming and paint as specified in Section 09 9123.
 - 2. Holy Smooth:
 - a. A low profile drywall texture created by skimming a thin flat layer of drywall mud over a well-prepared drywall surface while not allowing the drywall mud to cover the entire area. Applied with approximately 80% coverage.
 - 3. Smooth:
 - a. No applied texture is required. Apply priming and paint as specified in Section 09 9123.

3.07 FIELD QUALITY CONTROL

- A. Non-Conforming Work:
 - 1. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 - a. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - b. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

3.08 TOLERANCES

- A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

3.09 CLEANING

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

END OF SECTION 09 2116

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**SECTION 09 2216
NON-STRUCTURAL METAL FRAMING**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Metal partition, ceiling, and soffit framing.
- B. Framing accessories.

1.02 REFERENCE STANDARDS

- A. AISI S220 - North American Standard for Cold-Formed Steel Nonstructural Framing 2020.
- B. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures Most Recent Edition Cited by Referring Code or Reference Standard.
- C. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire 2019.
- D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2022.
- E. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members 2015.
- F. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable 2021a.
- G. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings 2022.
- H. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels 2019.
- I. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products 2020.
- J. ASTM C841 - Standard Specification for Installation of Interior Lathing and Furring 2003 (Reapproved 2018).
- K. ASTM C1513 - Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections 2018.
- L. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions 2022.
- M. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials 2022.
- N. UL 263 - Standard for Fire Tests of Building Construction and Materials Current Edition, Including All Revisions.
- O. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conferences:
 - 1. Schedule pre-installation conference to be held after submittals have been reviewed and returned by Architect, but before beginning metal framing work.
 - 2. In addition to agenda items specified in Section 01 3000, review following:
 - a. Identify location of required blocking.
- B. Coordination:
 - 1. Coordinate layout of suspension system with other construction that penetrates ceilings or is supported by them, including drywall furring, light fixtures, HVAC equipment, and fire-suppression systems.

2. All work above ceiling should be completed prior to installing suspended system. There should be no materials resting against or wrapped around suspension system, hanger wires or ties.

1.04 SUBMITTALS

- A. Shop Drawings:
 1. Indicate prefabricated work, component details, stud layout, framed openings, anchorage to structure, acoustic details, type and location of fasteners, accessories, and items of other related work.
 2. Describe method for securing studs to tracks, splicing, and for blocking and reinforcement of framing connections.
 3. Seismic Design Categories D, E and F:
 - a. Manufacturer's details and installation instructions for seismic bracing. If requested, provide copy of code requirements applicable to Project.
- B. Product Data: Provide data describing framing member materials and finish, product criteria, load charts, and limitations.
- C. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.
- D. Product Data: Provide Manufacturer's technical literature on suspension system including listing dimensions, load carrying capacity and standard compliance.
- E. Samples:
 1. Minimum 8 inch long samples of suspension system components, including main runner/tee and cross runner/tee with couplings.
- F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- G. Certificates:
 1. Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards.
 2. Installer's certificates of training.

1.05 QUALITY ASSURANCE

- A. Qualifications. Requirements of Section 01 4301 applies, but not limited to following:
 1. Installer:
 - a. Installer training ('Ceiling Masters' training course or equivalent).
 2. Manufacturer:
 - a. Manufacturer in good standing of CISCA (Ceiling and Interior Systems Construction Association).
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience and approved by manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

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

1.07 WARRANTY

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

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Metal Framing, Connectors, and Accessories:
 - 1. CEMCO: www.cemcosteel.com/#sle.
 - 2. ClarkDietrich: www.clarkdietrich.com/#sle.
 - 3. Any member of Steel Framing Industry Association (SFIA).
 - 4. Any member of Steel Stud Manufacturer's Association (SSMA).
 - 5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FRAMING MATERIALS

- A. Framing:
 - 1. General:
 - a. 20 gauge minimum, unless noted greater on Drawings, meeting requirements of ASTM C645.
 - b. Steel Sheet Components: Comply with ASTM C645 requirements for metal unless otherwise indicated.
 - c. Steel Coating Requirement: Comply with ASTM C645 roll-formed from hot dipped galvanized steel complying with ASTM A1003/A1003M and/or ASTM A653/A653M G40 (Z120) or equivalent corrosion resistant coating. A40 galvanized products are not acceptable.
 - 1) Coatings shall demonstrate equivalent corrosion resistance with evaluation report from approved testing agency.
 - 2. Steel Studs and Runners: Cold-formed galvanized steel C-studs, as per ASTM C645 for conditions indicated.
 - 3. Bridging, blocking, strapping, and other accessories shall be as described in Contract Documents or as required by Manufacturer's system.
 - 4. Acceptable Products:
 - a. 362DS20P by CEMCO.
 - b. ProSTUD 20 by ClarkDietrich Building Systems.
 - c. 20 Ga 3-5/8 SS Series by Steeler Inc.
 - d. Any member of Steel Framing Industry Association (SFIA).
 - e. Any member of Steel Stud Manufacturer's Association (SSMA).
 - f. Equal as approved by Architect before bidding. See Section 01 6200.
- B. Furring Channels:
 - 1. Hat Shaped Channels: ASTM C645; 25 gauge corrosion resistant steel in sizes shown on Drawings.
 - 2. 'Z' Shaped Channels: 20 gauge minimum corrosion resistant steel in sizes shown on Drawings.
- C. Firestop Tracks:
 - 1. Top runner manufactured to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
- D. Headers and Jambs - Heavy-Duty Stud:
 - 1. Shape used to form header beams and jambs, columns or posts, of web depths indicated, unpunched, with stiffened flanges.
- E. Fasteners:
 - 1. Corrosion resistant coated, self-drilling, self-threading steel drill screws complying with ASTM C1513.
- F. Non-Loadbearing Framing Accessories:
 - 1. Sill Sealer: Closed-cell polyethylene foam, 1/4 inch thick by width of plate.

2.03 METAL SUSPENSION SYSTEM

- A. All system components conform to ASTM standards.
- B. Fire-Resistance Rating: UL approved metal suspension system.
- C. Seismic Standard: Acoustical ceilings shall be designed and installed to withstand effects of earthquake motions according to following requirements:
 - 1. CISCA's Recommendations for Acoustical Ceilings: Comply with CISCA's 'Recommendations for Direct-Hung Acoustical Tile and Lay-in Panel Ceilings-Seismic Zones 0-2' (Apply to Seismic Categories A & B).
 - 2. CISCA's Guidelines for Systems Requiring Seismic Restraint: Comply with CISCA's 'Guidelines for Seismic Restraint of Direct-Hung Suspended Ceiling Assemblies-Seismic Zones 3 & 4' (Apply to Seismic Categories C, D, E & F).
 - 3. Seismic Design Categories D, E and F:
 - a. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E580/E580M.
 - b. Meet seismic bracing requirements of ASCE 7, ASTM C635/C635M and ASTM C636/C636M or equivalent governing standard for project site.
- D. Manufacturers:
 - 1. Acceptable Systems:
 - a. Drywall Grid by Armstrong World Industries, Lancaster, PA
www.armstrongceilings.com.
 - b. Drywall Grid System by Chicago Metallic Corporation, Chicago, IL
www.chicagometallic.com.
 - c. Drywall Suspension System - Flat Ceilings by USG, Chicago, IL www.usg.com.
 - d. Equal as approved by Architect before bidding. See Section 01 6000.
- E. Components:
 - 1. Main Runners/Tee and Cross Runners/Tee:
 - a. Heavy-duty in accordance with ASTM C635/C635M.
 - b. Cold-formed from ASTM A653/A653M, CS Type B steel and hot dipped galvanized G-40 coating for interior ceilings.
 - c. Double-Web construction.
 - 2. Wall Track/Molding.
 - 3. Fasteners:
 - a. Nails are not permitted when subjected to direct tension such as installed vertically into bottom of structural member.
 - b. Metal attachment:
 - 1) Acoustical Eye Lag Screws:
 - (a) 1/4 inch (6.4 mm) screws zinc coated with self-drilling or self-piercing sharp point.
 - c. Wood attachment:
 - 1) Acoustical Eye Lag Screws:
 - (a) 3 inch (76 mm) x 1/4 inch (6.4 mm) screws zinc coated for wood joists with Type 17 self-drilling point.
 - d. Wire Tie to Metal Structural Member attachment:
 - 1) Wire wrapped to structural member with pigtail knot with three (3) tight wraps within 3 inch (76 mm) length at top connection.
 - 4. Hanger Wires, Braces, and Ties:
 - a. Zinc-Coated, carbon-steel wire meeting requirements of ASTM A641/A641M, Class 1 zinc coating, soft temper.
 - b. Size:
 - 1) Standard size: 12 gauge (0.105 inch) (2.70 mm) galvanized, soft annealed steel wire.
 - 2) Select wire diameter so its stress is less than yield when loaded at three (3) times hanger design load (ASTM C635/C635M), Table 1, 'Direct Hung') will be

- less than yield stress of wire, but provide not less than 12 gauge (0.105 inch) (2.70 mm).
- c. Protect with rust inhibitive paint.
- 5. Seismic Joint Clip:
 - a. Required for Seismic Design Categories D, E and F.
 - 1) Quality Standard Product:
 - (a) SJCG by Armstrong.
 - (b) Equal as approved by Architect before bidding. See Section 01 6000.
- 6. Compression Posts/Struts:
 - a. Required for Seismic Design Categories D, E and F.
 - 1) Meet seismic requirements for Project.

2.04 FABRICATION

- A. Fabricate assemblies of framed sections to sizes and profiles required.
- B. Fit, reinforce, and brace framing members to suit design requirements.
- C. Fit and assemble in largest practical sections for delivery to site, ready for installation.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that rough-in utilities are in proper location.

3.02 INSTALLATION OF STUD FRAMING

- A. Comply with requirements of AISI S220.
- B. Extend partition framing to structure where indicated and to ceiling in other locations.
- C. Verification Of Conditions:
 - 1. Inspect area receiving suspension system to identify conditions which will adversely affect installation.
 - a. Work trades work to be thoroughly dry and complete prior to installation.
 - b. Verify weather tightness of area to receive suspension system prior to installation.
 - 2. Notify Architect of unsuitable conditions in writing.
 - a. Do not install suspension system until adverse conditions have been remedied.

3.03 INSTALLATION

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

3.04 CEILING AND SOFFIT FRAMING AND FURRING

- A. Comply with requirements of ASTM C754.
- B. Install furring after work above ceiling or soffit is complete. Coordinate the location of hangers with other work.
- C. Install furring independent of walls, columns, and above-ceiling work.
- D. Securely anchor hangers to structural members or embed them in structural slab. Space hangers as required to limit deflection to criteria indicated. Use rigid hangers at exterior soffits.

3.05 INSTALLATION OF METAL SUSPENSION SYSTEM

- A. Interface With Other Work:
 - 1. All work above ceiling should be completed prior to installing suspended ceiling system including related work including: drywall furring work, acoustical tile, light fixtures, mechanical systems, electrical systems, and sprinklers.
- B. General:
 - 1. Install suspension system in accordance with Manufacturer's written instructions, and in compliance with ASTM installation standard, and applicable codes as required by AHJ with modifications listed below except where Manufacturer's instructions are more stringent:
 - a. Main runners/tees hanger wires 48 inches (1 200 mm) on center maximum.
 - b. Cross runners/tees hanger wires 24 inches (600 mm) on center maximum.
 - c. Do not kink, twist, or bend hanger wires as a means of leveling assembly.
 - d. Do not attach suspension system to adjustable folding partition headers.
 - 2. Hanger Wires:
 - a. Install hanger wire to structure as required with necessary on center spacing to support expected ceiling load requirements, following local practices, codes and regulations. Attach with pigtail knot with three (3) tight wraps within 3 inch (76 mm) length at each end.
 - b. Provide additional wires at light fixtures, grilles, and access doors where necessary by appropriate method in accordance with industry accepted practice.
 - c. Additional Hanger Wires: Wrapped tightly three (3) full turns within 3 inch (76 mm) length to structure and component at locations where imposed loads could cause deflection exceeding 1/360 span.
- C. Seismic:
 - 1. Required for Seismic Design Categories D, E and F:
 - a. Installation must be in accordance with ASCE 7.

3.06 TOLERANCES

- A. Maximum Variation From True Position: 1/8 inch in 10 feet.
- B. Maximum Variation From Plumb: 1/8 inch in 10 feet.
- C. Distances between parallel walls shall be 1/4 inch (6 mm) maximum along length and height of wall.
- D. Main Runners/Tees:
 - 1. Installed and leveled to meet IBC requirements to within 1/4 inch (6.4 mm) in 10 foot (3.05 m) with supporting wire taut to prevent any subsequent downward movement of main runners when ceiling loads are imposed.
 - 2. At curved ceilings, install faceted main beams with same bend at each joint to achieve consistent ceiling arch across entire ceiling.
- E. Cross Runners/Tees:
 - 1. Main runners, or other cross runners, must support cross runners to within 1/32 inch (0.8 mm) of required center-to-center spacing. This tolerance must be noncumulative beyond 12 feet (3.60 m).
 - 2. Intersecting runners must be installed to form right angle to supporting members.

3.07 FIELD QUALITY CONTROL**A. Field Inspections:****1. Inspect:**

- a. Suspended ceiling system.
- b. Hanger wires, braces, ties, anchors and fasteners.
- c. Curved ceiling framing prior to installation of gypsum board.

B. Non-Conforming Work:

- 1. Remove and replace defective materials at no additional cost to Owner.

END OF SECTION

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**SECTION 09 5100
ACOUSTICAL CEILINGS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Suspended metal grid ceiling system.
- B. Acoustical units.

1.02 REFERENCE STANDARDS

- A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures Most Recent Edition Cited by Referring Code or Reference Standard.
- B. ASHRAE Std 62.1-2013 - Ventilation for Acceptable Indoor Air Quality 2013.
- C. ASTM A568/A568M - Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for 2019a.
- D. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire 2019.
- E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2022.
- F. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method 2022.
- G. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings 2022.
- H. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels 2019.
- I. ASTM D610 - Standard Practice for Evaluating Degree of Rusting on Painted Steel Surfaces 2008 (Reapproved 2019).
- J. ASTM D1779 - Standard Specification for Adhesive for Acoustical Materials 1998.
- K. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber 2021.
- L. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2022.
- M. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials 2022.
- N. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions 2022.
- O. ASTM E795 - Standard Practices for Mounting Test Specimens During Sound Absorption Tests 2016.
- P. ASTM E1111/E1111M - Standard Test Method for Measuring the Interzone Attenuation of Open Office Components 2014 (Reapproved 2022).
- Q. ASTM E1264 - Standard Classification for Acoustical Ceiling Products 2022.
- R. ASTM E1414/E1414M - Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum 2021a.
- S. ASTM E1477 - Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers 1998a (Reapproved 2022).
- T. NFPA 101 - Life Safety Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- U. NFPA 265 - Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Textile or Expanded Vinyl Wall Coverings on Full Height Panels and Walls 2019.

- V. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conferences:
1. Participate in pre-installation conference specified in Section 09 2900 to review finish requirements for gypsum wallboard ceilings.
 2. Schedule acoustical tile ceiling pre-installation conference after installation of gypsum wallboard but before beginning installation of tile.
 3. In addition to items specified in Section 01 3100, review following:
 - a. Verify that tile comes from same dye lot and has same dye lot code.
 - b. Review requirements of acceptable and non-acceptable tile.
- B. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.
- C. Do not install acoustical units until after interior wet work is dry.
- D. Coordination:
1. Coordinate layout of suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, and fire-suppression systems.
 2. All work above ceiling should be completed prior to installing suspended system. There should be no materials resting against or wrapped around suspension system, hanger wires or ties.

1.04 SUBMITTALS

- A. Product Data: Provide data on suspension system components and acoustical units.
- B. Samples: Submit two samples 6 by 6 inch in size illustrating material and finish of acoustical units.
- C. One (1) sample of each variant of specified tile series.
- D. Minimum 8 inch (200 mm) long samples of exposed wall molding and suspension system, including main runner/tee and cross runner/tee with couplings.
- E. Manufacturer's certifications that products comply with specified requirements including laboratory reports showing compliance with specified tests and standards. For acoustical performance, each carton of material must carry approved independent laboratory classification of NRC, CAC, and AC.
- F. Certificates:
1. Installer(s):
 - a. Provide each Installer's 'Certificate of Completion - Duratile' from Manufacture showing Name and completion date with bid to be included in closing documents for project.
 - 1) Certificate is valid for two (2) years from date printed on Certificate before recertification is required.
 2. Suspension Assemblies:
 - a. Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards.
 - b. Installer's certificates of training.
- G. If requested by Owner, provide copies of Quality Assurance requirements for 'Class A' flame spread rating and 'Room-Corner Test'.
- H. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- I. Closeout Submittals:

1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Warranty Documentation:
 - 1) Final, executed copy of Warranty.
 - b. Record Documentation:
 - 1) Manufacturers Documentation:
 - (a) Manufacturer's literature.
 - (b) Color and pattern selection.
2. Installer(s) 'Certificate of Completion - Duratile' submitted at time of bid.
- J. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 1. Extra Acoustical Units: Provide Owner with two (2) cartons of each pattern and color used on Project for future use.
 - a. Packaged with protective covering for storage and identified with appropriate labels.
 2. Acoustical Tile: Provide Owner with six (6) cartons of each type of tile with same dye lot code.

1.05 QUALITY ASSURANCE

- A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. Regulatory Agency Sustainability Approvals:
 1. All system components conform to ASTM standards.
 2. Fire-Resistance Rating: UL approved metal suspension system.
- C. Acoustical Panel Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Acoustical Tile Unit Manufacturer Qualifications:
 1. Installer: Requirements of Section 01 4301 applies, but not limited to following:
 - a. Minimum five (5) years satisfactorily completed projects of comparable quality, similar size, and complexity including a minimum of three (3) years of experience in glue-up ceiling tile installations and shall have satisfactorily completed glue-up installation(s) within in past three (3) years before bidding.
 - b. Review, understand, and comply Installer Qualifications and submitted 'Duratile' published installation recommendations provided by Manufacturer:
 - 1) Contact Armstrong CSA customer service center at (800) 442-4212 to obtain and review compliance package on Duratile prior to bidding.
 - 2) This requirement may be waived by Owner, if Installer has previously complied with Installer Qualification requirements and can document at least two (2) satisfactorily completed projects of comparable size using Armstrong 12 inch x 12 inch (300 mm x 300 mm) ceiling tile for glue-up within past three (3) years prior to bidding.
 - 3) Installer shall note complete compliance with Qualification requirements on submitted bid form.
 - 4) Submit qualification documentation unless waived by Owner.
 - c. Agree to complete and pass 'Duratile Personal Learning Module' (Certificate required for all Installer(s) for Church projects). Certification valid for two (2) years:
 - 1) Go to <http://www.armstrong.com/commceilingsna/#>.
 - 2) Click on My Armstrong Upper Right hand Corner.
 - 3) First time users: Click on 'Register' button and provide all appropriate information for username and password (you must register as a contractor to have access to 'ELearning System').
 - 4) Under My Armstrong Functions (left hand side), click on 'ELearning System'.
 - 5) Click on 'Duratile Video'.
 - 6) Watch video and take Quiz (10 questions). Passing grade required for certificate.
 - 7) Print Certificate.

- 8) Certificate must be submitted with Bid.
- 9) Submit 'Certificate of Completion - Duratile'. Required for all projects and may not be waived by Owner.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Acceptance Requirements:
 1. Materials shall be delivered in original, unopened packages with labels intact.
- B. Storage And Handling Requirements:
 1. Store materials where protected from moisture, direct sunlight, surface contamination, and damage.
 2. Store in cool, dry location, out of direct sunlight and weather, and at temperatures between 32 deg F (0 deg C) and 86 deg F (30 deg C).
 3. Store adhesive on site at installation temperature, between 65 and 90 deg F (18 and 32 deg C), for one week before installation.
 4. Handle acoustical ceiling panels carefully to avoid chipping edges or damage. Use no soiled, scratched, or broken material in the Work.

1.07 FIELD CONDITIONS

- A. Ambient Conditions:
 1. Building shall be enclosed, mechanical system operating with proper filters in place, and temperature and humidity conditions stabilized within limits under which Project will operate before, during, and after installation until Substantial Completion.
 2. Installation shall be at temperatures between 50 deg F (10 deg C) and 86 deg F (30 deg C) or as per Manufacturer recommendations.
- B. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

1.08 WARRANTY

- A. Acoustical Ceiling Panels:
 1. Manufacturers warranty to be free from defects in material and factory workmanship.
 2. Manufacturer's warranty against sagging and warping.
 3. Manufacturer's warranty against mold/mildew and bacterial growth.
- B. Acoustical Tile:
 1. Provide manufacturer's ten (10) year limited system warranty for the following:
 - a. Manufacturer's warranty to be free from defects in material and factory workmanship.
 - b. Manufacturer's warranty against sagging and warping.
 - c. Manufacturer's warranty against mold/mildew and bacterial growth.
- C. Suspension Assemblies:
 1. Manufacturer warranty including repair or replacement of rusting as defined by ASTM D610 and defects in material or factory workmanship.

PART 2 PRODUCTS

2.01 REGULATORY AGENCY SUSTAINABILITY APPROVALS

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

1. Room Corner Tests:
 - a. ASTM E84, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
 - b. IBC 803.2.1, 'Room Corner Test for Interior Wall or Ceiling Finish Materials'.
 - c. NFPA 265: 'Room Corner Test for Interior Wall or Ceiling Finish Materials'.
 - d. UL 723, 'Standard for Safety Test for Surface Burning Characteristics of Building Materials'.
- C. All system components conform to ASTM standards.
- D. Fire-Resistance Rating: UL approved metal suspension system.
- E. Meet seismic bracing requirements of ASCE 7, ASTM C635/C635M and ASTM C636/C636M or equivalent governing standard for project site.
- F. Seismic Standard: Acoustical ceilings shall be designed and installed to withstand the effects of earthquake motions according to the following:
 1. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E580/E580M.
 2. CISCA's Recommendations for Acoustical Ceilings: Comply with CISCA's 'Recommendations for Direct-Hung Acoustical Tile and Lay-in Panel Ceilings-Seismic Zones 0-2' (Apply to Seismic Categories A & B).
 3. CISCA's Guidelines for Systems Requiring Seismic Restraint: Comply with CISCA's 'Guidelines for Seismic Restraint of Direct-Hung Suspended Ceiling Assemblies-Seismic Zones 3 & 4' (Apply to Seismic Categories C, D, E & F).

2.02 MANUFACTURERS

- A. Acoustic Ceiling Panels: Manufacturers Contact List:
 1. Armstrong World Industries, Lancaster, PA www.ceilings.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.
- B. Acoustic Tile: Manufacturers:
 1. Manufacturer Contact List:
 - a. Armstrong World Industries, Strategic Accounts, Lancaster, PA www.ceilings.com.
 - 1) For pricing and ordering of tile, contact Sherry Brunt, Phyllis Miller, or Beth Rinehart at (800) 442-4212, or Armstrongcsa@armstrong.com.
 - 2) For Strategic Account information, contact Deborah Pickens at (480) 695-9053 dpickens@armstrong.com.
 - b. Franklin International, Inc., Columbus, OH www.titebond.com.

2.03 ACOUSTICAL PANEL UNITS

- A. Acoustic Ceiling Panels:
 1. Description:
 - a. Color: White (surface factory-applied).
 - b. Composition: Wet-formed mineral fiber.
 2. Design Criteria:
 - 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.
- B. Wide Face Design:
 - 1. Design Criteria:
 - a. Grid Face: 15/16 inch (24 mm).
 - b. Size: 24 inch x 24 inch x 3/4" (610 mm x 610 mm x 19 mm).
 - c. Edge profile: Square.
 - 2. Acceptable Product:
 - a. Fine Fissured item 1713 by Armstrong:
 - 1) Grid System: Prelude XL Exposed Tee.
 - 2) Edge Profile: Square Lay-in.
 - b. Radar ClimaPlus Open Plan item 22320 by USG:
 - 1) Grid System: DX/DXL Exposed Tee.
 - 2) Edge Profile: Square.
 - c. Equal as approved by Architect before bidding. See Section 01 6200.

2.04 ACOUSTICAL TILE UNITS

- A. Materials:
 - 1. Description:
 - a. Size: 3/4 inch (19 mm) thick minimum by 12 inches (300 mm) square.
 - b. Color: White.
 - c. Grid Face: Tile glue-up.
 - d. Surface Finish: Factory-applied.
 - e. Wet-formed high density mineral fiber.
 - 2. Design Criteria:
 - a. Meet requirements of ASTM E1264, Type III (mineral base with painted finish), Form water felted), Pattern CE (perforated, small holes – lightly textured), Fire Class A.
 - b. Acoustics:
 - 1) Noise Reduction Coefficient (Rating expressed according to ASTM E1284 requirements:
 - (a) NRC rating: 60 minimum.
 - 2) CAC rating: 35 minimum.
 - c. Anti Mold / Mildew:
 - 1) Resistance against growth of mold/mildew.
 - d. Durable:
 - 1) Impact-resistant.
 - 2) Scratch-resistant.
 - e. Tongue and Groove.
 - f. Finish:
 - 1) Abuse-resistant/durable, factory applied vinyl latex paint.
 - g. Fire Performance:
 - 1) Panels meet ASTM E84 or UL 723 Type 1 surface burning characteristics.
 - h. High Recycled Content (HRC): Classified as containing greater than 50 percent total recycled content.
 - i. Light Reflectance (LR): 0.86 Average (Range of 0.84 to 0.88).
 - j. Sag Resistance:
 - 1) Resistance to sagging in high humidity conditions up to, but not including, standing water and outdoor applications.
 - k. Texture: Embossed texture with fine fissuring and small perforations with natural variation in texture and color appearance between tile.
 - l. VOC Emissions:

- 1) Low formaldehyde: Contributing less than 13.5 ppb in typical conditions per ASHRAE Standard 62, 'Ventilation for Acceptable Indoor Air Quality'.
3. Approved Products. See Section 01 6200:
 - a. Durable Item No. MN80377 by Armstrong.

2.05 ACCESSORIES:

- A. Adhesive:
 1. Description:
 - a. For use on acoustical ceiling tiles.
 2. Design Criteria:
 - a. Meet requirements of ASTM D1779.
 - b. Meet NFPA Class A fire rating when tested in accordance with ASTM E84.
 - c. Fast grab and 'no sag' installation.
 - d. Water cleanup.
 - e. Not recommended for use on tiles larger than 12 inch x 12 inch (305 mm x 305 mm).
 3. Acceptable Products:
 - a. Titebond No. 2704 Solvent Free Acoustical Ceiling Tile Adhesive by Franklin International.
 - b. Highest quality of adhesive from manufacturer recommended by Tile Manufacturer as approved by Architect before use. See Section 01 6200.
- B. Edge Molding:
 1. Steel 'U' molding with baked enamel finish.
 2. Acceptable Products:
 - a. 7843 Series by Armstrong.
 - b. Equal as approved by Architect before installation. See Section 01 6200.

2.06 SUSPENSION SYSTEM(S)

- A. Manufacturers:
 1. Acceptable Manufacturers. See Section 01 6000:
 2. Acceptable Manufacturers:
 - a. Silhouette XL ¼ inch Reveal
 - 1) Armstrong World Industries Co, Lancaster, PA www.armstrong.com.
 - 2) Equal as approved by Architect before bidding. See Section 01 6000.
- B. Materials:
 1. Grid:
 - a. Systems shall meet requirements of ASTM C635/C635M, Intermediate Duty suspension system required for Seismic Design Categories A, B, or C.
 - b. Systems shall meet requirements of ASTM C635/C635M, Heavy Duty suspension system required for Seismic Design Categories D, E, or F.
 - c. Exposed surfaces shall be finished with factory-applied white baked enamel.
 - d. Meet requirements of ASTM D610 for red rust.
 - e. Main runners and cross tees:
 - 1) All main beams and cross tees shall be commercial quality hot-dipped galvanized (galvanized steel, aluminum, or stainless steel) as per ASTM A653/A653M. Main beams and cross tees are double-web steel construction with type exposed flange design.
 - 2) Wide-face design – main notched runners and slotted cross tees shall have 9/16 inch exposed face.
 2. Performance Standards:
 3. Wire Hangers, Braces, and Ties:
 - a. Zinc-Coated, carbon-steel wire meeting requirements of ASTM A641/A641M, Class 1 zinc coating, soft temper.
 - b. Size:

- 1) Standard size: 12 gauge (0.105 inch) (2.70 mm) galvanized, soft annealed steel wire.
- 2) Select wire diameter so its stress is less than yield when loaded at three (3) times hanger design load (ASTM C635/C635M), Table 1, 'Direct Hung') will be less than yield stress of wire, but provide not less than 12 gauge (0.105 inch) (2.70 mm).
- c. Protect with rust inhibitive paint.
4. Wall Molding: Channel section of cold-rolled electro-galvanized steel.
5. Edge Moldings and Trim: Metal or extruded aluminum of types and profiles indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations, including light fixtures, that fit type of edge detail and suspension system indicated. Provide moldings with exposed flange of same width as exposed runner.
6. Hold-down Clips: As required by UL to prevent lifting of panels under unusual draft conditions.
7. Seismic Joint Clip:
 - a. Required for Seismic Design Categories D, E, or F.
 - b. Quality Standard Product:
 - 1) SJCG by Armstrong World Industries, Lancaster, PA www.armstrong.com.
 - 2) Equal as approved by Architect before bidding. See Section 01 6000.
8. Seismic Suspension System:
 - a. Required for Seismic Design Categories A, B, C, D, E, or F:
 - b. Design Criteria:
 - 1) Installation of ceiling system must be as prescribed by ICC-ES Evaluation Reports ESR-1222 or ESR-1308 and applicable code.
 - 2) Meet requirements of ASTM A568/A568M for hot-dipped galvanized, cold-rolled steel.
 - 3) Attach cross runners to wall with seismic clips.
 - c. Wall Molding Size: 15/16 inch (22 mm) for all seismic design categories (code approved).
 - d. Acceptable Products. See Section 01 6000.
 - 1) 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.

2.07 ACCESSORIES:

- A. Adhesive:
 1. Description:
 - a. For use on acoustical ceiling tiles.
 2. Design Criteria:
 - a. Meet requirements of ASTM D1779.
 - b. Meet NFPA Class A fire rating when tested in accordance with ASTM E84.
 - c. Fast grab and 'no sag' installation.
 - d. Water cleanup.
 - e. Not recommended for use on tiles larger than 12 inch x 12 inch (305 mm x 305 mm).
 3. Acceptable Products:
 - a. Titebond No. 2704 Solvent Free Acoustical Ceiling Tile Adhesive by Franklin International.
 - b. Highest quality of adhesive from manufacturer recommended by Tile Manufacturer as approved by Architect before use. See Section 01 6200.
- B. Edge Molding:
 1. Steel 'U' molding with baked enamel finish.
 - a. Acceptable Products:
 - 1) 7843 Series by Armstrong.

- 2) Equal as approved by Architect before installation. See Section 01 6200.
- C. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.
 - D. Perimeter Moldings: Same metal and finish as grid.
 - E. Gypsum Board: Fire rated type; 5/8 inch thick, ends and edges square, paper faced.
 - F. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that layout of hangers will not interfere with other work.
- C. Inspect for defects in backing and support that are not acceptable.
 - 1. Examine areas around HVAC diffusers and light fixtures for tile installation problems.
 - 2. Examine ceiling for levelness. CISC 'Code of Practice' requires ceiling to be free of irregularities and be level to within 1/4 inch (6 mm) in 12 foot (305 mm).
 - 3. Examine substrate for any problems that will compromise adhesion of ceiling tile.
- D. Inspect for defects in support that are not acceptable.
 - 1. All wet work (concrete, painting, and etc.) must be completed and dry.
 - 2. Temperature conditions within Manufacturer's written recommendation.
 - 3. Verify weather tightness of area to receive suspension system prior to installation.
- E. Notify Architect of unsuitable conditions in writing.
 - 1. Do not install acoustical ceiling panels until defects in support or environmental conditions are corrected.
 - 2. Do not apply ceiling tile until defects in backing and support are corrected.

3.02 PREPARATION

- A. Materials shall be dry and clean at time of application.
- B. Follow Manufacturer recommendations for surface preparation:
 - 1. Substrate must be clean, free of grease and dirt, sound, smooth, even and level before applying tile to surface.
 - 2. Painted Surfaces: Avoid applying tile to newly painted ceiling.
 - 3. Materials shall be dry and clean at time of application.
- C. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at borders, and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.

3.03 INSTALLATION - SUSPENSION SYSTEM

- A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.
- B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360. Individual component deflection not to exceed 1/360 of span.
- C. Lay out system to a balanced grid design with edge units no less than 50 percent of acoustical unit size.
- D. Locate system on room axis according to reflected plan.
- E. Lay out suspension system symmetrically about center lines of room unless shown otherwise by Contract Drawings. Lay out system so use of tiles less than 1/2 size is minimized.
- F. Suspend main runner/tee from overhead construction with hanger wires spaced 4 feet (1.20 m) on center along length of main runner/tee. Install hanger wires plumb and straight. Hanger wires shall not be installed in convenience holes.

- G. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
 - 1. Use longest practical lengths.
- H. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.
- I. Provide hanger clips during steel deck erection. Provide additional hangers and inserts as required.
- J. Suspend main runner/tee from overhead construction with hanger wires spaced 4 feet (1.20 m) on center along length of main runner/tee. Install hanger wires plumb and straight. Hanger wires shall not be installed in convenience holes.
- K. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
- L. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
- M. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
- N. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.
- O. Do not eccentrically load system or induce rotation of runners.
- P. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
 - 1. Install in bed of acoustical sealant.
 - 2. Use longest practical lengths.
 - 3. Overlap and rivet corners or install corner caps.
- Q. Form expansion joints as detailed. Form to accommodate plus or minus 1 inch movement. Maintain visual closure.
- R. Install light fixture boxes constructed of gypsum board above light fixtures in accordance with fire rated assembly requirements and light fixture ventilation requirements.
- S. Do not attach suspension system to adjustable folding partition headers.
- T. Screws, eyebolts or lag bolts used to support metal acoustical suspended assemblies must have minimum embedment of 5/8 inch (15.9 mm) when installed into structural members.
- U. Nails installed vertically into bottom of structural members, which are subject to pullout, shall not be used to support metal acoustical suspended assemblies.
- V. Nails may be used when installed horizontally into sides of structural members.
- W. Embedment must be at least 5/8 inch (15.9 mm).

3.04 INSTALLATION - ACOUSTICAL TILE UNITS

- A. Special Techniques:
 - 1. Installation shall be in accordance with Manufacturer's recommendations:
 - a. Do not install tile when room temperature exceeds or below recommended ambient conditions.
 - b. Tile is directional tile and must be installed in same direction of pattern running parallel to long dimension of each room.
 - c. Remove loose dust from back of tile and ceiling where adhesive is to be applied.
 - d. Prime 3 inch (75 mm) minimum circle near each corner by buttering very thin coat of adhesive.
 - e. Apply daub of adhesive to each corner. Daubs will be of sufficient size to form a circle 2-1/2 to 3 inches (63 to 75 mm) in diameter and 1/8 to 1/4 inch (3 to 6 mm) thick

when tile is pressed firmly in place. Do not apply daubs so far in advance of installation that adhesive skins over.

- f. Tile are to have same color run number, do not bend tile during installation.
2. Tile Layout:
 - a. Lay out tile symmetrically about center lines of room.
 - b. Lay out so tiles at room perimeters are at least 1/2 full tile size.
 - c. Leave tile in true plane with straight, even joints.
 - d. Tile joints shall be straight and in alignment, and exposed surface flush and level.
 - e. Furnish and install specified molding wherever tile has exposed edges or abuts walls, columns, and other vertical surfaces, except at curves of 3 inch (75 mm) radius or smaller.
 - f. Cut around penetrations that are not to receive moldings cleanly with sharp knife and at a slight angle away from cutout.
3. Ceiling mounted items:
 - a. Locate light fixtures, speakers, and mechanical diffusers and grilles symmetrically in room and centered on tile centers or tile joints insofar as possible, unless shown otherwise.
 - b. Keep method of locating ceiling mounted items as consistent as possible throughout building.
 - c. Ceiling mounted item location method within each room shall always be consistent.

3.05 INSTALLATION - ACOUSTICAL PANEL UNITS

- A. Install acoustical units in accordance with manufacturer's instructions.
- B. Install acoustical panels in coordination with suspended system, with edges resting on flanges of main runner and cross tees. Cut and fit panels neatly against abutting surfaces. Support edges by wall moldings.
- C. Special Techniques:
 1. If recommended by Manufacturer, use tile one at a time from at least four (4) open boxes to avoid creating any pattern due to slight variations from box to box. Use tile from same color run in individual rooms to assure color match.
 2. Leave tile in true plane with straight, even joints.
- D. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.
- E. Lay directional patterned units with pattern parallel to longest room axis.
- F. Fit border trim neatly against abutting surfaces.
- G. Install units after above-ceiling work is complete.
- H. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.
- I. Cutting Acoustical Units:
 1. Cut to fit irregular grid and perimeter edge trim.
 2. Make field cut edges of same profile as factory edges.
 3. Double cut and field paint exposed reveal edges.
- J. Where round obstructions occur, provide preformed closures to match perimeter molding.
- K. Lay acoustical insulation for a distance of 48 inches either side of acoustical partitions as indicated.

3.06 TOLERANCES

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.
- B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

3.07 FIELD QUALITY CONTROL

- A. Non-Conforming Work:

1. Acoustical Tile. The following have been identified by the Manufacturer as tile defects, should not be installed, and will be replaced at no charge to Owner. Manufacturer will replace any material that does not meet product specifications. Installer to call 1 (800) 442-4212 immediately to report any tile discrepancies:
 - a. Obvious Tile Defects:
 - 1) Gross surface defects or damage.
 - 2) Gross damage to edges and corners.
 - 3) Bevels without paint.
 - b. Size Measurement:
 - 1) Tiles measure 12 inches (305 mm), plus or minus 1/32 inch (0.8 mm), measured across center of two (2) parallel sides.
 - c. Squareness Measurement:
 - 1) Measure two (2) diagonals of an individual ceiling tile.
 - 2) Diagonal measurements need to be within 1/16 inch (1.6 mm) of each other. No more than 1/16 inch (1.6 mm) difference.
 - d. Warp:
 - 1) Tiles specification is plus or minus 0.050 inch (1.27 mm) as measured in the center of tile.
 2. Installer:
 - a. Substrate preparation and installation of ceiling tile not following CISCA Code of Practice will be unacceptable and considered defective and subject to replacement at no cost to Owner.
- B. Non-Conforming Work:
1. Suspension Assemblies:
 - a. Field Inspections:
 - 1) Inspect:
 - (a) Suspended ceiling system.
 - (b) Hangers, anchors and fasteners.
 - 2) Correct any work found defective or not complying with contract document requirements at no additional cost to Owner.
- C. Non-Conforming Work:
 1. Acoustical Panels: Remove and replace defective materials at no additional cost to Owner including, but not limited to following:
 - a. Remove and replace damaged or broken acoustical ceiling panels.
 - b. Remove and replace discolored acoustical ceiling panels to match adjacent.
 - c. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

3.08 ADJUSTING

- A. 'Touch-up' minor abraded surfaces.

3.09 CLEANING

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

END OF SECTION

**SECTION 09 6263
STAINLESS STEEL HYGIENIC COVE BASE**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Stainless Steel Hygienic Cove Base

1.02 RELATED REQUIREMENTS

- A. Section 06 4000 - Finish Carpentry
B. Section 09 7220 - Fiberglass Reinforced Wall Panels (FRP)

1.03 SUBMITTALS

- A. Product Data:
1. Submit manufacturer's product data for each type of Stainless Steel Hygienic Cove Base specified, including the following:
 - a. Installation accessories.
 - b. Installation instructions.
- B. Informational Submittals:
1. Product test reports from a qualified independent testing laboratory showing compliance of each component with requirements indicated.
 2. Maintenance data for wall protection system components for inclusion in the operating and maintenance manuals specified in Division 01.
- C. Samples:
1. Submit samples to the Architect for review prior to delivering materials to the site or commencing the work in this Section.
 2. Stainless Steel Hygienic Cove Base: Submit full size samples, minimum 4 inches in length, of each type of Stainless Steel Hygienic Cove Base required with specified finish.

1.04 QUALITY ASSURANCE

- A. Manufacturer's qualifications: Not less than 5 years experience in the production of specified products and a record of successful in-service performance.
- B. Installer Qualifications: Installation of work of this section shall be by a subcontractor approved by the manufacturer with a minimum of 3 years experience in similar work or other decorative metal installations having successful in-service performance.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Packing and Shipping: Deliver materials to site in manufacturer's original unopened packaging with labels intact. Protect finished surfaces with removable wrapping or protective plastic film which will not bond when exposed to sunlight.
- B. Storage: Store Stainless Steel Hygienic Cove Base in manufacturer's original packaging, off ground and under cover away from direct sunlight, protected from weather, extreme temperature, moisture or other damage. Material must be stored flat.
- C. Handling: Handle materials so that surfaces are protected. Prevent distortion or damage to fabricated pieces.

1.06 FIELD CONDITIONS

- A. Ambient Conditions: Do not install wall protection products until installation areas are enclosed and weatherproof. HVAC system must be operational and maintaining temperatures within range expected during building occupancy to avoid thermal dimensional change in lengths of material after installation.

1.07 SCHEDULING AND SEQUENCING

- A. Coordination: Coordinate installation of Stainless Steel Hygienic Coved Base with associated flooring and wall finishes and other adjacent floor and wall finishes.

	09 6263 - 1	Stainless Steel Hygienic Cove Base

PART 2 PRODUCTS**2.01 MANUFACTURED UNITS**

- A. Manufacturers:
 - 1. Approved Manufacturers Contact List:
 - a. Inpro Corporation, Muskego, WI, www.inprocorp.com
 - b. TheCornerGuardStore.com, Scottsdale, AZ 85259 Tel: 800-516-0436
www.TheCornerGuardStore.com
 - c. Equal as approved by Architect prior to installation.

2.02 MANUFACTURED WALL BASE

- A. Design Criteria:
 - 1. Materials:
 - a. Stainless Steel: ASTM A240 Type 304, 20 gauge
 - b. Finish: No. 4 Brushed in accordance with ASTM A480.
- B. Fabrication :
 - 1. Stainless Steel Cove Base shall be factory formed from stainless steel sheet with directional polish grain oriented parallel with length.
 - a. Edges shall be free of burrs.
 - b. Standard Length: 8'-0"
 - c. Fabricate exposed ends with filler to match profile of Sani-Base.
 - d. Preformed corners shall be 90 degree, or as required to suit corner degree indicated on drawings. Fabricate preformed corners with minimum 4 inch legs.
- C. Approved Products:
 - 1. Type 304 Stainless Steel Sani-Base:
 - a. 7.5 inch SCB-6SL-3396 by InPro
 - b. 6 inch CBM-B-SS4-206 by TheCornerGuardStore.com
 - c. Equal as approved by Architect prior to installation.
 - 2. Use same manufacturer's inside and outside corners
- D. Accessories
 - 1. Adhesive:
 - a. Bostik BOSPRO MS Series A78000 white sealant
 - b. Equal as approved by Architect prior to installation.
 - 2. Microsealant:
 - a. EternaBond DoubleStick CR-DS microsealant, 60mils thick
 - b. Equal as approved by Architect prior to installation.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verification of Conditions: Examine subsurfaces to receive work and report detrimental conditions in writing to architect. Commencement of work will be construed as acceptance of subsurfaces.
 - 1. Painted walls shall be dry and thoroughly cured prior to application of Stainless Steel Hygienic Cove Base.
 - 2. Perform adhesion test on painted drywall or plaster walls to receive Stainless Steel Hygienic Cove Base in accordance with manufacturer's installation instructions to verify proper adhesion.
 - 3. Verify floors within areas where Stainless Steel Hygienic Cove Base is to be installed are level to within 1/8 inch in 10'-0".
- B. Coordination: Coordinate with other work which affects, connects with, or will be concealed by this work.
 - 1. Coordinate installation of Stainless Steel Hygienic Coved Base with application of wall finishes.

	09 6263 - 2	Stainless Steel Hygienic Cove Base

2. Install Stainless Steel Hygienic Cove Base prior to application of finishes such as wall tile, stainless steel wall sheeting, FRP, etc.

3.02 PREPARATION

- A. Surface Preparation: Surfaces to receive Stainless Steel Hygienic Coved Base shall be cleaned to remove all dust, debris, and other contaminants that would interfere with adhesive bond.
- B. Place Stainless Steel Hygienic Coved Base in locations/rooms where units be installed and acclimate to building conditions as specified herein in Project/Site Conditions article for a minimum period of 24 hours prior to installation.

3.03 INSTALLATION

- A. Adhesive Installation: Install Stainless Steel Hygienic Coved Base with adhesive in strict accordance with manufacturer's printed installation instructions.
- B. Install Stainless Steel Hygienic Coved Base accurately placed in proper location, level, and in proper alignment with adjoining work and applied finishes.
 1. Fit field connections accurately together to form hairline joints.
 2. Silver silicone to be applied to the face of each hairline joint.
- C. Where necessary to provide secure attachment at corners, end terminations, or where higher abuse is anticipated, supplement adhesive installation with two (2) countersunk #10 stainless steel screws (installer supplied) located within 1 inch of each exposed end or corner. Set screw heads flush in countersunk hole.

3.04 DAMAGE AND REPAIR

- A. Upon completion of the installation, visually check exposed surfaces of the work of this section, and touch up scratches and damaged surfaces by field polishing so they are completely invisible to the unaided eye from a distance of five feet.

3.05 CLEANING

- A. Upon completion of installation of Stainless Steel Hygienic Coved Base, promptly clean exposed surfaces in accordance with recommendations of the Stainless Steel Hygienic Coved Base manufacturer to remove all traces of dust, dirt, adhesive, and other foreign materials.
- B. During the course of the work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave work in clean condition.

END OF SECTION 09 7720

	09 6263 - 3	Stainless Steel Hygienic Cove Base

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	09 6263 - 4	Stainless Steel Hygienic Cove Base

**SECTION 09 7720
FIBERGLASS REINFORCED WALL PANELS (FRP)**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Fiberglass reinforced wall panels (FRP) and trim in restrooms and other areas as described in Contract Documents.

1.02 RELATED REQUIREMENTS

- A. Section 09 2116 - Gypsum Board Assemblies
- B. Section 09 6263 - Stainless Steel Hygienic Cove Base

1.03 REFERENCE STANDARDS

- A. American National Standards Institute / National Electrical Manufacturers Association:
 - 1. ANSI/NEMA LD 3-2005, 'High-Pressure Decorative Laminates (HPDL)'.
- B. ASTM International:
 - 1. ASTM D256-18b, 'Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics'.
 - 2. ASTM D570-98(2018), 'Standard Test Method for Water Absorption of Plastics'.
 - 3. ASTM D638-14, 'Standard Test Method for Tensile Properties of Plastics'.
 - 4. ASTM D790-17, 'Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials'.
 - 5. ASTM D2583-13a, 'Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor'.
 - 6. ASTM D5319-17, 'Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels'.
 - 7. ASTM E84-18b, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
- C. Underwriters Laboratories, Inc.:
 - 1. UL 723: 'Standard for Safety Test for Surface Burning Characteristics of Building Materials'; (11th Edition - 2018).

1.04 SUBMITTALS

- A. Product Data:
 - 1. Manufacturer's literature or cut sheet for panel and adhesive.
 - 2. Color and pattern selection.
- B. Samples:
 - 1. Physical panel showing applied color selected.
 - 2. Exposed molding and trim showing each type, finish, and color.
- C. Manufacturer's Installation Instructions: Indicate special procedures.
- D. Installer's Qualification Statement.
- E. 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 sheet.
 - (b) Color and pattern selection.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Minimum one (1) satisfactorily completed installation of comparable quality, scope, similar size, and complexity in past two (2) years before bidding.

	09 7720 - 1	Fiberglass Reinforced Wall Panels (FRP)

B. Regulatory Requirements:

1. Fire-Test-Response Characteristics:
 - a. Surface-Burning Characteristics:
 - 1) Wall panel shall have Class A flame spread rating in accordance with ASTM E84 or UL 723 Type 1.
 - (a) Class A (Flame spread index 0-25; Smoke-developed index 0-450).
 - (b) Flash point: None.

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

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

B. Storage And Handling Requirements:

- a. Follow Manufacturer's instructions and precautions for storage of materials.
- b. Store panels and trim lying flat surface off of floor.

1.07 FIELD CONDITIONS**A. Ambient Conditions:**

1. Building Conditions:
 - a. Conditions inside building shall be brought to levels to be normal at occupancy of building.
 - b. Maintain these conditions from material is delivered to site to time Certificate of Substantial Completion is signed.
 - c. Conditions include normal levels of humidity, lighting, heating, and air conditioning.
2. Panels:
 - a. Allow panels to acclimate to room temperature 70 deg F (21.1 deg C) for forty eight (48) hours prior to installation.
3. Adhesives:
 - a. Application temperature to be between 50 deg F (10 deg C) and 90 deg F (32.2 deg C).
 - b. Provide ventilation to disperse fumes during application of adhesive as recommended by adhesive manufacturer.

1.08 WARRANTY**A. Manufacturer Warranty:**

1. Provide Manufacturer's warranty against manufacturing defects and workmanship.

PART 2 PRODUCTS**2.01 SYSTEM****A. Manufacturers:**

1. Acceptable Manufacturers:
 - a. Standard FRP Panels by Marlite, Dover, OH www.marlite.com.
 - b. Equal as approved by Architect before bidding. See Section 01 6200.

B. Materials:

1. Panels:
 - a. Description:
 - 1) Fiberglass reinforced thermosetting polyester resin panel sheets.
 - 2) Resists stains, chemicals, scratches and abrasions and possesses high impact strength.
 - 3) Resistant to moisture. Does not support growth of mold or mildew.
 - b. Design Criteria:
 - 1) Complying with requirements of ASTM D5319.
 - 2) Meet USDA/FSIS requirements.
 - 3) Properties: Resistant to rot, corrosion, staining, denting, peeling, and splintering:

- (a) Flexural Modulus: 3.1 x 10⁵ psi as per ASTM D790. (217.9 kilogram-force/square millimeter).
 - (b) Flexural Strength: 1.0 x 10⁴ psi as per ASTM D790. (7.0 kilogram-force/square millimeter).
 - (c) Tensile Strength: 7.0 x 10³ psi as per ASTM D638. (4.9 kilogram-force/square millimeter).
 - (d) Water Absorption: 0.72 percent as per ASTM D570.
 - (e) Barcol Hardness (scratch resistance): 35 55 as per ASTM D2583.
 - (f) Izod Impact Strength: 70 feet (21.34 m) lbs/in as per ASTM D256.
- c. Dimensions:
 - 1) Thickness: 0.090 inch (2.29 mm) nominal.
 - 2) Width: 4 feet (1.20 m) nominal.
 - 3) Length: 10 foot (3.05 m) or 8 feet (2.45 m) as shown on Contract Drawings.
- d. Tolerance:
 - 1) Length and Width: +/-1/8 inch (3 mm).
 - 2) Square: Not to exceed 1/8 inch (3 mm) for 8 feet (2.45 m) panels or 5/32 inch (3.97 mm) for 10 foot (3.05 m) panels.
- e. Back Surface: Smooth. Imperfections which do not affect functional properties are not cause for rejection.
- f. Color And Texture:
 - 1) Color and texture as approved by Owner:
 - (a) P-199 Bright White, pebbled surface.
- g. Trim Molding:
 - 1) PVC Trim Moldings with integral color:
 - (a) White.
- h. Outside Corner Guard:
 - 1) Rigid Extruded PVC with integral color.
 - (a) White.
- i. Base Molding:
 - 1) As specified in Section 09 6263.

2.02 ACCESSORIES

- A. Adhesives:
 - 1. Comply with ASTM C557.
 - 2. Approved Products. See Section 01 6200 for definitions of Categories:
 - a. Marlite C 551: Water resistant, non flammable adhesive.
 - or
 - b. Marlite C 375: Construction adhesive flexible, water-resistant, solvent based adhesive formulated for fast, applications.
- B. Sealants:
 - 1. Approved Products. See Section 01 6200 for definitions of Categories:
 - a. Marlite Brand MS-251 White Silicone Sealant.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces are prime painted and ready to receive work, and comply with requirements of panel manufacturer.

3.02 PREPARATION

- A. Surface Preparation:
 - 1. Inspect surfaces for conditions not suitable for installation. Examine backup surfaces to determine that corners are plumb and straight, surfaces are smooth, uniform, clean and free from foreign matter, nails countersunk, joints and cracks filled flush and smooth with the adjoining surface.

	09 7720 - 3	Fiberglass Reinforced Wall Panels (FRP)

2. Repair defects prior to installation:
 - a. Level wall surfaces to panel manufacturer's requirements. Remove protrusions and fill indentations.

3.03 INSTALLATION

- A. Comply with manufacturer's recommended procedures and installation sequence.
- B. Allow panels to acclimate to room temperature as specified in Field Conditions in Part 1 of this specification prior to installation.
- C. Apply panels to board substrate vertically oriented with seams plumb and pattern aligned with adjoining panels:
 1. Use panels as large as possible to limit amount of joints.
 2. Install panels with manufacturer's recommended gap for panel field and corner joints:
 - a. Adhesive trowel and application method to conform to adhesive manufacturer's recommendations.
- D. Apply panel moldings to all panel edges using silicone sealant providing for required clearances.
 1. All moldings must provide for a minimum 1/8 inch (3 mm) of panel expansion at joints and edges, to insure proper installation.
 2. Apply sealant to all moldings, channels and joints between the system and different materials to assure watertight installation.

3.04 CLEANING

- A. General:
 1. Remove excess sealant from panels and moldings.
 2. Refer to manufacturer's specific cleaning recommendations:
 - a. Wipe panel down using damp cloth and mild soap solution or cleaner.
 - b. Do not use abrasive cleaners.

END OF SECTION 09 7720

**SECTION 09 9113
EXTERIOR PAINTING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Surface preparation.
- B. Field application of paints.

1.02 DEFINITIONS

- A. Comply with ASTM D16 for interpretation of terms used in this section.

1.03 REFERENCE STANDARDS

- A. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications 2019.
- B. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials 2020.
- C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual Current Edition.
- D. SSPC-SP 1 - Solvent Cleaning 2015, with Editorial Revision (2016).

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conferences:
 - 1. Schedule painting pre-installation conference after delivery of paint or coatings and before or at same time as application of field samples.
 - a. Coordinate pre-installation conferences of all related painting and coating Sections under 09 9000 heading 'Paints and Coatings'.
 - b. Schedule conference before preparation of control samples as specified in Sections under 09 9000 heading 'Paints and Coatings'.
 - c. Conference to be held at same time as Section 09 2116 to review gypsum board finish preparation.
 - 2. In addition to agenda items specified in Section 01 3000, review following:
 - a. Review Quality Assurance for Approval requirements.
 - b. Review Quality Assurance Field Sample requirements.
 - c. Review Submittal requirements for compliance for MPI Approved Products.
 - d. Review Design Criteria requirements.
 - e. Review Cleaning requirements.
 - f. Review painting schedule.
 - g. Review safety issues.
 - 3. Review additional agenda items from Sections under 09 9000 heading 'Paints and Coatings'.

1.05 SUBMITTALS

- A. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 - 2. MPI product number (e.g. MPI #47).
 - 3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
 - 4. Manufacturer's installation instructions.
 - 5. Confirmation of colors selected and that each area to be painted or coated has color selected for it.

- B. Samples: Submit two paper "draw down" samples, 4 x 6 inches in size, illustrating range of colors available for each finishing product specified.
 - 1. Where sheen is specified, submit samples in only that sheen.
 - 2. Where sheen is not specified, submit each color in each sheen available.
- C. Closeout Submittals:
 - 1. Include following in Operations and Maintenance Manual specified in Section 01 7800:
 - a. Record Documentation:
 - 1) Manufacturer's documentation:
 - (a) Manufacturer's cut sheet for each component of each system.
 - (b) Schedule showing rooms and surfaces where each system was used.

1.06 QUALITY ASSURANCE

- A. Applicator Qualifications: Company specializing in performing the type of work specified with minimum five years experience and minimum five (5) satisfactorily completed projects of comparable quality, similar size, and complexity in past three (3) years before bidding.
 - 1. Maintain qualified crew of painters throughout duration of the Work.
 - 2. Upon request, submit documentation.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 55 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.
- D. Deliver amount of materials necessary to meet Project requirements in single shipment.
- E. Notify Architect two working days before delivery of coatings.
- F. Store materials in single place.
- G. Keep storage area clean and rectify any damage to area at completion of work of this Section.
- H. Maintain storage area at 55 deg F (13 deg C) minimum.

1.08 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the paint product manufacturer's temperature ranges.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- D. Minimum Application Temperatures for Latex Paints: 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of 540 Lux 50 ft candles measured mid-height at substrate surface.
 - 1. Inspection of painting work shall take place under same lighting conditions as application.
 - 2. If painting and coating work is applied under temporary lighting, deficiencies discovered upon installation of permanent lighting will be considered latent damage as defined in MPI Manual, PDCA P1-92.

PART 2 PRODUCTS

2.01 PERFORMANCE AND DESIGN CRITERIA

- A. Regulatory Agency Sustainability Approval:

1. Conform to work place safety regulations and requirements of those authorities having jurisdiction for storage, mixing, application and disposal of all paint and related hazardous materials.
 2. Paint and painting materials shall be free of lead and mercury, and have VOC levels acceptable to local jurisdiction.
 3. Master Painters Institute (MPI) Standards:
 - a. Products: Comply with MPI standards indicated and listed in 'MPI Approved Products List'.
 - b. Preparation and Workmanship: Comply with requirements in 'MPI Architectural Painting Specification Manual' for products and coatings indicated.
- B. Performance:
1. Design Criteria:
 - a. Provide materials for use within each coating system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - b. All materials, preparation and workmanship shall conform to requirements of 'Architectural Painting Specification Manual' by Master Painters Institute (MPI).
 - c. All paint manufacturers and products used shall be as listed under Approved Product List section of MPI Painting Manual.
 - d. Provide Premium Grade systems (2 top coats) as defined in MPI Architectural Painting Specification Manual, except as otherwise indicated.
 - e. Where specified paint system does not have Premium Grade, provide Budget Grade.
 - f. Provide products of same manufacturer for each coat in coating system.
 - g. Color Levels:
 - 1) Color Level II:
 - (a) Number and placement of interior and exterior paint colors and gloss levels shall be as defined by Color Level II from MPI Manual, PDCA P3-93 as modified in following paragraph.
 - (b) No more than one paint color or gloss level will be selected for same substrate within designated interior rooms or exterior areas.
 - 2) Color Level III:
 - (a) Number and placement of interior and exterior paint colors and gloss levels shall be Color Level III from MPI Manual, PDCA P3-93 as modified in following paragraph.
 - (b) Several paint colors or gloss levels will be selected for same substrate within designated interior rooms or exterior areas.
- C. Materials:
1. Materials used for any painting system shall be from single manufacturer unless approved otherwise in writing by painting system manufacturers and by Architect. Include manufacturer approvals in Product Data submittal.
 2. Linseed oil, shellac, turpentine, and other painting materials shall be pure, be compatible with other coating materials, bear identifying labels on containers, and be of highest quality of an approved manufacturer listed in MPI manuals. Tinting color shall be best grade of type recommended by Manufacturer of paint or stain used on Project.

2.02 MANUFACTURERS

- A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.

2.03 PAINT SYSTEMS - EXTERIOR

- A. Manufacturers: Products listed in edition of MPI Approved Product List current at time of bidding and later are approved, providing they meet VOC requirements in force where Project is located.
1. New Surfaces: Use MPI(a) EXT 5.1M Waterborne Light Industrial Coating system.
 2. Previously Finished Surfaces: Use MPI(r) REX 5.1K Waterborne Light Industrial Coating.
- B. Exterior Ferrous Metal:
1. Materials:
 - a. All paints and coatings.
 - 1) Primer Coat: MPI Product 107, 'Primer, Rust-Inhibitive, Water Based'.
 - 2) Finish Coats: MPI Product 163, 'Light Industrial Coating, Exterior, Water Based, Semi-Gloss (MPI Gloss Level 5).
 - b. Traffic signage:
 - 1) Primer Coat: MPI Product 107, 'Primer, Rust-Inhibitive, Water Based'.
 - 2) Finish Coats: MPI Product 163, 'Light Industrial Coating, Exterior, Water Based, Semi-Gloss (MPI Gloss Level 5).
 2. Design Criteria:
 - a. Systems specified are in addition to prime coats provided under other Sections of Project Manual.
 - b. Finish Requirements: Use MPI Premium Grade finish requirements for work of this Section.
 - c. Gloss / Sheen Level Required: Gloss Level 5.
- C. Exterior Galvanized Metal:
1. Materials:
 - a. Polyurethane:
 - 1) Vinyl Wash Primer Coat: MPI Product 80: 'Primer, Vinyl Wash'.
 - 2) Finish Coats:
 - (a) Epoxy MPI Product 101: 'Primer, Epoxy, Anti-Corrosive, for Metal'.
 - (b) Polyurethane MPI Product 72: 'Polyurethane, Two-Component, Pigmented, Gloss (MPI Gloss Level 6-7)'.
 - b. Latex:
 - 1) Waterborne Primer Coat: MPI Product 134: 'Primer, Galvanized, Water Based'.
 - 2) Finish Coats: MPI Product 11: 'Latex, Exterior Semi-Gloss (MPI Gloss Level 5)'.
 2. Handrails And Exposed Miscellaneous Structural Steel:
 - a. New Surfaces: Use MPI(a) EXT 5.3D Pigmented Polyurethane Finish system.
 - b. Previously Finished Work: Use MPI(r) REX 5.3D Pigmented Polyurethane Finish system.
 3. All Other:
 - a. New Surfaces: Use MPI(a) EXT 5.3H Latex Finish system.
 - b. Previously Finished Surfaces: Use MPI(r) REX 5.3H Latex Finish system.
- D. Exterior CMU, Concrete and Stucco:
1. Materials:
 - a. Block Filler, New CMU Only: MPI Product 4: 'Block Filler, Latex, Interior/Exterior'.
 - b. Finish Coats: MPI Product 10: 'Latex, Exterior Flat (MPI Gloss Level 1-2)'.
 - c. Accent Stripe: MPI Product 164: 'Light Industrial Coating, Exterior, Water Based, Gloss (MPI Gloss Level 6)'.
 2. Performance:
 - a. Finish Requirements:
 - 1) New Surfaces: MPI Premium Grade finish requirements.
 - 2) Deteriorated Existing Surfaces: MPI Premium Grade finish requirements.
 - 3) Sound Existing Surfaces: MPI Custom Grade finish requirements.

- 4) Gloss / Sheen Level Required: Gloss Level 1.
- b. Concrete:
 - 1) New Surfaces: Use MPI(a) EXT 3.1A Latex Finish system.
 - 2) Previously Finished Surfaces: Use MPI(r) REX 3.1A Latex Finish system.
- c. Stucco:
 - 1) New Surfaces: Use MPI(a) EXT 3.1A Latex Finish system.
 - 2) Previously Finished Surfaces: Use MPI(r) REX 3.1A Latex Finish system.
- d. CMU:
 - 1) New Surfaces: Use MPI(a) EXT 4.2A Latex Finish system.
 - 2) Previously Finished Surfaces: Use MPI(r) REX 4.2A Latex Finish system.

PART 3 EXECUTION

3.01 EXAMINATION

- 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. Do not begin application of paints and finishes until substrates have been properly prepared.
- C. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- D. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- F. Test shop-applied primer for compatibility with subsequent cover materials.
- G. Verification of Conditions:
 - 1. Directing applicator to begin painting and coating work will indicate that substrates to receive painting and coating materials have been previously inspected as part of work of other Sections and are complete and ready for application of painting and coating systems as specified in those Sections.
- H. Pre-Installation Testing:
 - 1. Before beginning work of this Section, examine, and test surfaces to be painted or coated for adhesion of painting and coating systems.
 - 2. Report in writing to Architect of conditions that will adversely affect adhesion of painting and coating work.
 - 3. Do not apply painting and coating systems until party responsible for adverse condition has corrected adverse condition.
- I. Evaluation And Assessment:
 - 1. Report defects in substrates that become apparent after application of primer or first finish coat to Architect in writing and do not proceed with further work on defective substrate until such defects are corrected by party responsible for defect.
- J. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
 - 1. Exterior Plaster and Stucco: 12 percent.
 - 2. Fiber Cement Siding: 12 percent.
 - 3. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
 - 4. Exterior Wood: 15 percent, measured in accordance with ASTM D4442.
 - 5. Concrete Floors and Traffic Surfaces: 8 percent.

3.02 PREPARATION

- A. Protection of In-Place Conditions:
 - 1. Protect other finish work and adjacent materials during painting. Do not splatter, drip, or paint surfaces not intended to be painted. These items will not be spelled out in detail but pay special attention to the following:
 - a. Do not paint finish copper, bronze, chromium plate, nickel, stainless steel, anodized aluminum, or monel metal except as explicitly specified.
- B. Surface Preparation:
 - 1. Prepare surfaces in accordance with MPI requirements and requirements of Manufacturer for each painting system specified, unless instructed differently in Contract Documents. Bring conflicts to attention of Architect in writing.
 - 2. Fill minor holes and cracks in wood surfaces to receive paint or stain.
 - 3. Surfaces to be painted shall be clean and free of loose dirt. Clean and dust surfaces before painting or finishing.
 - 4. Do no exterior painting while surface is damp, unless recommended by Manufacturer, nor during rainy or frosty weather. Interior surfaces shall be dry before painting. Moisture content of materials to be painted shall be within tolerances acceptable to Paint Manufacturer.
 - 5. Sand woodwork smooth in direction of grain leaving no sanding marks. Clean surfaces before proceeding with stain or first coat application.
- C. Clean surfaces thoroughly and correct defects prior to application.
- D. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- E. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.
- F. Seal surfaces that might cause bleed through or staining of topcoat.

3.03 APPLICATION

- A. Interface with Other Work:
 - 1. Coordinate with other trades for materials and systems that require painting before installation.
 - 2. Schedule painting and coating work to begin when work upon which painting and coating work is dependent has been completed. Schedule installation of pre-finished and non-painted items, which are to be installed on painted surfaces, after application of final finishes.
- B. Paint or finish complete all surfaces to be painted or coated as described in Contract Documents, including but not limited to following items.
- C. Apply sealant in gaps 3/16 inch (5 mm) and smaller between two substrates that are both to be painted or coated. Sealants in other gaps furnished and installed under Section 07 9200.
- D. On wood to receive a transparent finish, putty nail holes in wood after application of stain using natural colored type to match wood stain color. Bring putty flush with adjoining surfaces.
- E. In multiple coat paint work, tint each succeeding coat with slightly lighter color, but approximating shade of final coat, so it is possible to check application of specified number of coats. Tint final coat to required color.
- F. Spread materials smoothly and evenly. Apply coats to not less than wet and dry film thicknesses and at spreading rates for specified products as recommended by Manufacturer.
- G. Touch up suction spots after application of first finish coat.
- H. Paint shall be thoroughly dry and surfaces clean before applying succeeding coats.

- I. Use fine sandpaper between coats as necessary to produce even, smooth surfaces.
- J. Make edges of paint adjoining other materials or colors clean, sharp, and without overlapping.
- K. Finished work shall be a 'Properly Painted Surface' as defined in this Section.
- L. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- M. Exterior Wood to Receive Opaque Finish: If final painting must be delayed more than 2 weeks after installation of woodwork, apply primer within 2 weeks and final coating within 4 weeks.
- N. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- O. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.
- P. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- Q. Apply each coat to uniform appearance.
- R. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply additional coats until complete hide is achieved.
- S. Exterior Ferrous Metal:
 - 1. New Surfaces: Clean metal to be painted of rust, mill scale, grease, oil, and welding spatters, burrs, flux, slag, and fume. If all traces of rust cannot be removed, apply rust blocker recommended by Paint Manufacturer before applying primer coat.
 - 2. Existing Painted Surfaces:
 - a. Remove deteriorated and chalked existing paint and rust down to sound substrate by scraping or power tools.
 - b. Clean existing sound painted surfaces as well as scraped and sanded existing painted surfaces as recommended by Paint Manufacturer. If all traces of rust cannot be removed, apply rust blocker recommended by Paint Manufacturer before applying primer coat.
 - c. Spot prime bare metal surfaces followed by a prime coat over entire surface to be painted.
 - d. Lightly sand entire surface.
 - e. Clean surface as recommended by Paint Manufacturer.
 - f. Apply specified finish coats.
- T. Exterior Galvanized Metal:
 - 1. New Surfaces:
 - a. Clean 'passivated' or 'stabilized' galvanized steel as specified in SSPC-SP 1.
 - b. After removal of 'passivated' or 'stabilized' coating or for surfaces without coating, clean surfaces to be painted with mineral spirits or product recommended by Paint Manufacturer. Change to clean rags or wiping cloths regularly to reduce possibility of re-contamination of surface.
 - c. Apply prime coat.
 - d. Apply finish coats.
 - 2. Existing Painted Surfaces:
 - a. Remove deteriorated and chalked existing paint and rust deposits down to sound substrate by sanding, scraping, or wire brushing.
 - b. Clean existing sound painted surfaces as well as scraped and sanded existing painted surfaces as recommended by Paint Manufacturer.
 - c. Apply prime coat.
 - d. Apply finish coats.
 - 3. Existing Unpainted Surfaces:
 - a. Wire brush or power wash as necessary to remove 'white rust'.

- b. Apply prime coat.
 - c. Apply finish coats.
- U. Exterior CMU, Concrete, Stucco
 - 1. New Surfaces:
 - a. On highly porous surfaces when weather is exceptionally hot and dry, it may be desirable to dampen surface before applying first coat of an emulsion paint.
 - b. Completely cover voids in masonry block.
 - c. Roll after spraying if necessary to eliminate pinholing.
 - 2. Existing Unpainted Surfaces:
 - a. Power wash surfaces to be painted.
 - b. Fill cracks with masonry crack filler.
 - c. Apply block filler and finish coat as required for new work.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection.
- B. Owner will provide field inspection.
- C. Non-Conforming Work:
 - 1. Correct deficiencies in workmanship as required to leave surfaces in conformance with 'Properly Painted Surface,' as defined in this Section.
 - 2. Correction of 'Latent Damage' and 'Damage Caused By Others,' as defined in this Section, is not included in work of this Section.

3.05 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.
- B. As work proceeds and upon completion of work of any painting Section, remove paint spots from floors, walls, glass, or other surfaces and leave work clean, orderly, and in acceptable condition.
- C. Waste Management:
 - 1. Remove rags and waste used in painting operations from building each night. Take every precaution to avoid danger of fire.
 - 2. Paint, stain and wood preservative finishes and related materials (thinners, solvents, caulking, empty paint cans, cleaning rags, etc.) shall be disposed of subject to regulations of applicable authorities having jurisdiction.
 - 3. Remove debris caused by work of paint Sections from premises and properly dispose.
 - 4. Retain cleaning water and filter out and properly dispose of sediments.

3.06 PROTECTION

- A. Protect finishes until completion of project.
- B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION 09 9113

**SECTION 09 9123
INTERIOR PAINTING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Surface preparation.
- B. Field application of paints.
- C. Materials for backpriming woodwork.
- D. Do Not Paint or Finish the Following Items:
 - 1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
 - 5. Stainless steel, anodized aluminum, bronze, terne-coated stainless steel, and lead items.
 - 6. Marble, granite, slate, and other natural stones.
 - 7. Floors, unless specifically indicated.
 - 8. Ceramic and other tiles.
 - 9. Brick, architectural concrete, cast stone, integrally colored plaster, and stucco.
 - 10. Glass.
 - 11. Concrete masonry units in utility, mechanical, and electrical spaces.
 - 12. Acoustical materials, unless specifically indicated.
 - 13. Concealed pipes, ducts, and conduits.

1.02 DEFINITIONS

- A. Comply with ASTM D16 for interpretation of terms used in this section.

1.03 REFERENCE STANDARDS

- A. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2019.
- B. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; Current Edition.
- C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conferences:
 - 1. Schedule painting pre-installation conference after delivery of paint or coatings and before or at same time as application of field samples.
 - a. Coordinate pre-installation conferences of all related painting and coating Sections under 09 9000 heading 'Paints and Coatings'.
 - b. Schedule conference before preparation of control samples as specified in Sections under 09 9000 heading 'Paints and Coatings'.
 - c. Conference to be held at same time as Section 09 2116 to review gypsum board finish preparation.
 - 2. In addition to agenda items specified in Section 01 3000, review following:
 - a. Review Quality Assurance for Approval requirements.
 - b. Review Quality Assurance Field Sample requirements.
 - c. Review Submittal requirements for compliance for MPI Approved Products.
 - d. Review Design Criteria requirements.

- e. Review Cleaning requirements.
- f. Review painting schedule.
- g. Review safety issues.
- 3. Review additional agenda items from Sections under 09 9000 heading 'Paints and Coatings'.

1.05 SUBMITTALS

- A. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").
 - 2. MPI product number (e.g., MPI #47).
 - 3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
 - 4. Manufacturer's installation instructions.
- B. Closeout Submittals:
 - 1. Include following in Operations and Maintenance Manual specified in Section 01 7800:
 - a. Record Documentation:
 - 1) Manufacturer's documentation:
 - (a) Manufacturer's cut sheet for each component of each system.
 - (b) Schedule showing rooms and surfaces where each system was used.

1.06 QUALITY ASSURANCE

- A. Applicator Qualifications: Company specializing in performing the type of work specified with minimum five years experience and approved by manufacturer.
 - 1. Minimum five (5) satisfactorily completed projects of comparable quality, similar size, and complexity in past three (3) years before bidding.
 - 2. Maintain qualified crew of painters throughout duration of the Work.
 - 3. Upon request, submit documentation.

1.07 MOCK-UP

- A. Before application of any paint system, meet on Project site with Architect, Owner's representative, and Manufacturer's representative. Architect may select one (1) surface for application of each paint system specified. This process will include establishing acceptable substrate conditions required for Project before application of paints and coatings.
- B. Apply paint systems to surfaces indicated by Architect following procedures outlined in Contract Documents and Product Data submission specified above.
- C. After approval of samples, proceed with application of paint system throughout Project. Approved samples will serve as standard of acceptability.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

PART 2 PRODUCTS

2.01 PERFORMANCE AND DESIGN CRITERIA

- A. Regulatory Agency Sustainability Approval:

1. Conform to work place safety regulations and requirements of those authorities having jurisdiction for storage, mixing, application and disposal of all paint and related hazardous materials.
2. Paint and painting materials shall be free of lead and mercury, and have VOC levels acceptable to local jurisdiction.
3. Master Painters Institute (MPI) Standards:
 - a. Products: Comply with MPI standards indicated and listed in 'MPI Approved Products List'.
 - b. Preparation and Workmanship: Comply with requirements in 'MPI Architectural Painting Specification Manual' for products and coatings indicated.

2.02 MANUFACTURERS

- A. Provide products indicated from one of the following. Alternate products must be approved by Architect prior to bid. Alternate products must meet specified criteria and be listed in Master Painters Institute Approved Product List, current edition available at www.paintinfo.com, for specified MPI categories, except as otherwise indicated.
 1. Benjamin Moore and Company: www.benjaminmoore.com.
 - a. National Account Representative: Doug Summers, Doug.Summers@Benjaminmoore.com , (801) 721-6380
 2. PPG Industries: www.ppgpaints.com
 - a. Specification and design Representative: Ryan Henrie, rhenrie@ppg.com, (435) 817-3011.
 - b. Corporate Account Manager: Vito Anteri, vfanteri@ppg.com (480) 6665-9769.
 - 1) Use Account #322073990000 for access to special pricing.
 3. Sherwin-Williams Company: www.sherwin-williams.com.
 - a. National Account Representative: Mike Koncilja, mike.k@sherwin.com ,
 - b. Account Representative: Todd W. Taylor, todd.w.taylor@sherwin.com ,
 - c. Architectural Account Executive: Richard Condie, Richard.condie@sherwin.com
 - d. Director-Enterprise Specifications: Carson Craddock, carson.craddock@sherwin.com
 4. Contact Account Representative before acquiring paint to ensure required acquisition process is followed.

2.03 PAINTS AND FINISHES - GENERAL

- A. Ready-mixed, unless intended to be a field-catalyzed paint.
 1. Where MPI paint numbers are specified, provide products listed in Master Painters Institute Approved Product List, current edition available at www.paintinfo.com, for specified MPI categories, except as otherwise indicated.
 2. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 3. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
 4. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
 5. Supply each paint material in quantity required to complete entire project's work from a single production run.
 6. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

2.04 PAINT SYSTEMS - INTERIOR

- A. Interior Gypsum Board and Plaster:
 1. Materials:

- a. Primers:
 - 1) MPI Product 50, 'Primer Sealer, Latex, Interior' (or):
 - (a) N534 Ultra Spec 500 Interior Latex Primer by Benjamin Moore
 - (b) 6-4900xi PPG Speedhide Zero Interior Latex Primer by PPG Paints.
 - (c) B28W02600 ProMar 200 Zero Interior Latex Primer by Sherwin Williams.
- b. Finish Coats:
 - 1) Restrooms And Custodial Rooms:
 - (a) Buildings with only Gypsum Board surfaces in rooms:
 - (b) MPI Product 115, 'Epoxy-Modified Latex, Interior, Gloss (MPI Gloss Level 6)' (or):
 - (1) Corotech Pre-Catalyzed Waterborne Epoxy Semi-Gloss by Benjamin Moore.
 - (2) Aquapon WB EP 98E-X/98E-98 Waterborne Catalyzed Semi-Gloss Epoxy by PPG Paints.
 - (3) B73W311 Pro Industrial Waterbased Catalyzed Epoxy by Sherwin Williams.
 - (c) Buildings with CMU and Gypsum Board surfaces in same rooms:
 - (d) MPI Product 77, 'Epoxy, Gloss' (or):
 - (1) Corotech Pre-Catalyzed Waterborne Epoxy Semi-Gloss by Benjamin Moore.
 - (2) Aquapon WB EP 98E-X/98E-98 Waterborne Catalyzed Semi-Gloss Epoxy by PPG Paints.
 - (3) B73W311 Pro Industrial Waterbased Catalyzed Epoxy by Sherwin Williams.
 - 2) Remaining Painted Surfaces:
 - (a) Walls/Partitions/Vertical Surfaces - MPI Product 141, 'Latex, Interior, High Performance Architectural, Semi-Gloss (MPI Gloss Level 5)' (or):
 - (1) Ultra Spec 500 Latex Semi-Gloss by Benjamin Moore.
 - (2) 6-5510 PPG Speedhide Zero Interior Latex Semi-Gloss by PPG Paints.
 - (3) ProMar 200 Zero VOC HP Latex Semi-Gloss by Sherwin Williams.
 - (b) Ceilings - MPI Product 143 'Latex, Interior, High Performance Architectural, Flat (MPI Gloss Level 1 or 2)' (or):
 - (1) T535 Ultra Spec 500 Interior Latex Flat by Benjamin Moore.
 - (2) 6-4110xi PPG Speedhide Zero Interior Latex Flat by PPG Paints.
 - (3) ProMar 200 Zero VOC Interior Latex Flat by Sherwin Williams.
- 2. Performance:
 - a. Design Criteria:
 - 1) New Surfaces: MPI Premium Grade finish requirements.
 - 2) Gloss / Sheen Required:
 - (a) Restrooms And Custodial Rooms: Gloss Level 6.
 - (b) Remaining Painted Surfaces: Gloss Level 5.
 - b. Restrooms And Custodial Rooms:
 - 1) New Surfaces: Use MPI(a) INT 9.2E Waterborne Epoxy Finish system (or products listed above).
 - c. All Other:
 - 1) New Surfaces: Use MPI(a) INT 9.2B Latex Finish system (or products listed above).
- B. Interior Metal:
 - 1. Materials:

- a. All paints and coatings shall comply with VOC content limits as indicated in section 01 8113
 - 1) Primers:
 - (a) Ferrous Metal: MPI Product 107, 'Primer, Rust-Inhibitive, Water Based' (or):
 - (1) Ultra Spec HP Acrylic Metal Primer by Benjamin Moore.
 - (2) PPG Pitt-Tech Plus 4020PF / 90-19XX series Waterborne Acrylic Primer/Finish by PPG Paints.
 - (3) Pro-Cryl Universal Primer by Sherwin Williams.
 - (b) Galvanized Metal: MPI Product 134: 'Primer, Galvanized, Water Based' (or):
 - (1) Ultra Spec HP Acrylic Metal Primer by Benjamin Moore.
 - (2) PPG Pitt-Tech Plus 4020PF / 90-19XX series Waterborne Acrylic Primer/Finish by PPG Paints.
 - (3) Pro-Cryl Universal Primer by Sherwin Williams.
 - (c) Aluminum: MPI Product 134: 'Primer, Quick Dry, for Aluminum' (or):
 - (1) Ultra Spec HP Acrylic Metal Primer by Benjamin Moore.
 - (2) PPG Pitt-Tech Plus 4020PF / 90-19XX series Waterborne Acrylic Primer/Finish by PPG Paints.
 - (3) Pro-Cryl Universal Primer by Sherwin Williams.
 - 2) Finish Coats: MPI Product 153: 'Light Industrial Coating, Interior, Water Based, Semi-Gloss (MPI Gloss Level 5)' (or):
 - (a) V341 Corotech Pre-Catalyzed Waterborne Epoxy Semi-Gloss by Benjamin Moore.
 - (b) 16-1510 PPG Pitt-Glaze WB1 Waterborne Pre-Catalyzed Semi-Gloss Epoxy by PPG Paints.
 - (c) B73W311 Pro Industrial Waterbased Catalyzed Epoxy by Sherwin Williams.
2. Performance:
 - a. Design Requirements:
 - 1) New Surfaces: MPI Premium Grade finish requirements.
 - 2) Deteriorated Existing Surfaces: MPI Premium Grade finish requirements.
 - 3) Sound Existing Surfaces: MPI Custom Grade finish requirements.
 - 4) Gloss / Sheen Level Required: Gloss Level 5.
 - b. Ferrous Metal:
 - 1) New Surfaces: Use MPI(a) INT 5.1B Waterborne Light Industrial Finish system (or products listed above).
 - 2) Previously Finished Surfaces: Use MPI(r) RIN 5.1B Waterborne Light Industrial Finish system (or products listed above).
 - c. Galvanized Metal:
 - 1) New Surfaces: Use MPI(a) INT 5.3J Latex Finish system (or products listed above).
 - 2) Previously Finished Surfaces: Use MPI(r) RIN 5.3AH Latex Finish system (or products listed above).
 - d. Aluminum:
 - 1) New Surfaces: Use MPI(a) INT 5.4E Waterborne Light Industrial Finish system (or products listed above).
 - 2) Previously Finished Surfaces: Use MPI(r) REX 5.4E Light Industrial Finish system (or products listed above).
- C. Locations indicated as Epoxy:
 1. Materials
 - a. Wall and Ceiling Surfacing System:
 - 1) Interior Primer:

- (a) Approved Product. See Section 01 6000:
 - (b) 6-4 PPG Speedhide MaxPrime High Build Interior Latex Primer/Surfacer by PPG Paints.
 - (c) B28W601 PrepRite High Build Interior Latex Primer/Surfacer by Sherwin-Williams.
- 2) Epoxy:
- (a) Color: White.
 - (b) Approved Product. See Section 01 6000:
 - (c) 16-1510 PPG Pitt-Glaze WB1 Waterborne Pre-Catalyzed Semi-Gloss Epoxy by PPG Paints.
 - (d) B71W111 Pro Industrial HI-BLD Water-based Catalyzed Epoxy by Sherwin-Williams

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin application of paints and finishes until substrates have been adequately prepared.
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Protection of In-Place Conditions:
 - 1. Protect other finish work and adjacent materials during painting. Do not splatter, drip, or paint surfaces not intended to be painted. These items will not be spelled out in detail but pay special attention to the following:
 - a. Do not paint finish copper, bronze, chromium plate, nickel, stainless steel, anodized aluminum, or monel metal except as explicitly specified.
 - b. Keep cones of ceiling speakers completely free of paint. In all cases where painting of metal speaker grilles is required, paint without grilles mounted to speakers and without grilles on ceiling.
- B. Surface Preparation:
 - 1. Prepare surfaces in accordance with MPI requirements and requirements of Manufacturer for each painting system specified, unless instructed differently in Contract Documents. Bring conflicts to attention of Architect in writing.
 - 2. Fill minor holes and cracks in wood surfaces to receive paint or stain.
 - 3. Surfaces to be painted shall be clean and free of loose dirt. Clean and dust surfaces before painting or finishing.
 - 4. Do no exterior painting while surface is damp, unless recommended by Manufacturer, nor during rainy or frosty weather. Interior surfaces shall be dry before painting. Moisture content of materials to be painted shall be within tolerances acceptable to Paint Manufacturer.
 - 5. Sand woodwork smooth in direction of grain leaving no sanding marks. Clean surfaces before proceeding with stain or first coat application.
- C. Clean surfaces thoroughly and correct defects prior to application.
- D. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- E. Remove or repair existing paints or finishes that exhibit surface defects.

- F. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- G. Seal surfaces that might cause bleed through or staining of topcoat.
- H. Interior Poured Concrete:
 - 1. New Surfaces:
 - a. Prep according to manufacturer's instructions.
 - b. Apply prime coat.
 - c. Apply finish coats.
 - 2. Existing Painted Surfaces:
 - a. Remove deteriorated existing paint down to sound substrate by scraping and sanding. Feather edges of existing paint by sanding to be smooth with adjacent surfaces. Acid etch bare concrete areas, if necessary.
 - b. Clean floors as recommended by Paint Manufacturer.
 - c. Apply coating system.
- I. Interior Gypsum Board and Plaster:
 - 1. Interface With Other Work: Properly clean and paint light cove interiors before installation of light fixtures.
 - 2. New Surfaces:
 - a. Primer: Apply primer to be covered with other paint coats with roller only, or with spray gun and back-rolled.
 - 3. Existing Painted Surfaces:
 - a. Remove deteriorated existing paint down to sound substrate by scraping or sanding. Feather edges of existing paint by sanding to be smooth with adjacent surfaces.
 - b. Clean surface with mild soap and water, or with tri-sodium phosphate (TSP). Wash surfaces that have been defaced with marking pens, crayons, lipstick, etc, with solvent recommended by Paint Manufacturer. Spot prime such surfaces.
 - c. Spackle and tape cracks. Sand to smooth finish and spot prime.
 - d. Sand or chemically etch existing painted surface as required to prepare surface to accept new paint.
 - e. Re-clean surface.
 - f. Apply primer coat.
 - g. Apply finish coats.
- J. Interior Metal:
 - 1. New Surfaces: Remove rust spots by sanding and immediately spot prime. If all traces of rust cannot be removed, apply rust blocker recommended by Paint Manufacturer before applying full primer coat.
 - 2. Existing Painted Surfaces:
 - a. Remove deteriorated existing paint down to sound substrate by scraping and sanding. Feather edges of existing paint by sanding to be smooth with adjacent surfaces. Spot prime bare metal surfaces immediately.
 - b. Remove rust spots by sanding and immediately spot prime. If all traces of rust cannot be removed, apply rust blocker recommended by Paint Manufacturer before applying full primer coat.
 - c. Clean existing sound painted surfaces as well as scraped and sanded existing painted surfaces as recommended by Paint Manufacturer.
 - d. Apply prime coat over entire surface to be painted.
 - e. Lightly sand entire surface.
 - f. Clean surface as recommended by Paint Manufacturer.
 - g. Apply finish coats.
- K. Interior Wood:

1. New Surfaces:
 - a. Spot prime nail holes, cracks, and blemishes before and after puttying.
 - b. Apply stain blocker or other product recommended by Paint Manufacturer to knots before applying primer coat.
2. Existing Painted Surfaces:
 - a. Remove deteriorated existing paint down to sound substrate by scraping and sanding. Feather edges of existing paint by sanding to be smooth with adjacent surfaces. Spot prime bare wood areas on woodwork.
 - b. Wash surfaces that have been defaced with marking pens, crayons, lipstick, etc, with solvent recommended by Paint Manufacturer. Spot prime such surfaces.
 - c. Apply finish coats.

3.03 APPLICATION

- A. Interface with Other Work:
 1. Coordinate with other trades for materials and systems that require painting before installation.
 2. Schedule painting and coating work to begin when work upon which painting and coating work is dependent has been completed. Schedule installation of pre-finished and non-painted items, which are to be installed on painted surfaces, after application of final finishes.
- B. Paint or finish complete all surfaces to be painted or coated as described in Contract Documents, including but not limited to following items.
- C. Apply sealant in gaps 3/16 inch (5 mm) and smaller between two substrates that are both to be painted or coated. Sealants in other gaps furnished and installed under Section 07 9200.
- D. On wood to receive a transparent finish, putty nail holes in wood after application of stain using natural colored type to match wood stain color. Bring putty flush with adjoining surfaces.
- E. In multiple coat paint work, tint each succeeding coat with slightly lighter color, but approximating shade of final coat, so it is possible to check application of specified number of coats. Tint final coat to required color.
- F. Spread materials smoothly and evenly. Apply coats to not less than wet and dry film thicknesses and at spreading rates for specified products as recommended by Manufacturer.
- G. Touch up suction spots after application of first finish coat.
- H. Paint shall be thoroughly dry and surfaces clean before applying succeeding coats.
- I. Use fine sandpaper between coats as necessary to produce even, smooth surfaces.
- J. Make edges of paint adjoining other materials or colors clean, sharp, and without overlapping.
- K. Finished work shall be a 'Properly Painted Surface' as defined in this Section.
 1. Finish casework and wood trims that are specified to be installed under Section 06 2000 and that are not called out to be factory-or shop-finished. Back prime wood elements to be installed against concrete or masonry or that may be subjected to moisture.
 2. Paint mechanical, electrical, and audio/visual items that require field painting as indicated in Contract Documents. These include but are not limited to:
 - a. Gas pipe from gas meter into building.
 - b. Mechanical flues and pipes penetrating roof.
 - c. Electrical panel and disconnect enclosures.
 - d. Metal protective structures for refrigerant lines.
 3. Metal reveals at ceiling access doors.
 4. Paint inside of chases in occupied spaces flat black for 18 inches (450 mm) or beyond sightline, whichever is greater.
 5. Paint surfaces in organ chamber behind grille cloth with flat black paint.

- L. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- M. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- N. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.
- O. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- P. Apply each coat to uniform appearance in thicknesses specified by manufacturer.
- Q. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.
- R. Sand wood and metal surfaces lightly between coats to achieve required finish.
- S. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- T. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection.
- B. Owner will provide field inspection.
- C. Non-Conforming Work:
 - 1. Correct deficiencies in workmanship as required to leave surfaces in conformance with 'Properly Painted Surface,' as defined in this Section.
 - 2. Correction of 'Latent Damage' and 'Damage Caused By Others,' as defined in this Section, is not included in work of this Section.

3.05 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.
- B. As work proceeds and upon completion of work of any painting Section, remove paint spots from floors, walls, glass, or other surfaces and leave work clean, orderly, and in acceptable condition.
- C. Waste Management:
 - 1. Remove rags and waste used in painting operations from building each night. Take every precaution to avoid danger of fire.
 - 2. Paint, stain and wood preservative finishes and related materials (thinners, solvents, caulking, empty paint cans, cleaning rags, etc.) shall be disposed of subject to regulations of applicable authorities having jurisdiction.
 - 3. Remove debris caused by work of paint Sections from premises and properly dispose.
 - 4. Retain cleaning water and filter out and properly dispose of sediments.

3.06 PROTECTION

- A. Protect finishes until completion of project.
- B. Touch-up damaged finishes after Substantial Completion.

3.07 SCHEDULE OF PAINT COLORS

- A. Interior:
 - 1. Interior Clear Finished Wood (See Section 09 9300):
 - a. Match other interior clear finished wood building elements.
 - 2. Interior Gypsum Board, Plaster (See Section 09 9123):

- a. Color Quality Standard. See Section 01 6000:
 - 1) SW6098 Pacer White by Sherwin Williams or PPG 1078-2 Water Chestnut by PPG Paints
- 3. Interior Metal (See Section 09 9123):
 - a. Color Quality Standard. See Section 01 6000:
 - 1) SW6098 Pacer White by Sherwin Williams or PPG 1078-2 Water Chestnut by PPG Paints
- 4. Interior Painted Wood (See Section 09 9123):
 - 1) SW6098 Pacer White by Sherwin Williams or PPG 1078-2 Water Chestnut by PPG Paints

END OF SECTION 09 9123

**SECTION 09 9300
STAINING AND TRANSPARENT FINISHING**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Surface preparation.
- B. Field application of stains and transparent finishes.

1.02 DEFINITIONS

- A. Comply with ASTM D16 for interpretation of terms used in this section.

1.03 REFERENCE STANDARDS

- A. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications 2019.
- B. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials 2020.
- C. KCMA A161.1 - Performance and Construction Standard for Kitchen and Vanity Cabinets 2017.
- D. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association Current Edition.
- E. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conferences:
 - 1. Participate in pre-installation conference as specified in Section 09 9123.
 - 2. In addition to agenda items specified in Section 01 3100 and Section 09 9001, review following:
 - a. Review control sample(s).

1.05 SUBMITTALS

- A. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category.
 - 2. MPI product number (e.g. MPI #33).
 - 3. Manufacturer's installation instructions.
- B. Samples: Submit two samples, illustrating selected colors and sheens for each system with specified coats cascaded. Submit on actual wood substrate to be finished, 4 by 6 inch in size.
 - 1. Sample will be used as performance standard for evaluating finish provided.
- C. Finish Manufacturer's literature or certification that finish material meets requirements of ANSI / KCMA A161.1.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of stain or transparent finish, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Stain and Transparent Finish Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.07 FIELD CONDITIONS

	09 9300 - 1	Staining and Transparent Finishing

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by manufacturer of stains and transparent finishes.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply materials when relative humidity exceeds 85 percent; at temperatures less than 5 degrees F above the dew point; or to damp or wet surfaces.
- D. Minimum Application Temperature: 50 degrees F unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 STAINS AND TRANSPARENT FINISHES - GENERAL

- A. Finishes:
 - 1. Where MPI paint numbers are specified, provide products listed in Master Painters Institute Approved Product List, current edition available at www.paintinfo.com, for specified MPI categories, except as otherwise indicated.
 - 2. Provide finishes capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - 3. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
 - 4. Supply each finish material in quantity required to complete entire project's work from a single production run.
 - 5. Do not reduce, thin, or dilute finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

2.02 INTERIOR STAIN AND TRANSPARENT FINISH SYSTEMS

- A. Stain: MPI 90, 'Stain, Semi-Transparent, for Interior Wood'.
 - 1. 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 (vinyl sealer not required if required thickness can be achieved without) or three (3) coats of Conversion Varnish from one (1) of the approved Finish Manufacturers, or approved equal, 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.
 - 2. Color:
 - a. Design Criteria:
 - 1) Finish to match Owner selected sample.

	09 9300 - 2	Staining and Transparent Finishing

- (a) Oak 95:
 - (1) Performance standard: Owner provided sample.
 - (2) Contact Information: Michael Jensen (801) 240-3367
jensonmb@churchofjesuschrist.org, Meetinghouse Facilities
Department.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin application of stains and finishes until substrates have been properly prepared.
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.
- D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
 - 1. Wood: 15 percent, measured in accordance with ASTM D4442.

3.02 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or repair existing finishes that exhibit surface defects.

3.03 APPLICATION

- A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- C. Apply each coat to uniform appearance in thicknesses specified by manufacturer.
- D. Sand wood surfaces lightly between coats to achieve required finish.
- E. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- F. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.
- G. Reinstall items removed prior to finishing.
- H. 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-steared 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-steared 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.
- I. Where back-priming is required, apply one coat of finish material.
- J. Architectural Woodwork Door Surfaces (cabinetry doors only):
 - 1. Finish tops, bottoms, and edges before faces.
 - 2. Finish architectural woodwork doors with no hardware applied to doors.

	09 9300 - 3	Staining and Transparent Finishing

3.04 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

- A. Protect finishes until completion of project.
- B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

**SECTION 10 1100
VISUAL DISPLAY UNITS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Glass markerboards.
- B. Tackboards.

1.02 REFERENCE STANDARDS

- A. FS CCC-W-408 - Wall Covering, Vinyl-Coated Revision D.

1.03 SUBMITTALS

- A. Product Data: Provide manufacturer's data on installation instructions, markerboard, tackboard surface covering, trim, and accessories.
- B. Manufacturer's printed installation instructions.
- C. Closeout Submittals:
 - 1. Include following in Operations and Maintenance Manual specified in Section 01 7800:
 - a. Operations and Maintenance Data:
 - 1) Maintenance instructions.
 - 2) Printed cleaning instructions.
 - b. Warranty Documentation:
 - 1) Manufacturer Warranty.
 - c. Record Documentation:
 - 1) Manufacturer's documentation:
 - (a) Manufacturer's product literature.
 - (b) Color selections.
- D. Maintenance Data: Include data on regular cleaning, stain removal.

1.04 WARRANTY

- A. Provide manufacturer warranty to include warranty against faulty workmanship and materials, discoloration due to cleaning, crazing or cracking, and staining.

PART 2 PRODUCTS**2.01 OWNER FURNISHED FIXED MARKERBOARDS**

- A. Approved Manufacturers. See Section 01 6000:
 - 1. Quartet, www.quartet.com.
- B. Fabrication:
 - 1. Furnish printed cleaning instructions with each shipment.

2.02 OWNER FURNISHED TACK BOARDS

- A. Manufacturer:
- B. Fabrication:
 - 1. Prefabricate units at factory and ship to jobsite in one piece.
 - 2. Furnish printed cleaning instructions with each shipment.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that internal wall blocking is ready to receive work and positioning dimensions are as indicated on shop drawings.
- C. Verify flat wall surface for frameless adhesive-applied boards.

3.02 PREPARATION

- A. Acclimatize tackable wall panels by removing from packaging in installation area not less than 24 hours before application.
- B. Remove switchplates, wall plates, and surface-mounted fixtures where tackable wall paneling is applied. Reinstall items on completion of installation.
- C. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

- A. Install boards in accordance with manufacturer's printed installation instructions.
- B. Secure units level and plumb.
- C. Shim as necessary to provide permanent installation and smooth operation.
- D. Anchor concealed hangers with screws at 24 inches (600mm)
- E. Butt Joints: Install with tight hairline joints.
- F. Carefully cut holes in boards for thermostats and wall switches.
- G. Mounting fasteners shall penetrate framing lumber or blocking 1-1/2 inch (38 mm) minimum. Use toggle bolts or expansion bolts in masonry walls.
- H. After attaching map clips, apply permanently attached end cap or screw to prevent removal of map clips.

3.04 CLEANING

- A. Clean board surfaces in accordance with manufacturer's instructions.
- B. Cover with protective cover, taped to frame.
- C. Remove temporary protective cover at Date of Substantial Completion.

END OF SECTION

**SECTION 10 1400
SIGNAGE****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Interior directional and informational signs.
- B. Building identification signs.

1.02 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.03 SUBMITTALS

- A. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.
- B. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
 - 1. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
 - 2. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
 - 3. Submit for approval by Owner through Architect prior to fabrication.
- C. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

1.04 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Sign shall meet ANSI A117.1 accessibility code and ADA standards for accessible design and local and state authorities having jurisdiction (AHJ) requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Package signs as required to prevent damage before installation.
- B. Package room and door signs in sequential order of installation, labeled by floor or building.
- C. Store tape adhesive at normal room temperature.

1.06 FIELD CONDITIONS

- A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.
- B. Maintain this minimum temperature during and after installation of signs.

PART 2 PRODUCTS**2.01 SIGNAGE APPLICATIONS**

- A. Owner Furnished Exterior Building Identification Signs
 - 1. Approved Distributors. See Section 01 6000:
 - a. Standard Exterior Metal Pan Signs:
 - 1) Visual Identity Office:
 - (a) Contact Information:
 - (b) 50 E. North Temple St. Rm. 2350, Salt Lake City, UT 84150-3232.
 - (c) Phone: 1-801-240-1302.
 - (d) Fax: 1-801-240-5997.
 - (e) vidoffice@churchofjesuschrist.org.
- B.

- C. Owner Furnished Miscellaneous Interior Signage.
 - 1. Approved Distributors. See Section 01 6000:
 - a. Standard Interior Signs:
 - 1) Visual Identity Office:
 - (a) Contact Information:
 - (b) 50 E. North Temple St. Rm. 2350, Salt Lake City, UT 84150-3232.
 - (c) Phone: 1-801-240-1302.
 - (d) Fax: 1-801-240-5997.
 - (e) vidoffice@churchofjesuschrist.org.
 - 2) Room Signs: Molded clear acrylic sub-surface graphics sign with set-screw to attach to included mounting bracket.
 - 3) Provide tactile / braille features in signage.
 - 4) Cabinet Door Signs: Flat clear acrylic sub-surface graphics sign with mounting adhesive in position.
 - 5) Color:
 - (a) Background: Blue.
 - (b) Lettering: White.
 - 2. Install interior signs square and plumb:
 - a. Room Signs:
 - 1) Install bracket using two screws. Use proper anchor for substrate.
 - 2) Attach sign to bracket using set-screw.
 - 3) Mount signs as described in Contract Drawings.
 - b. Cabinet Signs:
 - 1) Remove adhesive protective layer.
 - 2) Position sign correctly and apply to door.
 - 3) Roll sign to secure to door, taking care not to damage sign.
 - 4) Mount signs as described in Contract Drawings.
- D. Rest Room Doors Signs:
 - 1. One sign for each designated Rest Room door indicating gender of users.
 - 2. Quality Standard. See Section 01 6200.
 - a. No. 231595 California Title 24 signs by Best Sign Systems Inc, Montrose, CO www.bestsigns.com.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install neatly, with horizontal edges level.
- C. Locate signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.
- D. Protect from damage until Date of Substantial Completion; repair or replace damaged items.

END OF SECTION 10 1400

**SECTION 10 2600
WALL AND DOOR PROTECTION**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Corner guards.

1.02 REFERENCE STANDARDS

- A. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics 2010 (Reapproved 2018).
- B. ASTM D543 - Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents 2021.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2022.
- D. NFPA 101 - Life Safety Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. NFPA 265 - Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Textile or Expanded Vinyl Wall Coverings on Full Height Panels and Walls 2019.
- F. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. Product Data: Manufacturer's literature, Indicate physical dimensions, features, wall mounting brackets with mounted measurements, anchorage details, and rough-in measurements, color selections.
- B. Shop Drawings: Include plans, elevation, sections, and attachment details. Show design and spacing of supports for protective corridor handrails, required to withstand structural loads.
- C. Samples: Submit samples illustrating component design, configurations, joinery, color and finish.
 - 1. Submit two sections of corner guards, 12 inches long.
- D. Manufacturer's Instructions: Indicate special procedures, perimeter conditions requiring special attention.
- E. Maintenance Data: For each type of product include information regarding recommended and potentially detrimental cleaning materials and methods.
- F. Test and Evaluation Reports:
 - 1. Copies of Quality Assurance requirements for 'Class A' flame spread rating.
- G. Qualification Statement:
 - 1. Installer:
 - a. Provide Qualification documentation if requested by Architect or Owner.
- H. Closeout Submittals:
 - 1. Include following in Operations and Maintenance Manual specified in Section 01 7800:
 - a. Operations and Maintenance Data:
 - 1) Maintenance, and cleaning instructions.
 - b. Warranty Documentation:
 - 1) Final, executed copy of Warranty
 - c. Record Documentation:
 - 1) Manufacturers documentation:
 - (a) Manufacturer's literature.
 - (b) Color selection.

1.04 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. System shall be recognized for intended use by applicable building codes.
- B. Qualifications:
 - 1. Installers:
 - a. Installer shall have performed at least three (3) installations of similar size, scope, and complexity in each of the past two (2) years.
 - b. Provide documentation if requested.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver wall and door protection items in original, undamaged, unopened protective packaging. Intact Label items to designate installation locations.
- B. Protect work from moisture damage.
- C. Protect work from UV light damage.
- D. Do not deliver products to project site until areas for storage and installation are fully enclosed, and interior temperature and humidity are in compliance with manufacturer's recommendations for each type of item.
- E. Store products in either horizontal or vertical position, in compliance with manufacturer's instructions.
- F. Storage and Handling Requirements:
 - 1. Store materials in protected area in original, undamaged packaging in a cool, dry place out of direct sunlight and exposure to elements. Minimum room temperature of 40 deg F (4.4 deg C) and a maximum of 100 deg F (37.8 deg C) should be maintained.
- G. Ambient Conditions:
 - 1. Material must be acclimated in an environment of 65 deg F to 75 deg F (18 deg C to 24 deg C) for at least twenty-four (24) hours prior to beginning installation.
 - 2. Installation areas must be enclosed and weatherproofed before installation commences.

PART 2 PRODUCTS

2.01 PRODUCT TYPES

- A. Corner Guards:
 - 1. Manufacturers:
 - a. Vinyl Corner Guards:
 - 1) Approved Manufacturers.
 - (a) Acrovyn, Div Construction Specialties Group, Muncie, PA www.c-sgroup.com.
 - (b) American Floor Products Co, Rockville, MD www.afco-usa.com.
 - (c) IPC Door and Wall Protection Systems, Muskego, WI www.inprocorp.com.
 - (d) Koroseal Wall Protection Systems, Fairlawn, OH www.korogard.com.
 - (e) Pawling Corp, Pawling, NY www.pawling.com.
 - 2. Materials:
 - a. Vinyl Corner Guards:
 - 1) Design Criteria:
 - (a) Chemical and stain resistance: Provide wall protection system components with chemical and stain resistance in accordance with ASTM D543.
 - 2) Color and Texture: As selected by Architect from Manufacturer's premium colors.
 - 3) Design Standard: Acrovyn VA Series, 1-1/2 inches (38mm) by 1-1/2 inches (38mm).
 - 3. Fabrication:
 - a. Fabricate wall protection systems to comply with requirements indicated for design, dimensions, details, finish, and member sizes.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that rough openings, concealed blocking, and anchors are correctly sized and located, and identify conditions detrimental to proper or timely completion.
- B. Verify that field measurements are as indicated on drawings.
- C. Verify that substrate surfaces for adhered items are clean and smooth.
 - 1. Test painted or wall covering surfaces for adhesion in inconspicuous area, as recommended by manufacturer. Follow adhesive manufacturer's recommendations for remedial measures at locations and/or application conditions where adhesion test's results are unsatisfactory.
- D. Notify Architect of unsuitable conditions in writing.
- E. Do not proceed until unsatisfactory conditions have been corrected.
- F. Start of installation constitutes acceptance of project conditions.

3.02 INSTALLATION

- A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to supporting construction.
- B. Apply adhesive carefully to insure continuous contact between wall and guard. Take care to avoid soiling or leaving visible adhesive on wall or base.
- C. Maintain ambient conditions for at least forty-eight (48) hours.
- D. Allow materials to acclimate to building temperature 65 to 75 deg F (18 to 24 deg C) for at least twenty-four (24) hours prior to installation.
- E. Take all necessary steps to prevent damage to material during installation as required in manufacturer's installation instructions.
- F. Surface Preparation:
 - 1. Prior to installation, clean substrate to remove dirt, debris and loose particles. Perform additional preparation procedures as required by manufacturer's instructions.
 - 2. Follow Manufacturers' installation instructions, using only approved mounting hardware, and locating all components firmly into position, level and plumb.

3.03 TOLERANCES

- A. Maximum Variation From Required Height: 1/4 inch.
- B. Maximum Variation From Level or Plane For Visible Length: 1/4 inch.

3.04 CLEANING

- A. Clean wall and door protection items of excess adhesive, dust, dirt, and other contaminants as per Manufacturer's cleaning instructions.
- B. Remove surplus materials, rubbish and debris resulting from installation as work progresses and upon completion of work.

3.05 PROTECTION

- A. Protect installed materials to prevent damage by other trades. Use materials that may be easily removed without leaving residue or permanent stains.

END OF SECTION

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SECTION 10 2800
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Commercial toilet accessories.
- B. Utility room accessories.

1.02 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design 2010.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2022.
- D. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2015.
- E. ASTM C1036 - Standard Specification for Flat Glass 2021.
- F. ASTM F446 - Standard Consumer Safety Specification for Grab Bars and Accessories Installed in the Bathing Area 2019.
- G. ISO 25537 - Glass in building — Silvered, flat-glass mirror 2008.

1.03 SUBMITTALS

- A. Product Data: Submit data on accessories describing operating characteristics, size, finish, details of function, rough-in dimensions and attachment methods.
- B. Shop Drawings:
 - 1. Schedule showing items used, location where installed, and proper attaching devices for substrate.
- C. Manufacturer's Installation Instructions: Indicate operation, care, cleaning instructions, special procedures and conditions requiring special attention.
- D. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - 2. Warranty Documentation:
 - a. Final, executed copy of Warranty for each product.
 - 3. Record Documentation:
 - a. Manufacturers documentation:
 - 1) Manufacturer's literature or cut sheets.

1.04 QUALITY ASSURANCE

- A. Source Limitations:
 - 1. For products listed together in same Part 2 articles, obtain products from single source from single manufacturer.

1.05 WARRANTY

- A. Commercial Toilet Accessories:
 - 1. Manufacturer's standard warranty.
- B. Special Mirror Warranty:
 - 1. Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage or frame corrosion defects within specified warranty period:
 - a. Warranty Period: fifteen (15) years from date of Substantial Completion.

PART 2 PRODUCTS**2.01 OWNER-FURNISHED PRODUCTS**

	10 2800 - 1	Toilet, Bath, and Laundry Accessories

A. Approved Products:

1. Automatic Touchless Towel Dispensers:
 - a. Size: 14.8 inches (376 mm) wide x 9.75 inches (248 mm) deep x 16.75 inches (425 mm) high.
2. Soap dispensers.
3. Toilet tissue dispensers.

2.02 MANUFACTURED UNITS

A. Manufacturers:

1. Manufacturer Contact List:
 - a. AJW Architectural Products, A&J Washroom Accessories, Inc., New Windsor, NY www.ajwashroom.com.
 - b. American Specialties Inc (ASI), Yonkers, NY www.americanspecialties.com.
 - c. Bobrick Washroom Equipment Inc, North Hollywood, CA www.bobrick.com or Bobrick Washroom Equipment of Canada Ltd, Scarborough, ON (416) 298-1611.
 - d. Bradley Corp, Menomonee Falls, WI www.bradleycorp.com.
 - e. General Accessory Manufacturing Co (GAMCO), Durant, OK www.gamcousa.com.

B. Materials:

1. Design Criteria:
 - a. Stainless Steel: ASTM A666 Type 304 (18-8); satin finish exposed surfaces unless otherwise indicated.
 - b. Galvanized-Steel Mounting Devices: ASTM A153/A153M, hot-dip galvanized after fabrication.
 - c. Fasteners:
 - 1) Exposed: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant.
 - 2) Concealed: Galvanized Steel.
2. Rest Rooms:
 - a. Mirrors:
 - 1) Channel-Frame Mirror:
 - (a) Frame: Type 304 or Type 430, 20 gauge stainless steel channel frame.
 - (b) Roll-formed one piece construction.
 - (c) Exposed surfaces have #4 satin finish.
 - (d) Edges and corners are burr free.
 - (e) Glass: 1/4 inch (6.4 mm) silver coated and hermetically sealed. Guaranteed for 15 years against silver spoilage. Mirrors meet ASTM C1036 requirements.
 - (f) Concealed surface mounted wall hanger.
 - 2) Approved Products. See Section 01 6000:
 - (a) AJW Architectural Products: Model U711.
 - (b) American Specialties (ASI): Model 0620.
 - (c) Bobrick: Model B-165.
 - (d) Bradley: Model 781.
 - (e) General Accessory (GAMCO): Model C Series.
 - b. Sanitary Napkin Disposal Container:
 - 1) Design Criteria:
 - (a) Surface mounted type 304, 22 gauge stainless steel with #4 satin finish. Seamless construction with radius and hemmed edges.
 - (b) Stainless steel piano hinge.
 - 2) Approved Products. See Section 01 6000:
 - (a) AJW Architectural Products: Model U590.
 - (b) American Specialties (ASI): Model 0852.
 - (c) Bobrick: Model B-270.

	10 2800 - 2	Toilet, Bath, and Laundry Accessories

- (d) Bradley: Model 4781-15.
 - (e) General Accessory (GAMCO): Model ND-1.
 - c. Single Robe Hook:
 - 1) Surface mounted type 304, 22 gauge stainless steel with #4 satin finish.
 - 2) Concealed mounting bracket.
 - 3) Stainless steel locking setscrew on bottom.
 - 4) Approved Products. See Section 01 6000:
 - (a) AJW Architectural Products: Model UX110SF.
 - (b) American Specialties (ASI): Model 7340-S.
 - (c) Bobrick: Model B6717.
 - (d) Bradley: Model 9114.
 - (e) General Accessory (GAMCO): Model 76717.
 - d. Grab Bars:
 - 1) Configuration shown on Contract Drawings. Include center support for longer lengths when required:
 - 2) Design Criteria:
 - (a) Comply with ADA guidelines and ADAAG accessible design for structural strength and local and state codes.
 - (b) Concealed mount.
 - (c) 18 ga (1.27 mm), type 304 stainless steel tubing.
 - (d) 1-1/2 inch (38 mm) diameter.
 - (e) Provide center support when required.
 - (f) Snap-on flange covers.
 - (g) Peened (non-slip) finish.
 - (h) Sustain loads in excess of 900 lbs (408 kg).
 - 3) Approved Products. See Section 01 6000:
 - (a) AJW Architectural Products: Model UG3 Series.
 - (b) American Specialties (ASI): Model 3800 Series.
 - (c) Bobrick: Model B-6806 Series.
 - (d) Bradley: Model 812 Series.
 - (e) General Accessory (GAMCO): Model 150 Series.
 - e. Shelf:
 - 1) Design Criteria:
 - (a) 18 ga (1.27 mm), stainless steel with No. 4 Satin finish.
 - (b) 6 inches (150 mm) wide.
 - 2) Approved Products. See Section 01 6000:
 - (a) AJW Architectural Products: Model U776.
 - (b) American Specialties (ASI): Model 0692.
 - (c) Bobrick: Model B-296.
 - (d) Bradley: Model 756.
 - (e) General Accessory (GAMCO): Model S-6.
- 3. Custodial Rooms:
 - a. Utility Shelf:
 - 1) Provide mop / broom hangers, shelf, and rod for hanging rags.
 - 2) Size as shown on Contract Drawings.
 - 3) Approved Products. See Section 01 6000:
 - (a) AJW Architectural Products: Model UJ41.
 - (b) American Specialties (ASI): Model 1300 Series.
 - (c) Bobrick: Model B-224 Series.
 - (d) Bradley: Model 9933 Series.
 - (e) General Accessory (GAMCO): Model US Series.

PART 3 EXECUTION

	10 2800 - 3	Toilet, Bath, and Laundry Accessories

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify exact location of accessories for installation.
- C. For electrically-operated accessories, verify that electrical power connections are ready and in the correct locations.
- D. Verify that field measurements are as indicated on drawings.
- E. See Section 06 1000 for installation of blocking, reinforcing plates, and concealed anchors in walls and ceilings.

3.02 PREPARATION

- A. Deliver inserts and rough-in frames to site for timely installation.
- B. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

- A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.
- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. Comply with ADA Accessibility Guidelines and installation heights as shown on Contract Drawings.
- D. Assemble fixtures and associated fittings and trim in accordance with manufacturer's instructions.
- E. Install using mounting devices proper for base structure.
- F. Install equipment level, plumb, and firmly in place in accordance with manufacturer's rough-in drawings.
- G. Where possible, mount like items in adjoining compartments back-to-back on same partition.
- H. Grab Bars:
 - 1. Install as per Manufacturers written installation instructions.
 - 2. Install grab bars to withstand downward force of not less than 250 lbf (1112 N) per ASTM F446.
- I. Install items in accordance with Manufacturer's submitted, written instructions for screws or lag bolts into solid substrate capable of supporting 200 lbs (90 kg). Install using mounting devices proper for base structure.

3.04 REPAIR

- A. Repair or replace defective work, including damaged equipment and components.
- B. Repair or replace malfunctioning equipment, or equipment with parts that bind or are misaligned.

3.05 CLEANING

- A. Clean unit surfaces and leave in ready-to-use condition.

3.06 ADJUSTING

- A. Test each piece of equipment provided with moving parts to assure proper operation, freedom of movement, and alignment. Install new batteries in battery-powered items.

3.07 CLOSEOUT ACTIVITIES

- A. Turn over keys, tools, maintenance instructions, and maintenance stock to Owner.

3.08 PROTECTION

- A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

	10 2800 - 4	Toilet, Bath, and Laundry Accessories

**SECTION 10 2815
MISCELLANEOUS ACCESSORIES**

PART 1 GENERAL**1.01 SUMMARY**

- A. Products Furnished but Not Installed Under This Section:
 - 1. Portable baptismal font and accessories.
 - 2. Wall clocks.

1.02 RELATED REQUIREMENTS:

- A. Section 06 1000 - Rough Carpentry for wall blocking.
- B. United States Department of Justice Civil Rights Division (www.ADA.gov)
 - 1. The Americans with Disabilities Act of 1990:
 - a. Guidance on the 2010 ADA Standards for Accessible Design.

1.03 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.

1.04 WARRANTY

- A. Portable Baptistry:
 - 1. Manufacturer's one year limited warranty
 - 2. Manufacturer's ten year liner warranty

PART 2 PRODUCTS**2.01 PORTABLE BAPTISMAL FONT**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. PortableBaptistry.com, Lynnwood, WA, www.portablebaptistry.com
- B. Materials:
 - 1. Portable Baptistry
 - a. Design Criteria:
 - 1) Dimensions: 6'-8" wide x 39" deep
 - 2) Capacity: 450 gallons
 - 3) Entry stairs and handrails
 - b. Included accessories bundle:
 - 1) 2 Portable Baptistry Entries with HandRail
 - 2) Thermal Cover
 - 3) Baptistry 'Liner-Safe' Drain Pump
 - 4) Floating Thermometer
 - 5) Faucet Adapter
 - 6) Storage Strap
 - 7) Spray Cleaner
 - 8) Heater (110v/220v)
 - 9) Splash Pad
 - 10) Splash Guard
 - 11) Zip Cover
 - 12) 2 Towel Bin/Planters
 - 13) Care Kit
 - c. Acceptable Products:

- 1) The Portable Baptistry, Pastor's Choice Bundle
 - (a) Liner: 'Covenant' color
 - (b) Entry: 'Ebony' color

2.02 OWNER-FURNISHED CLOCKS

- A. Wall Clocks:
 1. Approved Suppliers. See Section 01 6000 for definitions of Categories:
 - a. Staples Advantage, PO Box 95708, Chicago, IL, phone (877) 295-0003, fax (800) 270-7611.
 - 1) Howard Miller model HOW625323.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Portable Baptistry:
 1. Assemble and install per manufacturer's written instructions.
- B. Wall Clocks:
 1. Mount at height as shown and in locations as shown on Contract Drawings.

END OF SECTION

**SECTION 10 4400
FIRE PROTECTION SPECIALTIES**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Fire extinguishers.
- B. Fire extinguisher cabinets.
- C. Accessories.

1.02 REFERENCE STANDARDS

- A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems 2013a (Reapproved 2017).
- B. NFPA 10 - Standard for Portable Fire Extinguishers 2022.

1.03 SUBMITTALS

- A. Product Data: Provide extinguisher operational features.
- B. Shop Drawings: Indicate locations of cabinets, cabinet physical dimensions, and rough-in measurements for recessed cabinets.
- C. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.
- D. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.
- E. Closeout Submittals:
 - 1. Include following in Operations and Maintenance Manual specified in Section 01 7800:
 - a. Warranty Documentation:
 - 1) Include copy of final, executed warranty.
 - b. Record Documentation:
 - 1) Testing and Inspection Reports:
 - (a) Testing Agency Inspecting Reports of Drilled-In Mechanical Anchors / Adhesive Anchors / Screw Anchors.

1.04 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Fire extinguishers shall be inspected and have annual inspection tag attached before Substantial Completion.

1.05 FIELD CONDITIONS

- A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

1.06 WARRANTY

- A. Manufacturer Warranty:
 - 1. Manufacturer's standard, written warranty on fire extinguisher.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Fire Extinguishers:
 - 1. Approved Manufacturers. See Section 01 6000:
 - a. Amerex Corp, Trussville, AL www.amerex-fire.com.
 - b. Ansul Incorporated, Marinette, WI www.ansul.com.
 - c. Buckeye Fire Equipment, Kings Mountain, NC www.buckeyef.com.
 - d. Extinguishers private-labeled by manufacturers approved above are approved, with appropriate documentation.
- B. Cabinets and Brackets:

1. Acceptable Manufacturers:
 - a. J L Industries, Bloomington, MN www.jlindustries.com.
 - b. Larsen's Manufacturing Co, Minneapolis, MN www.larsensmfg.com.
 - c. Modern Metal Products / Technico, Owatonna, MN www.modern-metal.com.
 - d. National Fire Equipment Ltd, Scarborough, ON www.nationalfire.com.
 - e. Potter-Roemer, Cerritos, CA www.potterroemer.com.
 - f. Samson Products Inc, City of Commerce, CA www.samsonproducts.com.
 - g. Seton Inc, Richmond Hill, ON (905) 764-1122.
 - h. Equal as approved by Architect before bidding. See Section 01 6000.
- C. Acceptable Distributors:
 1. W.W. Grainger, Inc., Lake Forest, IL www.grainger.com.
 2. Equal as approved by Architect before bidding. See Section 01 6000.

2.02 FIRE EXTINGUISHERS

- A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
- B. Design Criteria:
 1. Ten pound dry chemical ABC stored pressurized type equipped with pressure gauge and which does not need recharging except after use.
 2. Instructions for repairs, maintenance, and recharging shall be attached.
 3. Unit shall be tested and approved by UL and have minimum 4A:60-B:C UL rating. UL rating shall appear on extinguisher labels and be attached to and a part of fire extinguisher units.

2.03 FIRE EXTINGUISHER CABINETS

- A. Fire Rating: Listed and labeled in accordance with ASTM E814 requirements for fire resistance rating of walls where being installed.
- B. Design Criteria:
 1. Two-piece, semi-recessed or flush type depending on wall thickness, and have white baked enameled steel tubs with white baked enamel return trim and doors, clear acrylic glazing, 'Safe-T-Lock,' and cylinder locks.
 2. Supply each cabinet with one specified fire extinguisher.
- C. Acceptable Manufacturers:
 1. Basis of Design Product: Ambassador 1017 G10 by J L Industries.
 2. Equal as approved by Architect before bidding from Acceptable Manufacturer's equivalent product. See Section 01 6000.

2.04 ACCESSORIES

- A. Extinguisher Brackets:
 1. Design Criteria:
 - a. Heavy duty with minimum of double strap/bracket.
 2. Approved Bracket. See Section 01 6000:
 - a. Basis of Design Product: No. 846 by Larsen's.
 - b. Equal as approved by Architect before bidding from Approved Manufacturer's equivalent product.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

- B. Securely Install cabinets and hangers plumb and level with wall surfaces.
- C. Trim for cabinets shall be neat in appearance.
- D. Place extinguishers in cabinets.

3.03 ADJUSTING

- A. Fire extinguishers shall be inspected and have annual inspection tag attached before Substantial Completion.

END OF SECTION

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SECTION 11 3013 RESIDENTIAL APPLIANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Kitchen appliances.

1.02 SUBMITTALS

- A. Product Data: Manufacturer's data indicating dimensions, capacity, and operating features of each piece of residential equipment specified.
 - 1. Provide Anti-Tip Bracket installation instructions for free-standing range.
 - 2. Catalog sheets before ordering items of equipment.
- B. Shop Drawings:
 - 1. Complete utility drawings showing exact locations of electrical outlets and connections.
- C. Copies of Warranties: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- D. Closeout Submittals:
 - 1. Include following in Operations and Maintenance Manual specified in Section 01 7800:
 - a. Record Documentation:
 - 1) Manufacturers documentation:
 - (a) Manufacturer's literature packaged for each appliance.

1.03 DELIVERY, STORAGE, AND HANDLING REQUIREMENTS

- A. Delivery and Acceptance Requirements:
 - 1. General Contractor responsibility:
 - a. Supervise unloading and handling for Owner Furnished Products.
 - b. Range:
 - 1) Verify Anti-Tip Brackets are included. Contact Owner for missing brackets.
- B. Storage and Handling Requirements:
 - 1. General Contractor responsibility:
 - a. Provide secure location protected from weather and other trades.

PART 2 PRODUCTS

2.01 OWNER-FURNISHED PRODUCTS

- A. Manufactured Units:
 - 1. Free Standing Range:
 - a. 30 inch (750 mm) free-standing conventional electric range with two 8 inch (400 mm) and two 6 inch (150 mm) calrod surface heating units.
 - 2. Refrigerator / Freezer:
 - a. 15.5 cu ft (0.44 cu meters) with top freezer compartment and reversible doors.
 - b. Dimensions: 64 inches (1 600 mm) high by 28 inches (700 mm) wide by 28-7/8 inches (722 mm) deep.
 - 3. Microwave Oven:
 - a. 800 watts.
 - b. Dimensions: 12 inches (300 mm) high by 24 inches (200 mm) wide by 13 inches (325 mm) deep.

2.02 ACCESSORIES

- A. Free Standing Range:
 - 1. Anti-Tip Bracket.
 - 2. Range Cord with 4 prong plug for new buildings and those built since 1995.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify utility rough-ins are provided and correctly located.

3.02 INSTALLATION

- A. General Contractor shall install all Owner Furnished Products as identified in this specification section:
 - 1. Free Standing Range:
 - a. Anti-Tip Bracket provided by Owner Furnished Manufacturer:
 - 1) Range must be secured by properly installed Anti-Tip Bracket.
 - 2) Install bracket using Manufacturer's printed installation instructions (screws provided for wall mounting only).
 - 3) Verify bracket is installed correctly and engaged properly:
 - (a) After installation of bracket, slide range into final location.
 - (b) Verify rear leveling leg must be fully inserted into bracket.
 - (c) Carefully tip range forward. DO NOT tip range more than 4 inches (100 mm).
 - (d) If bracket does not stop range within 4 inches (100 mm), bracket is NOT properly installed, and MUST be reinstalled and retested.
- B. Install in accordance with manufacturer's instructions.
- C. Anchor built-in equipment in place.

3.03 ADJUSTING

- A. Adjust equipment to provide efficient operation.

3.04 SOURCE QUALITY CONTROL

- A. Field Inspections:
 - 1. Nameplates:
 - a. Each piece of equipment shall bear nameplate of suitable size, securely fastened to equipment.
 - b. Each piece of electrically operated or heated equipment shall bear nameplate showing complete electrical requirements and capacities.

3.05 CLEANING

- A. Remove packing materials from equipment and properly discard.
- B. Wash and clean equipment.

END OF SECTION 11 3013

**SECTION 21 1313
WET-PIPE SPRINKLER SYSTEMS**

PART 1 GENERAL**1.01 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install modifications to existing fire sprinkler system to provide complete fire sprinkler system as specified in Contract Documents. Field verify and provide parts and materials compatible with existing system.
 - 2. Furnish and install Firestop Penetration Systems for plumbing systems penetrations as described in Contract Documents.

1.02 RELATED REQUIREMENTS

- A. Section 01 7000: 'Closeout Submittals'.
- B. Section 28 4600 Fire Detection and Alarm

1.03 REFERENCE STANDARDS

- A. ASME B1.20.1-2013 'Pipe Threads, General Purpose (Inch)'.
- B. ASME B1.20.1M-2006 (R2011), 'Pipe Threads, General Purpose (Metric)'.
- C. ASME B16.1-2015, 'Grey Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250'.
- D. ASME B16.3-2011, 'Malleable Iron Threaded Fittings: Classes 150 and 300'.
- E. ASME B16.4-2011, 'Gray Iron Threaded Fittings, Classes 125 and 250'.
- F. ASME B16.5-2013, 'Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard'.
- G. AWWA C606-15, 'Grooved and Shouldered Joints'.
- H. AWA B2.1/B2.1M-2014, 'Specification for Welding Procedure and Performance Qualification', (5th Edition).
- I. ASTM A53/A53M-12, 'Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless'.
- J. ASTM A135/A135M-09 (2014), 'Standard Specification for Electric-Resistance-Welded Steel Pipe'.
- K. ASTM A234/A234M-17, 'Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service'.
- L. ASTM A395/A395M-99 (2014), 'Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures'.
- M. ASTM A536-84 (2014), 'Standard Specification for Ductile Iron Castings'.
- N. ASTM A795/A795M-13, 'Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use'.
- O. NFPA 13, 'Standard for the Installation of Sprinkler Systems' (2016 Edition or latest AHJ approved edition).
- P. NFPA 24, 'Standard for the Installation of Private Fire Service Mains and their Appurtenances' (2016 Edition).
- Q. NFPA 25, 'Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems' (2014 Edition).
- R. NFPA 101, 'Life Safety Code' (2015 Edition).
- S. UL Directory B, 'Fire Protection Equipment, Directory B' (2011).

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate the installation of [] with size, location and installation of service utilities.
- B. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.
- C. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Action Submittals:
 - 1. Shop Drawings:
 - a. Size sprinkler system using NFPA 13 hydraulic calculation design method based on water supply evaluation performed at building site:
 - 1) On submittals, refer to sprinkler heads by sprinkler identification or model number published in appropriate agency listing or approval. Trade names and other abbreviated designations are not acceptable.
 - (a) Grooved joint couplings and fittings shall be shown on drawings and product submittals and be specifically identified with applicable Victaulic styles or series numbers.
 - b. Submittal Procedure:
 - 1) After award of Contract and before purchase of equipment, submit seven sets of shop drawings with specifications and hydraulic calculations, if pipe schedule method is not used, to Fire Sprinkler Consultant and two sets to local jurisdiction having authority for fire prevention for review.
 - 2) After integrating Fire Sprinkler Consultant's and local jurisdiction's comments into drawings, licensed certified fire protection engineer of record submitting fire sprinkler system design construction documents shall stamp, sign, and date each sheet of shop drawings and first page of specifications and calculations.
 - 3) Submit stamped documents to area office and local jurisdiction having authority for fire prevention for final approval.
 - 4) After final approval, submit four copies of approved stamped documents to Fire Sprinkler Consultant.
 - 5) Failure of system to meet requirements of authority having jurisdiction shall be corrected at no additional cost to Owner.
- C. Informational Submittals:
 - 1. Certificates:
 - a. Provide one (1) copy of completed NFPA 13 'Contractor's Material and Test Certification for Aboveground Piping' as specified in 'Field Quality Control' in Part 3 of this specification:
 - 2. Qualification Statement:
 - a. Licensed fire protection engineer or fire protection system designer:
 - 1) Licensed for area of Project.
 - 2) Certified by NICET to level three minimum.
 - 3) Provide Qualification documentation if requested by Fire Sprinkler Consultant or Owner's Representative.
 - b. Installer:
 - 1) Provide Qualification documentation if requested by Fire Sprinkler Consultant or Owner's Representative.
- D. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Operations and Maintenance Data:
 - 1) Maintenance and instructions.
 - (a) List of system components used indicating name and model of each item.

- (b) Manufacturer's maintenance instructions for each component installed in Project.
 - (c) Instructions shall include installation instructions, parts numbers and lists, operation instructions of equipment, and maintenance and lubrication instructions.
 - b. Warranty Documentation:
 - 1) Include copies of required warranties.
 - c. Record Documentation:
 - 1) Include copies of approved shop drawings.
 - 2) Provide master index showing items included.
 - 3) Provide name, address, and phone number of Architect, Fire Sprinkler Consultant, General Contractor, and Fire Protection subcontractor.
 - 4) Provide operating instructions to include:
 - (a) General description of fire protection system.
 - (b) Step by step procedure to follow for shutting down system or putting system into operation.
 - 5) Provide signed copy of NFPA 13 'Contractor's Material and Test Certification for Aboveground Piping'.
- 2. Instruction of Owner (as specified in Part 3 of this specification):
 - a. Provide Owner with latest version of NFPA 25.
- E. Maintenance Materials Submittals:
 - 1. Extra Stock Materials:
 - a. Six (6) spare sprinkler heads selected in representative proportion to quantity used in Project and in accordance with NFPA 13. Do not include Pendent and sidewall dry barrel sprinkler heads.
 - b. Provide spare heads in cabinet with sprinkler head wrench for each type of head used. After approval of cabinet and contents, mount cabinet in convenient location in Riser Room.
- F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies:
 - 1. Unless noted otherwise, system shall conform to:
 - a. NFPA 13 for Light & Ordinary Hazard Occupancies.
 - b. NFPA 24 for Service Mains and Their Appurtenances, Private.
 - c. NFPA 25, for 'Inspection, Testing, and Maintenance.
 - d. NFPA 101, for Life Safety Code.
 - e. Requirements of local water department and local authority having jurisdiction for fire protection.
 - f. Underwriters Laboratories Publication, 'Fire Protection Equipment Directory' (Current Edition at time of Pre-Bid Meeting).
 - g. Comply with backflow prevention requirements and, if required, include device in hydraulic calculations.
 - h. Applicable rules, regulations, laws, and ordinances.
- B. Qualifications:
 - 1. Licensed fire protection engineer or fire protection system designer certified by NICET to level three minimum and engaged in design of fire protection systems. Engineer / designer shall:
 - a. Licensed for area of Project.
 - b. Minimum five (5) years experience in fire protection system installations.
 - c. Minimum five (5) satisfactorily completed installations in past three (3) years of projects similar in size, scope, and complexity required for this project before bidding.

- d. Be responsible for overseeing preparation of shop drawings, hydraulic calculations where applicable, and system installation.
- e. Make complete inspection of installation.
- f. Provide corrected record drawings to Owner with letter of acceptance.
- g. Certify that installation is in accordance with Contract Documents.
- h. Upon request, submit documentation.
- 2. Installer:
 - a. Licensed for area of Project.
 - b. Minimum five (5) years experience in fire protection system installations.
 - c. Minimum five (5) satisfactorily completed installations in past three (3) years of projects similar in size, scope, and complexity required for this project before bidding.
 - d. Upon request, submit documentation.
- C. Designer Qualifications: Perform design under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
- D. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Acceptance Requirements:
 - 1. Do not deliver system components until proper protection can be provided.
 - 2. Accept valves on-site in shipping containers with labeling in place.
 - 3. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- B. Storage and Handling Requirements:
 - 1. Protect all components from damage and corrosion.
 - 2. Store items subject to moisture damage in dry, heated spaces.
 - 3. Leave protective coverings and packaging in place until time of installation.

1.08 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Manufacturer Warranty:
 - 1. Pipe Boot:
 - a. Provide thirty-five (35) year limited Product Warranty.

PART 2 PRODUCTS

2.01 SYSTEM

- A. Manufacturers:
 - 1. Manufacturers Contact List:
 - a. AGF Manufacturing, Inc , Malvern, PA 19355 www.agfmanufacturing.com
 - b. Croker Corp, Elmsford, NY www.croker.com.
 - c. Gruvlock by Anvil International, Portsmouth, NH www.anvilintl.com.
 - d. H O Trerice Company, Oak Park, MI www.hotco.com.
 - e. Kennedy Valve, Elmira, NY www.kennedyvalve.com.
 - f. Milwaukee Valve Co, New Berlin, WI www.milwaukeevalve.com.
 - g. Mueller Company, Decatur, IL www.muellerflo.com.
 - h. Nibco Inc, Elkhart, IN www.nibco.com.
 - i. Noble Company, Grand Haven MI www.noblecompany.com.
 - j. Notifier by Honeywell, Northford, CT www.notifier.com.
 - k. Potter Electric Signal Co, St Louis, MO www.pottersignal.com.
 - l. Potter-Roemer, Cerritos, CA www.potterroemer.com.
 - m. Prinzing, Milwaukee, WI www.prinzing.com.
 - n. Reliable Automatic Sprinkler Co, Mount Vernon, NY www.reliablesprinkler.com.

- o. System Sensor, St Charles, IL www.systemsensor.com.
 - p. TYCO Fire & Building Products, Lansdale, PA www.tyco-fire.com.
 - q. Viega LLC 585 Interlocken Blvd Broomfield, CO 80021
<https://www.viega.us/en/homepage.html>
 - r. Victaulic Company of America, Easton, PA or Victaulic Company of Canada, Rexdale, ON www.victaulic.com.
 - s. Viking Corp, Hastings, MI www.vikingcorp.com.
 - t. Equal as approved by Architect before bidding. See Section 01 6200.
- B. Description:
- 1. Automatic wet-pipe fire sprinkler system starting at flange in Fire Riser Room and extending throughout heated portions of building.
 - 2. Dry sprinkler heads connected to wet system over and into Vestibules.
- C. Performance:
- 1. Design Criteria:
 - a. Area of Application and Corresponding Design Density:
 - 1) Serving Area and Mechanical, Electrical, and Janitorial Areas:
 - (a) Ordinary Hazard Group 1.
 - (b) Design density = 0.15 gpm per sq ft over 1,500 sq ft (140 sq m).
 - 2) Storage Areas:
 - (a) Ordinary Hazard Group 2.
 - (b) Design density = 0.20 gpm per sq ft over 1,500 sq ft (140 sq m).
 - 3) All Other Areas:
 - (a) Light Hazard.
 - (b) Design density = 0.10 gpm per sq ft over 1,500 sq ft (140 sq m).
 - 4) Increase remote areas by 30 percent where ceiling / roof is sloped more than 2 inches (50 mm) per ft.
 - 5) Remote areas may be reduced within parameters indicated in NFPA 13 for use of quick response sprinklers throughout.
 - b. Maximum Coverage per Sprinkler Head:
 - 1) Ordinary Hazard Areas: 130 sq ft (12.1 sq meters).
 - 2) Attic Areas: 120 sq ft (11.2 sq meters).
 - 3) Light Hazard Areas: 225 sq ft (20.1 sq meters).
 - c. Design Area shall be hydraulically most remote area in accordance with NFPA 13.
 - 1) Provide a 10% safety allowance under adjusted water flow supply curve.
 - d. Maximum velocity of water flow within piping: 20 feet (6.1 m) per sec.
- D. Components:
- 1. General: Use only domestically manufactured cast iron pipe fittings, valves, sprinkler heads, and other components.
 - a. Pipe of foreign manufacture that meets ASTM Standards is acceptable.
 - b. Ductile iron fittings of foreign manufacture are acceptable.
 - 2. Pipe:
 - a. **Schedule 40 Welded Steel:**
 - 1) Exterior, Above Ground: Schedule 40 hot-dip galvanized welded steel meeting requirements of ASTM A53/A53M, ASTM A135/A135M or ASTM A795/A795M.
 - 2) Interior, Above Ground: Schedule 40 black welded steel meeting requirements of ASTM A53/A53M, ASTM A135/A135M or ASTM A795/A795M.
 - 3) Connections:
 - (a) 2 inches (50 mm) And Smaller: Screwed, flanged, or roll grooved coupling system.
 - (b) 2-1/2 inches (64 mm) And Larger: Flanged or roll grooved coupling system.
 - 3. Fittings:
 - a. Usage:

- 1) 2 inches (50 mm) And Smaller: Welded, screwed, flanged, press, or roll grooved coupling system. For use with schedule 40 carbon steel pipe.
- 2) 2-1/2 inches (64 mm) And Larger: Welded, flanged, or roll grooved coupling system.
- b. Types And Quality:
 - 1) Screwed:
 - (a) Cast iron meeting requirements of ANSI B 16.4 or ductile iron meeting requirements of ANSI B 16.3 and ASTM A536, Grade 65-45-12.
 - (b) Threaded fittings and pipe shall have threads cut to ANSI B1.20.1.
 - (c) Do not extend pipe into fittings to reduce waterway.
 - (d) Ream pipe after cutting to remove burrs and fins.
 - 2) Flanged: Steel meeting requirements of ANSI B16.5.
 - 3) Welded:
 - (a) Carbon steel meeting requirements of ASTM A234/A234M.
 - (b) Weld pipe using methods complying with AWS B2.1, level AR-3. Welding procedures and performance of welders shall comply with ASW B2.1, level AR3.
 - 4) Press
 - (a) Approved Product
 - (1) Viega MergPress for Black Iron 1/2 inch to 2 inch and/or current offerings.
 - 5) Roll Grooved Pipe Coupling System:
 - (a) Ductile iron meeting requirements of ASTM A395/A395M and ASTM A536, and UL / CASA listed and FM approved.
 - (b) Grooved products used on Project shall be from same manufacturer. Grooving tools shall be as recommended by manufacturer of grooved products.
 - (c) Approved Products. See Section 01 6200:

	Grulvok	Tyco	Victaulic	Viking
Rigid Couplings	7401	772	Style 005	V-Z05
Flexible Couplings (*1)	7000	705	Style 75	V-7705
Flange Adaptors (*2)	7012	71	Style 744	V-7041
Grooved Coupling Gaskets (*3)	'E' EPDM	'E' EPDM	'E' EPDM (*4)	E-EPDM

- (1) Use in locations where vibration attenuation and stress relief are required.
 - (2) Class 125 or 150.
 - (3) Temperature rated 30 to 150 deg F (minus one to 65 deg C). NSF-61 certified.
 - (4) Grade 'A'
 - c. Use of saddle or hole cut type mechanical tees is NOT APPROVED.
4. Valves:
- a. Ball Valves:
 - 1) UL / CASA / FM approved.
 - 2) Valve tamper switch.
 - 3) Approved Products.
 - (a) Milwaukee: BB-SCS02 with threaded ends.
 - (b) Nibco:
 - (1) KT-505 with threaded ends.
 - (2) KG-505 with grooved ends.

- (c) Victaulic: Series 728 with grooved or threaded ends.
- b. Swing Check Valves:
 - 1) 2 to 4 inch (50 to 100 mm), grooved ends, ductile iron, 300 psi (2.07 MPa).
 - (a) Regrinding type.
 - (b) Renewable disk.
 - (c) Bronze Class 125 with threaded ends.
 - (d) Approved Products.
 - (1) Nibco: KT-403-W.
 - (2) Tyco (Grinnell): CV-1F grooved ends.
 - (3) Victaulic: 712.
 - (4) Viking: G-1 grooved ends.
 - 2) 3 to 12 inch Horizontal Check:
 - (a) Bolted bonnet.
 - (b) Raised face flanges.
 - (c) Bronze mounted with ductile iron body.
 - (d) 125 lb Class A.
 - (e) Approved Products.
 - (1) Nibco: F-938-31.
 - (2) Mueller: A-2120-6.
 - (3) Viking: F-1 grooved and flanged.
- c. Wafer Type Check Valves:
 - 1) 4 to 8 inch (100 to 200 mm) cast iron body.
 - 2) 175 psi minimum working pressure.
 - 3) Rubber Seat.
 - 4) Approved Products.
 - (a) Nibco: KW-900-W.
 - (b) Mueller: A-2102.
 - (c) Kennedy: Fig. 706.
- d. Grooved-End Check Valves:
 - 1) 2-1/2 to 12 inch (64 to 300 mm) ductile iron body.
 - 2) 250 psi maximum working pressure.
 - 3) Disc And Seat:
 - (a) 2-1/2 And 3 Inch (64 to 76 mm): Aluminum bronze disc with mounted elastomer seal and PPS (polyphenylene sulfide) coated seat.
 - (b) 4 Inch (100 mm) And Larger: Elastomer encapsulated ductile iron disc with welded in nickel seat.
 - 4) Approved Products.
 - (a) Victaulic Series 717.
 - (b) Kennedy: Fig. 426.
- e. Retard Chamber
 - 1) Design Criteria:
 - (a) Self-draining.
- f. Approved Products:
 - 1) Reliable: E-1.
 - 2) Victaulic: Series 752.
 - 3) Viking: C-1.
- g. Inspector's Test Valve:
 - 1) Design Criteria:
 - (a) Bronze body with threaded or grooved ends.
 - (b) Combination sight glass / orifice.
- h. Approved Products:
 - 1) Reliable Model TD or TD with optional relief valve kit.
 - 2) Tyco (Grinnell): Model F350.

- 3) Victaulic: Testmaster Alarm Test Module Style 720.
 - 4) Viking 3011ASG [includes pressure relief] or Viking 3011SG.
 - i. Inspector's Test Valve:
 - 1) Combination sight glass/orifice.
 - (a) Bronze top works.
 - (b) Approved Products.
 - (1) Reliable Model TD or TD with optional Relief valve kit.
 - (2) Tyco (Grinnell): Model F350.
 - (3) Victaulic: Testmaster II Alarm Test Module Style 720.
 - (4) Viking 3011ASG [includes pressure relief] or Viking 3011SG.
5. Sprinkler Heads:
 - a. Concealed Pendant:
 - 1) Design Criteria:
 - (a) Adjustable cover.
 - (b) UL / CASA listed and approved.
 - (c) Concealed Cover Finish: White.
 - 2) Acceptable Products:
 - (a) Wet Pendant, Flat Profile:
 - (1) Reliable: F4FR.
 - (2) Victaulic: Model 3802.
 - (3) Viking: Model VK462.
 - (4) Tyco (Grinnell): Model RF11.
 - (5) Equal as approved by Fire Sprinkler Consultant before bidding. See Section 01 6200.
 - (b) Dry Pendant, Flat Profile:
 - (1) Tyco (Grinnell): DS-C.
 - (2) Victaulic: V3618.
 - (3) Equal as approved by Fire Sprinkler Consultant before bidding. See Section 01 6200.
 - b. Dry Pendant
 - 1) Flat Profile:
 - (a) Tyco (Grinnell): DS-C.
 - (b) Victaulic: V3618.
 - (c) Equal as approved by Fire Sprinkler Consultant before bidding. See Section 01 6200.
 - c. Dry Flexible
 - 1) Acceptable Product
 - 2) Victaulic VICFLEX VS1
6. Horizontal Sidewall Sprinkler:
 - a. Design Criteria:
 - 1) UL / CASA listed and approved.
 - 2) Recess adjustable.
 - 3) Where guards are required, use chrome plated sprinkler guards that are listed, that are approved by Sprinkler Manufacturer for use with head, and that are supplied by Sprinkler Manufacturer.
 - b. Acceptable Products:
 - 1) Wet System:
 - (a) Reliable: F1FR.
 - (b) Tyco (Grinnell): Model TY-FRB.
 - (c) Victaulic: Model V2710.
 - (d) Viking: VK305.
 - (e) Equal as approved by Fire Sprinkler Consultant before bidding. See Section 01 6200.

7. Attic Sprinklers, Upright:
 - a. Design Criteria:
 - 1) UL / CASA listed and approved.
 - 2) Approved for use in roof structures, combustible and non-combustible, with ceiling below.
 - b. Approved Products:
 - 1) Tyco: BB, SD, or HIP.
 - 2) Reliable DD56, DS56, GP56
 - 3) Viking V-BB, V-SD, V-HIP, VK697
8. Pendant Sprinklers:
 - a. Design Criteria:
 - 1) UL / CASA listed and approved.
 - 2) Where guards or escutcheons are required, use chrome plated sprinkler guards and escutcheons that are listed, that are approved by Sprinkler Manufacturer for use with head, and that are supplied by Sprinkler Manufacturer.
 - b. Acceptable Products:
 - 1) Reliable: F1FR.
 - 2) Tyco: TY-FRB.
 - 3) Victaulic: Model V2704.
 - 4) Viking: VK302.
 - 5) Equal as approved by Fire Sprinkler Consultant before bidding. See Section 01 6200.
9. Upright Sprinklers:
 - a. Design Criteria:
 - 1) UL / CASA listed and approved.
 - b. Acceptable Products:
 - 1) Reliable: F1FR.
 - 2) Tyco: TY-FRB.
 - 3) Victaulic: Models V2704.
 - 4) Viking: VK300.
 - 5) Equal as approved by Fire Sprinkler Consultant before bidding. See Section 01 6200.
10. Concealed Spaces Sprinkler heads
 - a. Design Criteria:
 - 1) UL / CASA listed and approved.
 - b. Acceptable Products:
 - 1) Viking VK950
 - 2) Other sprinklers listed in other sections can be used if it meets their listing.

2.02 ACCESSORIES

- A. Manufacturers:
 1. Manufacturer Contact List:
 - a. Anvil International, Portsmouth, NH www.anvilintl.com.
 - b. Eaton, Highland, IL www.cooperblin.com.
 - c. Unistrut Construction, Itasca, IL www.unistrutconstruction.com.
 2. Continuous Inserts:
 - a. Quality Standard: See Section 01 6000.
 - 1) Unistrut Standard Duty P-3249 through P-3270.
- B. Hangers, Rods, And Clamps:
 1. Design Criteria:
 - a. Galvanized, unless specified otherwise, and UL/CASA listed and labeled for service intended.
 - b. Hanger supports for sprinkler piping to conformance with NFPA 13.

2. Quality Standard:
 - a. Hangers and accessories shall be Anvil numbers specified or equals by B-Line by Eaton.
 - b. Pipe Ring Hangers: Equal to Anvil Fig 69.
 - c. Riser Clamps: Equal to Anvil Fig. 261.
- C. Posted System Diagram:
 1. Provide single floor plan diagram showing wet pipe system elements.
 2. Include following information on diagram sheet:
 - a. Step by step shut down procedure.
 - b. Step by step system drainage procedure.
 - c. Step by step start-up procedure.
 - d. Step by step procedure for protection of system from freezing.
 - e. Step by step procedure to follow in deactivating system for maintenance.
 3. Laminate diagram with plastic and mat or frame suitable for hanging near riser.

PART 3 EXECUTION

3.01 INSTALLERS

- A. Approved Installers. See Section 01 4000:
 1. Meet Quality Assurance Installer Qualifications as specified in Part 1 of this specification.

3.02 EXAMINATION

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

3.03 INSTALLATION

- A. Interface With Other Work: Provide inserts for attaching hangers in concrete floor construction at time floors are placed.
- B. Connect system to flange provided under Section 33 1416: Site Water Utility Distribution Piping'. After installation of riser, fill annular space between pipe and slab with flexible mastic.
- C. Install sprinkler systems in accordance with requirements of latest edition of NFPA 13 and as specified below:
 1. Provide maintenance access to equipment.
 2. Conceal sprinkler lines installed in occupied areas. In Mezzanine areas, route pipe to side or underneath Mezzanine walkway. Do not impede egress from Attic.
 3. Install to enable drainage of system.
 - a. Install main drain from riser according to NFPA 13.
 4. Install piping system, except for dry heads, so it will not be exposed to freezing temperatures.
 5. Do not use dropped, damaged, or used sprinkler heads.
 6. Install tamper switches and flow detectors where located by Fire Sprinkler Consultant.
 7. Except for Siamese connection, install automatic ball drip device in lowest point of piping to fire department connection and drain to floor drain or to exterior of building.
 8. Brace and support system to meet seismic zone requirements for building site.
 9. Replacing anti-freeze fluid in existing systems only:

- a. Placard: Provide tag/placard on antifreeze system main valve that indicates manufacture type and brand of antifreeze solution, concentration by volume of antifreeze solution used, and volume of antifreeze solution used in system.
- D. Flush system at full design flow rate for minimum five minutes. Route water to outside of building. Protect landscaping and other exterior elements from damage during flow tests.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Field Tests:
 - 1. Pressure Test:
 - a. Hydrostatically test system to 200 psi (1.38 MPa) minimum for two (2) hours as required by 'Contractor's Material And Testing certificate for Aboveground Piping':
 - 1) NFPA 13 (2010), Figure 24.1.
 - 2) NFPA 13 (2013), Figure 25.1.
 - 3) NFPA 13 (2016), Figure 25.1.
 - 2. Water Flow Test:
 - a. Test to determine static and residual pressures and corresponding flow rate at point of connection to utility water main.
 - b. Adjust water flow test data for seasonal fluctuations and future growth as recommended by Water Utility and AHJ.
 - c. At point of connection to utility water main, combine inside and outside hose stream allowances.
 - d. Flush system
 - 3. Check piping in relation to insulation envelope to be certain piping and auxiliary drains are properly enclosed inside building insulation envelope. Report unsatisfactory conditions to Fire Sprinkler Consultant.
 - 4. Check piping in relation to building's thermal envelope to be certain piping is within insulation envelope and protected from freezing temperatures. Report unsatisfactory conditions to Fire Sprinkler Consultant.
 - 5. Tests shall be witnessed by Fire Sprinkler Consultant and representative of local jurisdiction over fire prevention.

3.05 CLOSEOUT ACTIVITIES

- A. See Section 01 7800 - Closeout Submittals, for closeout submittals.
- B. Instruction of Owner:
 - 1. Instruction Sessions:
 - a. Instruct Owner's personnel in operation and maintenance of system utilizing 'Operation And Maintenance Manual' when so doing. Minimum instruction period shall be four (4) hours.
 - b. Instruction sessions shall occur after Substantial Completion inspection when system is properly working and before final payment is made.
 - c. Provide Owner with latest version of NFPA 25.
- C. Training:
 - 1. Installer required to provide FM Training from latest version of NFPA 25 with checklist and brief explanation of following inspections:
 - a. Weekly Inspection.
 - b. Monthly Inspection.
 - c. Quarterly Inspection.
 - d. Semi-Annual Inspection.
 - e. Annual Inspection.

END OF SECTION

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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 MECHANICAL DEMOLITION

- A. Disconnect, demolish, and remove mechanical systems, equipment, and components indicated to be removed.
 - 1. Piping to be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - 2. Piping to be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
 - 3. Ducts to be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
 - 4. Ducts to be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.
 - 5. Equipment to be Removed: Disconnect and cap services and remove equipment.
 - 6. Equipment to be Removed and Reinstalled: Disconnect and cap services and remove, clean and store equipment; when appropriate, reinstall, reconnect and make equipment operational.
 - 7. Equipment to be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
- B. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

1.3 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.

1.4 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:

1. Perform work in accordance with applicable provisions of Plumbing Codes applicable to Project. Provide materials and labor necessary to comply with rules, regulations, and ordinances.
2. In case of differences between building codes, laws, local ordinances, utility company regulations, and Contract Documents, the most stringent shall govern. Notify Architect in writing of such differences before performing work affected by such differences.
3. Identification:
 - a. Motor and equipment name plates as well as applicable UL / ULC and AGA / CGA labels shall be in place when Project is turned over to Owner.

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

1. Plumbing Subcontractor:

- a. Company specializing in performing work of this section.

- 1) Minimum five (5) years experience in plumbing installations.

- 2) Minimum five (5) satisfactorily completed installations in past three (3) years of projects similar in size, scope, and complexity required for this project before bidding.

- b. Upon request, submit documentation.

2. Installer:

- a. Licensed for area of Project.

- b. Designate one (1) individual as project foremen who shall be on site at all times during installation and experienced with installation procedures required for this project.

- c. Upon request, submit documentation.

1.5 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.

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

PART 2 - PRODUCTS

2.1 COMPONENTS

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

PART 3 - EXECUTION

3.1 INSTALLERS

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

3.2 EXAMINATION

- A. Drawings:

1. Plumbing Drawings show general arrangement of piping, equipment, etc. Follow as closely as actual building construction and work of other trades will permit.
2. Consider Architectural and Structural Drawings part of this work insofar as these drawings furnish information relating to design and construction of building. These drawings take precedence over Plumbing Drawings.
3. Because of small scale of Drawings, it is not possible to indicate all offsets, fittings, and accessories that may be required. Investigate structural and finish conditions affecting this work and arrange work accordingly, providing such fittings, valves, and accessories required to meet conditions.

B. Verification Of Conditions:

1. Examine premises to understand conditions that may affect performance of work of this Division before submitting proposals for this work. Examine adjoining work on which plumbing work is dependent for efficiency and report work that requires correction.
2. Ensure that items to be furnished fit space available. Make necessary field measurements to ascertain space requirements including those for connections and furnish and install equipment of size and shape so final installation shall suit true intent and meaning of Contract Documents. If approval is received by Addendum or Change Order to use other than originally specified items, be responsible for specified capacities and for ensuring that items to be furnished will fit space available.
3. Check that slots and openings provided under other Divisions through floors, walls, ceilings, and roofs are properly located. Perform cutting and patching caused by neglecting to coordinate with Divisions providing slots and openings at no additional cost to Owner.
4. No subsequent allowance for time or money will be considered for any consequence related to failure to examine site conditions.

3.3 PREPARATION

A. Changes Due To Equipment Selection:

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

3.4 INSTALLATION

A. Interface With Other Work:

1. Furnish exact location of electrical connections and complete information on motor controls to installer of electrical system.
2. Furnish sleeves, inserts, supports, and equipment that are to be installed by others in sufficient time to be incorporated into construction as work proceeds. Locate these items and confirm that they are properly installed.

B. Cut carefully to minimize necessity for repairs to previously installed or existing work. Do not cut beams, columns, or trusses.

C. Locating Equipment:

1. Arrange pipes and equipment to permit ready access to valves, cocks, unions, traps, and to clear openings of doors and access panels.
2. Adjust locations of pipes, equipment, and fixtures to accommodate work to interferences anticipated and encountered.
3. Install plumbing work to permit removal of equipment and parts of equipment requiring periodic replacement or maintenance without damage to or interference with other parts of equipment or structure.
4. Determine exact route and location of each pipe before fabrication.

- a. Right-Of-Way:
 - 1) Lines that pitch shall have right-of-way over those that do not pitch. For example, plumbing drains shall normally have right-of-way.
 - 2) Lines whose elevations cannot be changed shall have right-of-way over lines whose elevations can be changed.
 - b. Offsets, Transitions, and Changes in Direction:
 - 1) Make offsets, transitions, and changes in direction in pipes as required to maintain proper head room and pitch of sloping lines whether or not indicated on Drawings.
 - 2) Furnish and install all traps, air vents, sanitary vents, and devices as required to effect these offsets, transitions, and changes in direction.
- D. Penetration Firestops:
- 1. Install Penetration Firestop System appropriate for penetration at plumbing systems penetrations through walls, ceilings, roofs, and top plates of walls.
- E. Sealants:
- 1. Seal openings through building exterior caused by penetrations of elements of plumbing systems.
 - 2. Furnish and install acoustical sealant to seal penetrations through acoustically insulated walls and ceilings.
- F. Furnish and install complete system of piping, valved as indicated or as necessary to completely control entire apparatus:
- 1. Pipe drawings are diagrammatic and indicate general location and connections. Piping may have to be offset, lowered, or raised as required or directed at site. This does not relieve this Division from responsibility for proper installation of plumbing systems.
 - 2. Arrange piping to not interfere with removal of other equipment, ducts, or devices, or block access to doors, windows, or access openings:
 - a. Arrange so as to facilitate removal of tube bundles.
 - b. Provide accessible flanges or ground joint unions, as applicable for type of piping specified, at connections to equipment and on bypasses.
 - 1) Make connections of dissimilar metals with di-electric unions.
 - 2) Install valves and unions ahead of traps and strainers. Provide unions on both sides of traps.
 - c. Do not use reducing bushings, bull head tees, close nipples, or running couplings. Street elbows are allowed only on potable water pipe 3/4 inch 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 of straight run.
 - b. Provide 12 inch offset below roof line in each vent line penetrating roof.
- 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.
 - 3. Sleeves through floors shall extend 1/4 inch above floor finish in mechanical equipment rooms above basement floor. In other rooms, sleeves shall be flush with floor.
 - 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 Facility Manager in operation and maintenance of plumbing systems utilizing Operation And Maintenance Manual when so doing.
 2. Conduct instruction period after Substantial Completion inspection when systems are properly working and before final payment is made.

3.9 PROTECTION

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

END OF SECTION

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

- A. Includes But Not Limited To:
 - 1. Common hanger and support requirements and procedures for plumbing systems.
- B. 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'.

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
5/8 inch	4 to 5 inches
3/4 inch	6 inches
7/8 inch	8 to 12 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
2	5/8 Inch	Six	Four	Three	Two	0	0	0
2	5/8 Inch	Nine	Seven	Five	Three	Two	Two	0
2	5/8 Inch	Twelve	Nine	Seven	Five	Three	Two	Two

- 1) Size trapeze angles so bending stress is less than 10,000 psi.
- e. Riser Clamps For Vertical Piping:
 - 1) Type Two Acceptable Products:
 - a) Anvil Fig. 261.
 - b) Equals by Cooper B-Line.
- f. Concrete Inserts:
 - 1) Individual Inserts:
 - a) Suitable for special nuts size 3/8 inch through 7/8 inch with yoke to receive concrete reinforcing rods, and with malleable iron lugs for attaching to forms.
 - b) Type Two Acceptable Products:
 - (1) Anvil Fig. 282.
 - (2) Equals by Cooper B-Line.
 - 2) Continuous Inserts:
 - a) Class Two Quality Standard: Equal to Unistrut P-3200 series.
- g. Steel Deck Bracket:
 - 1) Class Two Quality Standard: Equal to Unistrut P1000 with clamp nut, minimum 6 inch 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) Provide support at each elbow. Install additional support as required.
 - c. Supports for Vertical Piping:
 - 1) Place riser clamps at each floor or ceiling level.
 - 2) Securely support clamps by structural members, which in turn are supported directly from building structure.
 - 3) Provide clamps as necessary to brace pipe to wall.
 - d. Attach Unistrut to structural steel roof supporting structure. Spacing and support as described above.
 - e. Insulate hangers for copper pipe from piping by means of at least two layers of Scotch 33 plastic tape.

END OF SECTION

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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 high minimum.
 2. Pipe Markers:
 - a. Rigid vinyl or polyester, 360 degree wrap-around pipe markers.
 - b. Surface printed with UV ink and then thermoformed. Legend to include pipe contents and directional arrows.
 - c. Provide pipe markers as follows:

Pipe Use	Abbreviation
Domestic Hot Water	HW
Domestic Hot Water Recirculation	HW RECIRC
Domestic Cold Water	CW
Sanitary Vent	SV
Relief Vent	RV

3. Tags:
 - a. Regardless of size, each valve shall have brass tag 1-1/2 inches by 3 inches minimum in size and 0.051 inch thick.

PART 3 - EXECUTION**3.1 APPLICATION**

- A. Pipe Markers:
1. Wrap pipe marker around pipe with 1/2 inch minimum overlap. Use adhesive strip at overlap to adhere ends of marker together.
 2. Locate markers as follows:
 - a. Adjacent to each item of equipment.
 - b. At points of entry and exit where piping goes through wall.
 - c. On each riser and junction.
 - d. Every 25 feet maximum on long, continuous runs.

END OF SECTION

SECTION 22 0719**PLUMBING PIPING INSULATION****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install insulation on hot and cold water lines, fittings, valves, and accessories as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 22 1116: 'Domestic Water Piping'.

PART 2 - PRODUCTS**2.1 COMPONENTS**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Armacell, Mebane, NC www.armacell.com.
 - b. Childers Products Co, Eastlake, OH www.fosterproducts.com.
 - c. IMCOA, Youngsville, NC www.nomacokflex.com.
 - d. Johns-Manville, Denver, CO www.jm.com.
 - e. Knauf, Shelbyville, IN www.knauffiberglass.com.
 - f. Manson, Brossard, PQ, Canada www.isolationmanson.com.
 - g. Nomaco Inc, Yopungsville, NC www.nomacokflex.com.
 - h. Owens-Corning, Toledo, OH www.owenscorning.com.
 - i. Speedline Corp, Solon, OH www.speedlinepvc.com.
- B. Materials:
 - 1. Above Grade Metal Piping:
 - a. Insulation For Piping:
 - 1) Snap-on glass fiber or melamine foam pipe insulation, or heavy density pipe insulation with factory vapor jacket.
 - 2) Insulation Thickness:

Service Water Temperature	Pipe Sizes		
	Up to 1-1/4 In	1-1/2 to 2 In	Over 2 In
170 - 180 Deg F	One In	1-1/2 In	2 In
140 - 160 Deg F	1/2 In	One In	1-1/2 In
45 - 130 Deg F	1/2 In	1/2 In	One In
 - 3) Performance Standards: Fiberglas ASJ by Owens-Corning.
 - 4) Type One Acceptable Manufacturers:
 - a) Childers Products.
 - b) Knauf.
 - c) Manson.
 - d) Owens-Corning.
 - e) Johns-Manville.
 - f) Equal as approved by Architect before bidding. See Section 01 6200.
 - b. Fitting, Valve, And Accessory Covers:
 - 1) PVC.
 - 2) Performance Standard: Zeston by Johns-Manville.
 - 3) Type One Acceptable Manufacturers:
 - a) Knauf.

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

PART 3 - EXECUTION

3.1 APPLICATION

- A. Above Grade Piping:
 - 1. Apply insulation to clean, dry piping with joints tightly butted.
 - 2. Install insulation in manner to facilitate removal for repairs. Place sections or blocks so least possible damage to insulation will result from inspection or repairs of piping or equipment.
 - 3. Piping up to 1-1/4 inch Diameter:
 - a. Adhere 'factory applied vapor barrier jacket lap' smoothly and securely at longitudinal laps with white vapor barrier adhesive.
 - b. Adhere 3 inch wide self-sealing butt joint strips over end joints.
 - 4. Piping 1-1/2 inches Diameter And Larger:
 - a. Use broken-joint construction in application of two-layer covering.
 - b. Fill cracks and depressions with insulating cement mixed to thick plastic paste.
 - 1) Apply by hand in several layers to make up total specified thickness.
 - 2) Final layer shall have smooth uniform finish before application of covering.
 - 5. Fittings, Valves, And Accessories:
 - a. Do not apply insulation over flanged joints or victaulic couplings until piping has been brought up to operating temperature and flange bolts have been fully tightened. Insulate valves so wheel, stem, and packing nut are exposed.
 - b. Insulate with same type and thickness of insulation as pipe, with ends of insulation tucked snugly into throat of fitting and edges adjacent to pipe insulation tufted and tucked in.
 - c. Piping Up To 1-1/4 Inch Diameter:
 - 1) Cover insulation with one piece fitting cover secured by stapling or taping ends to adjacent pipe covering.
 - 2) Alternate Method:
 - a) Insulate fittings, valves, and accessories with one inch of insulating cement and vapor seal with two 1/8 inch wet coats of vapor barrier mastic reinforced with glass fabric extending 2 inches onto adjacent insulation.
 - d. Piping 1-1/2 inches To 2 Inches:
 - 1) Insulate with hydraulic setting insulating cement or equal, to thickness equal to adjoining pipe insulation.
 - 2) Apply final coat of fitting mastic over insulating cement.
 - 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 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.
 - c. At Pipe Hangers:
 - 1) Provide rigid calcium silicate insulation (100 psi compressive strength) at least 2 inches beyond shield.

7. Protect insulation wherever leak from valve stem or other source might drip on insulated surface, with aluminum cover or shield rolled up at edges and sufficiently large in area and of shape that dripping will not splash on surrounding insulation.

END OF SECTION

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

- A. Includes But Not Limited To:
 - 1. Furnish and install potable water piping complete with necessary valves, connections, and accessories inside building as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 03 3111: 'Cast-In-Place Structural Concrete'.
 - a. Pre-installation conference held jointly with other concrete related sections.
 - 2. Section 22 0501: 'Common Piping Requirements'.
 - 3. Section 22 0719: 'Plumbing Piping Insulation'.

1.2 REFERENCES

- A. Reference Standards:
 - 1. American National Standards Institute / American Society of Sanitary Engineers:
 - a. ANSI/ASSE 1003-2009, 'Water Pressure Reducing Valves for Domestic Water Distribution Systems'.
 - b. ANSI/ASSE 1017-2009, 'Performance Requirements for Temperature Actuated Mixing Valves for Hot Water Distribution Systems'.
 - c. ANSI/ASSE 1070-2015, 'Performance Requirements for Water Temperature Limiting Devices'.
 - 2. ASTM International:
 - a. ASTM B88-16, 'Standard Specification for Seamless Copper Water Tube'.
 - b. ASTM E84-18b, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
 - 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 14-2018, 'Plastic Piping System Components and Related Materials'.
 - b. NSF/ANSI 61-2017, 'Drinking Water System Components - Health Effects'.
 - c. NSF/ANSI 372-2016, 'Drinking Water System Components - Lead Content'.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference:
 - 1. Participate in pre-installation conference as specified in Section 03 3111.

1.4 SUBMITTALS

- A. Informational Submittals:
 - 1. Test And Evaluation Reports:
 - a. Written report of sterilization test.

1.5 QUALITY ASSURANCE

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

1.6 WARRANTY

A. Manufacturer Warranty:

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

PART 2 - PRODUCTS

2.1 SYSTEMS

A. Manufacturers:

1. Manufacturer Contact List:
 - a. Acorn Controls, City of Industry, CA www.acorneng.com
 - b. Cash Acme, Cullman, AL www.cashacme.com
 - c. Chicago Faucets, Des Plaines, IL, www.chicagofaucets.com.
 - d. Cla-Val Company, Costa Mesa, CA or Cla-Val Canada Ltd, Beamsville, ON www.cla-val.com.
 - e. Conbraco Industries Inc, Matthews, NC www.conbraco.com or Conbraco (Honeywell Ltd), Scarborough, ON (416) 293-8111.
 - f. Hammond Valve, New Berlin, WI www.hammondvalve.com.
 - g. 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.
 - h. Harris Products Group, Cincinnati, OH www.harrisproductsgroup.com.
 - i. Honeywell Inc, Minneapolis, MN www.honeywell.com.
 - j. Milwaukee Valve Co, New Berlin, WI www.milwaukeevalve.com.
 - k. Nibco Inc, Elkhart, IN www.nibco.com.
 - l. Sloan Valve Co, Franklin Park, IL www.sloanvalve.com.
 - m. Spence Engineering Co, Walden, NY www.spenceengineering.com.
 - n. Symmons Industries, Braintree, MA www.symmons.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.

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 minimum under slabs.
 - b) 2 inches And Smaller: Annealed soft drawn.
 - c) 2-1/2 inches And Larger: Hard Drawn.
3. Fittings:
 - a. For Copper Pipe: Wrought copper.
4. Connections For Copper Pipe:
 - a. Above-Grade:
 - 1) Sweat copper type with 95/5 or 96/4 Tin-Antimony solder, Bridgit solder, or Silvabrite 100 solder. Use only lead-free solder.
 - 2) Viega ProPress System
 - b. Below Grade:
 - 1) Brazed using following type rods:
 - a) Copper to Copper Connections:
 - (1) AWS Classification BCuP-4 Copper Phosphorus (6 percent silver).
 - (2) AWS Classification BCuP-5 Copper Phosphorus (15 percent silver).
 - 2) Copper to Brass or Copper to Steel Connections: AWS Classification BAg-5 Silver (45 percent silver).

- 3) Do not use rods containing Cadmium.
 - 4) Brazing Flux:
 - a) Approved Products:
 - (1) Stay-Silv white brazing flux by Harris Product Group.
 - (2) High quality silver solder flux by Handy & Harmon.
 - 5) Joints under slabs acceptable only if allowed by local codes.
5. 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 SWP.
 - 1) Operate with flow in either direction, suitable for throttling and tight shut-off.
 - 2) Body: Bronze, 150 psig wsp at 350 deg F and 400 psig wog.
 - 3) Seat: Bubble tight at 100 psig 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 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 hydrostatic pressure for four (4) hours and show no leaks.
 2. Disconnect equipment not suitable for 125 psig 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

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

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

1.2 REFERENCES

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

1.3 QUALITY ASSURANCE

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

PART 2 - PRODUCTS**2.1 ACCESSORIES**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Ashcroft, Stratford, CT www.ashcroftinc.com.
 - b. ConBraco Industries, Matthews, NC www.conbraco.com.
 - c. Febco, Denver, CO www.repmasters.com.
 - d. H O Trerice, Oak Park, MI www.hotco.com.
 - e. IPS Corporation, Compton, CA www.ipscorp.com.
 - f. Josam Co, Michigan City, IN www.josam.com.
 - g. Jay R. Smith Manufacturing Co, Montgomery, AL www.jrsmith.com.
 - h. Mifab Manufacturing Inc, Chicago, IL www.mifab.com.
 - i. Oatey, Cleveland, OH www.oatey.com.
 - j. Powers, North Andover, MA or Burlington ON www.powers.com.
 - k. Precision Plumbing Products (PPP), Portland, OR www.pppinc.net.
 - l. Prier Products, Inc., Grandview, MD www.prier.com.
 - m. Proset Systems Inc., Lawrenceville, GA www.prosetsystems.com.
 - n. Sioux Chief Manufacturing Co, Peculiar, MO www.siuoxchief.com.
 - o. Sure Seal, Tacoma, WA www.thesureseal.com.
 - p. Wade (Division of Tyler Pipe), Tyler, TX www.wadedrains.com.
 - q. Watts Drainage, Spindale, NC www.watts.com or Watts Industries, Burlington, ON, Canada www.wattscda.com.
 - r. Weiss Instruments, Inc., Holtsville, NY www.weissinstruments.com.
 - s. Woodford Manufacturing, Colorado Springs, CO www.woodfordmfg.com.
 - t. Zurn Cast Metals, Erie, PA or Zurn Industries Limited, Mississauga, ON www.zurn.com.
- B. Materials:

1. Trap Guard Trap Seal:
 - a. Design Criteria:
 - 1) Not required to meet NSF International Standards for Lead Free.
 - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Trap Guard by Proset:
 - a) Install per Manufacturer's recommendations.
 - 2) Sure Seal by Sure Seal:
 - a) Install per Manufacturer's recommendations.
2. Mixing Valve for Lavatories
 - a. Solid brass construction and CSA B125 certified.
 - b. Includes integral check valves and inlet screen. Features advanced paraffin-based actuation technology.
 - c. Flow of 5.7 GPM with maximum 10 psi pressure drop. Perform to minimum flow of 0.5 GPM in accordance with ASSE 1016 and 1070.
 - d. Set for 110 deg F service.
 - e. Class One Quality Standard: Powers LM495. See Section 01 6200.
 - f. Acceptable Manufacturers: Leonard, Powers, Sloan, Symmons, and Watts.
3. Font Hydrant:
 - a. Design Criteria:
 - 1) Provide with integral anti-siphon device and stainless steel face. Key-operated.
 - 2) Not required to meet NSF International Standards for Lead Free.
 - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Josam: 71070.
 - 2) Mifab: MHY-30.
 - 3) Prier: C-255CP.75.
 - 4) Watts: HY-430
 - 5) Zurn: Z-1333.
4. Recirculation Pump and Circulation Pump Control:
 - a. Hot water demand control type.
 - b. Acceptable Manufacturers: Bell & Gossett; a Xylem brand, Flo Fab Inc., Grundfos CBS Inc., Marshall Engineered Products Co., Pentair Pump Group, Thrush Co., Inc.
 - c. Minimum Working Pressure: 125 psig.
 - d. Maximum Continuous Operating Temperature: 220 deg F.
 - e. Thermostat: Electric; adjustable for control of hot-water circulation pump.
 - f. Flow Switch: Electric, adjustable for control of hot-water circulation pump.

PART 3 - EXECUTION – NONE

END OF SECTION

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

- A. Includes But Not Limited To:
 - 1. Furnish and install soil, waste, and vent piping systems within building.
 - 2. Perform excavation and backfill required by work of this Section.
- B. Related Requirements:
 - 1. Section 07 8400: 'Firestopping' for quality of firestopping material.
 - 2. Section 22 0501: 'Common Plumbing Requirements'.
 - 3. Section 22 1319: 'Facility Sanitary Sewer Specialties' for furnishing of sewer specialties.
 - 4. Section 31 2316: 'Excavation for criteria for performance of excavation.
 - 5. Section 31 2323: 'Fill' for criteria performance of backfill and compaction.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference: Participate in pre-installation conference specified in Section 03 3111.

1.3 REFERENCES

- A. Reference Standards:
 - 1. ASTM International:
 - a. ASTM D2321-14, 'Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications'.
 - b. ASTM D2564-12, 'Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems'.
 - c. ASTM D3034-14, 'Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings'.
 - d. ASTM F656-15, 'Standard Specification for Primers for Use in Solvent Cement Joints of Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings'.
 - e. ASTM F891-10, 'Standard Specification for Coextruded Poly(Vinyl Chloride) (PVC) Plastic Pipe With a Cellular Core'.
 - 2. International Code Council:
 - a. ICC IPC-2015, 'International Plumbing Code'.

PART 2 - PRODUCTS**2.1 SYSTEMS**

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

- B. Performance:
1. Design Criteria:
 - a. Minimum size of waste piping installed under floor slab on grade shall be 2 inches.
- C. Materials:
1. Piping And Fittings: PVC Schedule 40 solid 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. Cleanouts:
 - a. Furnish wall cleanouts with chrome wall cover and screw.
 - b. Type Two Acceptable Products:
 - 1) Finish Floors:
 - a) Josam: 56010.
 - b) J. R. Smith: 4023.
 - c) Mifab: C1100C-R-1.
 - d) Wade: W-6000.
 - e) Watts: CO-200-R.
 - f) Zurn: Z-1402.
 - 2) 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 fall in one foot in direction of flow.
 3. Bottom of trenches shall be hard. Tamp as required.
 4. Remove debris from trench before laying of pipe.

5. Do not cut trenches near footings without consulting Architect.
- B. Thermoplastic Pipe And Fittings:
 1. General: Piping and joints shall be clean and installed according to Manufacturer's recommendations. Break down contaminated joints, clean seats and gaskets and reinstall.
 2. Above Grade: Locate pipe hangers every 4 feet 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.
 - 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 or diameter of pipe plus 12 inches, whichever is greater.
 - 2) Maximum: Outside diameter of pipe plus 24 inches.
 - f. Do not use backhoe or power equipment to assemble pipe.
 - g. Initial backfill shall be 12 inches 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 before wheel loading.
 - 2) 48 inches before compaction.
- C. Install piping so cleanouts may be installed as follows:
 1. At every 135 degrees of accumulative change in direction for horizontal lines.
 2. Every 100 feet of horizontal run.
 3. Extend piping to accessible surface. Do not install piping so cleanouts must be installed in carpeted floors. In such locations, configure piping so wall type cleanouts may be used.
- D. Each fixture and appliance discharging water into sanitary sewer or building sewer lines shall have seal trap in connection with complete venting system so gasses pass freely to atmosphere with no pressure or siphon condition on water seal.
- E. Vent entire waste system to atmosphere. Join lines together in fewest practicable numbers before projecting above roof. Set back vent lines so they will not pierce roof near edge or valley. Vent line terminations shall be:
 1. 6 inches minimum above roof and 12 inches minimum from any vertical surface.
 2. Same size as vent pipe.
 3. In areas where minimum design temperature is below 0 deg F 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 in diameter.
 - b. Vents shall terminate 10 inches minimum above roof or higher if required by local codes.
- F. Furnish and install firestopping at penetrations of fire-rated structures as required under Sections 07 8400 and 22 0501.
- G. If test Tees are used for testing, plug Tees so wall finish can be installed. Do not leave as exposed cleanouts.

3.2 FIELD QUALITY CONTROL

- A. Field Tests:
 1. Conduct tests for leaks and defective work. Notify Architect before testing.
 2. Thermoplastic Pipe System:
 - a. Before backfilling and compacting of trenches, fill waste and vent system with water to roof level or 10 feet minimum, and show no leaks for two hours. Correct leaks and defective work.

- b. After backfilling and compacting of trenches is complete but before placing floor slab, re-test as specified above. Uncover pipe and correct leaks and defective work. Re-backfill and compact and re-test.

END OF SECTION

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

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

PART 2 - PRODUCTS**2.1 SYSTEMS**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. H-M Company, Cincinnati, OH www.draintroughs.com.
 - b. Josam Co, Michigan City, IN www.josam.com.
 - c. Jay R. Smith Manufacturing Co, Montgomery, AL www.jrsmith.com.
 - d. Mifab Manufacturing Inc, Chicago, IL www.mifab.com.
 - e. Precision Plumbing Products (PPP), Portland, OR www.pppinc.net.
 - f. Sioux Chief Manufacturing Co, Peculiar, MO www.siouxchief.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.
 - b. Floor Drain FD-2:
 - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) Same as Floor Drain FD-1, except with funnel top.
 - b) Mifab: F-1100-C-EF.

PART 3 - EXECUTION: Not Used

END OF SECTION

SECTION 22 3305**ELECTRIC DOMESTIC WATER HEATERS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install electric water heater as specified 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. NSF International Standard / American National Standards Institute:
 - a. NSF/ANSI 61-2017, 'Drinking Water System Components - Health Effects'.
 - b. NSF/ANSI 372-2016, 'Drinking Water System Components - Lead Content'.

1.3 SUBMITTALS

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

1.4 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Meet NSF International Standards for materials or products that come in 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. Special Warranty:
 - 1. Three-year non-prorated warranty on water heaters of 20 gallon capacity and larger.

PART 2 - PRODUCTS**2.1 ASSEMBLIES**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. American Water Heater Co, Johnson City, TN www.americanwaterheater.com.
 - b. A. O. Smith Water Products Co, Ashland City, TN www.hotwater.com or A. O. Smith Ltd, Stratford, ON (800) 265-8520 or (519) 271-5800.
 - c. Bradford-White Corp, Ambler, PA www.bradfordwhite.com.
 - d. Lochinvar, Lebanon, TN www.lochinvar.com.

- e. Rheem / Ruud Water Heater Div Rheem Manufacturing, Atlanta, GA www.rheem.com or Rheem Canada Inc Water Heater Division, Hamilton, ON (800) 268-6966 or (905) 527-9194.
 - f. State Industries Inc, Ashland City, TN www.stateind.com.
- B. Materials:
- 1. Design Criteria:
 - a. All (wetted) drinking water products, components, and materials used in drinking water systems must meet NSF International Standards for Lead Free.
 - b. All water heaters require 'Tempered Water Temperature Control' (mixing valves) as specified in Section 22 1116.
 - 2. 35 / 40 Gallon:
 - a. Glass lined storage tank pressure tested and rated for 125 psi working pressure.
 - b. 200-208 V, single phase, 6000 watts maximum heating capacity.
 - c. Water heaters shall each have ASME rated temperature-pressure relief valve rated at MBH input of heater minimum set to relieve at 120 psi.
 - d. Complete with thermostat, high limit control, and anode rod.
 - e. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) American: LDCE32-40L-40.
 - 2) AO Smith: DEL-40.
 - 3) Bradford White: LE240LN3-3
 - 4) Lochinvar: JER-40 DAK
 - 5) State Industries: PCE-40-20LS

2.2 ACCESSORIES

- A. Anchoring Components:
 - 1. One inch by 18 ga galvanized steel straps.
 - 2. No. 10 by 2-1/2 inch screws.
- B. Thermal Expansion Absorbers:
 - 1. Bladder type for use with potable water systems.
 - 2. Type One Acceptable Products.
 - a. Therm-X-Trol ST-12-C by Amtrol Inc, West Warwick, RI www.amtrol.com.
 - b. Equal as approved by Architect before bidding. See Section 01 6200.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install temperature-pressure relief valve on hot water heater and pipe discharge to directly above funnel of floor drain.
- B. Anchor 20 gallon and larger water heaters to wall using anchoring straps and specified screws.

3.2 ADJUSTING

- A. Set discharge water temperature at 140 deg F. Final hot water temperature shall be 110 deg F after thermostatic mixing valve. If no mixing valve set discharge temperature at 110 deg F.

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. Maximum Performance (MaP): Toilet testing that rates toilet efficiency and flush performance by measuring number of grams of solid waste (soybean paste and toilet paper) that a toilet can flush and remove completely from fixture in single flush represented as a scale or score. 1000 grams is highest score possible (www.map-testing.com).
- B. Reference Standards:
 - 1. American Society of Mechanical Engineers / CSA Group (Canadian Standards Association):
 - a. ASME A112.19.2-2018/CSA B45.1-18, 'Ceramic Plumbing Fixtures'.

1.3 SUBMITTALS

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

PART 2 - PRODUCTS**2.1 ASSEMBLIES**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. American Standard Brands, Piscataway, NJ www.americanstandard-us.com or American Standard Canada, Mississauga, ON www.americanstandard.ca.
 - b. AMTC - Advanced Modern Technologies Corp, Woodland Hills, CA www.amtcorporation.com.
 - c. Bemis Manufacturing Co, Sheboygan Falls, WI www.bemismfg.com.
 - d. Beneke by Sanderson Plumbing Products, Columbus, MS www.sppl.com.
 - e. Church Seat Co, Sheboygan Falls WI www.churchseats.com.
 - f. Delany Flush Valves, Charlottesville, VA www.delanyproduct.com.
 - g. Delta Faucet Co, Indianapolis, IN www.deltafaucet.com or Delta Faucet Canada, London, ON (519) 659-3626.
 - h. Dearborn Brass, Cleveland, OH www.dearbornbrass.com.
 - i. Gerber Plumbing Fixtures LLC, Woodridge, IL www.gerberonline.com.
 - j. Josam Co, Michigan City, IN www.josam.com.
 - k. Jay R. Smith Mfg. Co, Montgomery, AL www.jrsmith.com.
 - l. Kohler Co Plumbing Div, Kohler, WI www.us.kohler.com.
 - m. McGuire Manufacturing Co, Cheshire, CT www.mcguiremfg.com.
 - n. Mifab Manufacturing Inc, Amherst, NY www.mifab.com.

- o. Moen Incorporated, North Olmsted, OH, or Moen Canada, Oakville, ON www.moen.com.
 - p. Olsonite Corp, Newnan, GA www.olsonite.net or Olsonite Co Ltd, Tilbury, ON (519) 682-1240.
 - q. Sloan Valve Co, Franklin Park, IL www.sloanvalve.com.
 - r. South Fork Manufacturing, Coalville, UT (801) 953-3001 www.dirt-grabber.com.
 - s. Toto U.S.A., Inc., Morrow, GA www.totousa.com
 - t. Wade Div Tyler Pipe, Tyler, TX www.wadedrains.com.
 - u. Watts Drainage, Spindale, NC www.wattsdrainage.com or Watts Industries, Burlington, ON, Canada www.wattscda.com.
 - v. Zurn Industries, LLC, Erie PA www.zurn.com. or Zurn Industries Ltd, Mississauga, ON (905) 795-8844.
- B. Performance:
- 1. Design Criteria:
 - a. Meet or exceed ASME A112.19.2/CSA B45.1 for Vitreous China Plumbing Fixtures.
 - b. Interior exposed pipe, valves, and fixture trim, including trim behind custom casework doors, shall be chrome plated.
 - c. All materials NOT required to be low lead compliant.
- C. Materials:
- 1. Water Closets:
 - a. Floor Mounted (Top Spud) with matched Flush Valve:
 - 1) Standard Fixture:
 - a) Water usage of 1.6 gallons per flush.
 - b) Battery operated.
 - c) MaP Score of 1000 grams.
 - d) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (1) American Standard: Madera FloWise Elongated 3451.00 (water closet) with American Standard 6065.161.002 (flush valve) battery.
 - (2) Kohler: Wellworth K-4406 with Tripoint DC 1.6 GPF WC Flushometer K-10957-SV.
 - (3) Sloan ST-2009-A with flushometer Sloan G2 OPTIMA Plus 8111-1.6.
 - 2) Handicap Accessible Fixture:
 - a) Water usage of 1.6 gallons per flush.
 - b) 18 inch maximum rim height.
 - c) Battery operated.
 - d) MaP Score of 1000 grams.
 - e) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (1) American Standard: Madera FloWise Elongated 3461.001 with Flushometer American Standard 6065.161.002.
 - (2) Kohler: Highline EL ADA K-4405 with Tripoint DC 1.6 GPF WC Flushometer K-10957-SV.
 - (3) Sloan ST-2029-A with flushometer Sloan G2 OPTIMA Plus 8111-1.6.
 - 2. Water Closet Accessories:
 - a. Flush Valves:
 - 1) Water Closets must have required flush valves.
 - b. Seats:
 - 1) Provide split front type with check hinge.
 - 2) 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.
 - c. Flush Valve Filter:

- 1) Required in following flush valves:
 - a) Sloan.
 - b) Zurn.
- 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) SFDG1 'Dirt Grabber' by South Fork Manufacturing.
3. Urinals:
 - a. Standard Fixture (wall mounted Flush Valve, mount standard height or ADA mounting height):
 - 1) Water usage of 1.0 gallons per flush.
 - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) American Standard: Washbrook FloWise 6590.001.
 - b) Gerber: Monitor 27-780 or 27-730.
 - c) Kohler: Bardon K-4904-ET.
 - d) Sloan SU-1006-1.0.
 - e) Toto: UT447E.
4. Urinal Accessories:
 - a. Carrier / Support:
 - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) Josam.
 - b) Jay R. Smith.
 - c) Mifab.
 - d) Wade.
 - e) Zurn.
 - b. Flush Valve:
 - 1) Standard:
 - a) Proximity sensor type.
 - b) Low flow, 1 gallon per flush maximum.
 - c) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (1) American Standard 6065.101.
 - (2) Delany: PL 1451-1.
 - (3) Delta: 81T231BTA.
 - (4) Moen: 8312.
 - (5) Sloan: 816-SFSM..
 - (6) Zurn: ZR6003AV-WSI with maintenance override button.
 - c. Flush Valve Filter:
 - 1) Required in following flush valves:
 - a) Sloan.
 - b) Zurn.
 - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) SFDG1 'Dirt Grabber' by South Fork Manufacturing.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install each fixture with separate vent line. Do not circuit vent.
- B. Ensure provisions are made for proper support of fixtures and that rough-in piping is accurately set and protected from movement and damage.
 1. Seal wall-mounted fixtures around edges to wall with sealant specified in Section 07 9213 'Elastomeric Joint Sealants'.
 2. Attach wall-hung fixtures to carriers.
 3. Support fixture hanger or arm free of finished wall.
- C. Adjust flush valves for proper flow.
- D. Provide each individual fixture supply with accessible chrome-plated stop valve with hand wheel.

- E. Urinals: Install with accessible stop or control valve in each branch supply line.
- F. Mounting:
 - 1. Urinals:
 - a. Standard: 24 inches from floor to bottom lip.
 - b. Handicap Accessible: 17 inches maximum from floor to bottom lip.
- G. Water Closets:
 - 1. 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.
- H. Flush Valve Filters:
 - 1. Install in Sloan and Zurn only flush valves.
 - 2. Install after water lines have been flushed out, but before turning water into flush valve.

3.2 CLEANING

- A. Polish chrome finish at completion of Project.

END OF SECTION

SECTION 22 4216**COMMERCIAL LAVATORIES AND SINKS****PART 1 - GENERAL****1.1 SUMMARY**

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

1.2 REFERENCES

- A. Reference Standard:
 - 1. American National Standards Institute / International Code Council:
 - a. ANSI/ICC A117.1-20179, 'Standard for Accessible and Usable Buildings and Facilities'.
 - 2. American Society of Mechanical Engineers / Canadian Standards Association (CSA Group):
 - a. ASME A112.18.1-2018/CSA B125.1-18, 'Plumbing Supply Fittings'.
 - 3. NSF International Standard / American National Standards Institute:
 - a. NSF/ANSI 61-2017, 'Drinking Water System Components - Health Effects'.
 - b. NSF/ANSI 372-2016, 'Drinking Water System Components - Lead Content'.

1.3 QUALITY ASSURANCE

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

1.4 SUBMITTALS

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

1.5 WARRANTY

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

PART 2 - PRODUCTS**2.1 ASSEMBLIES**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. American Standard Brands, Piscataway, NJ www.americanstandard-us.com or American Standard Canada, Mississauga, ON www.americanstandard.ca.
 - b. Brocar Products Inc, Cincinnati, OH www.brocar.com.
 - c. CECO, Huntington Park, CA www.cecosinks.com.
 - d. Chicago Faucet Co, Des Plaines, IL www.chicagofaucets.com.

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

B. Performance:

1. Design Criteria:

- a. Interior exposed pipe, valves, and fixture trim, including trim behind custom casework doors, shall be chrome plated.
- b. Faucets and other fixture fittings shall conform to requirements of ASME A112.18.1/CSA B125.1.

C. Components:

1. Lavatories And Fittings:

- a. Handicap Accessible Self Supporting Lavatories:
 - 1) Size: 20 by 18 inches 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 Drain:
 - a) Design Criteria:
 - (1) Meet NSF International Standards for Lead Free.
 - (2) Battery-operated automatic faucet.
 - b) Accessories:
 - (1) Cast brass spout.
 - (2) 4 inches cover plate.
 - (3) Single supply configuration.
 - (4) Solenoid valve.

- (5) Control module and transformer.
 - (6) Hermetically sealed electronics.
 - (7) In-line filter.
 - c) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (1) Chicago: 116.405.21.1 with 4" CC E-tronic and 327A strainer.
 - (2) Delta: 591T0250 WITH 33T260 grid strainer and R2900 mixing valve.
 - (3) Gerber: 44-804-4 with 43-970 grid strainer.
 - (4) Moen: 8305 with McGuire 155A grid strainer.
 - (5) Sloan: EBF-650 with ETF-460A strainer.
 - (6) Speakman: S-8710 with S-3440 grid drain.
 - (7) Symmons: S-6080-G with grid strainer.
 - (8) Zurn: Z6913-SSH with 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 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 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.
2. Miscellaneous Sinks And Fittings:
- a. Service Sink:
 - 1) Description:
 - a) Floor Type, enameled cast iron, 28 inches square with vinyl coated rim guard or 24 inches square with Stainless Steel rim guard.
 - 2) Design Criteria:

- a) Not required to meet NSF International Standards for Lead Free.
- 3) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) American Standard: Florwell Enameled Cast Iron 7741.000 with vinyl rim guard 7745.811.
 - b) CECO: 871.
 - c) Kohler: Whitby K-6710.
 - d) Zurn: 5850.
- 4) Service Sink Fittings:
 - a) Design Criteria:
 - (1) Not required to meet NSF International Standards for Lead Free.
 - b) Supply:
 - (1) Mounting height of 42 inches.
 - (2) Provide 48 inch hose and clamp unless spout is threaded.
 - (3) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (a) American Standard: Exposed Yoke Wall-Mount Utility Faucet with top brace 8344.112 with threaded spout.
 - (b) Chicago: 897 CP.
 - (c) Delta: 28T9 with 28T911 hose and bracket.
 - (d) Gerber: C4-44-654.
 - (d) Kohler: K-8928.
 - (e) Moen: 8124.
 - (f) Speakman: SC-5812.
 - (g) T&S: B-0665-BSTP.
 - (h) Zurn: Z-843M1.
 - c) Drain and Strainer:
 - (1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (a) American Standard: Grid strainer 7721.038.
 - (b) Kohler: K-9146, 3 inch IPS.
 - d) Trap: Cast iron, PVC, or ABS to match piping.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install each fixture with separate vent line. Do not circuit vent.
- B. Ensure provisions are made for proper support of fixtures and that rough-in piping is accurately set and protected from movement and damage.
- C. Seal wall-mounted fixtures around edges to wall 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. Install Safety Covers on all under sink / lavatories with exposed water supply pipes and traps.
- G. Install Handicap Accessible Lavatories as per ADA height mounting requirements.

3.2 CLEANING

- A. Polish chrome finish at completion of Project.

END OF SECTION

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

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

1.2 REFERENCES

- A. Reference Standard:
 - 1. American National Standards Institute / International Code Council:
 - a. ANSI/ICC A117.1-2017, 'Standard for Accessible and Usable Buildings and Facilities'.
 - 2. Canadian Standards Association (CA):
 - a. CSA C22.2 No. 120-13 (F2018), 'Refrigeration Equipment'.
 - 3. NSF International Standard / American National Standards Institute:
 - a. Bottle Filling Station:
 - 1) NSF/ANSI 42-2017, 'Drinking Water Treatments Units – Aesthetic Effects'.
 - 2) NSF/ANSI 53-2017, 'Drinking Water Treatments Units – Health Effects'.
 - b. Water Cooler:
 - 1) NSF/ANSI 61-2017, 'Drinking Water System Components - Health Effects'.
 - 2) NSF/ANSI 372-2016, 'Drinking Water System Components - Lead Content'.
 - 4. Underwriters Laboratories (UL):
 - a. UL 399: 'Drinking-Water Coolers'.

1.3 SUBMITTALS

- A. Closeout Submittals:
 - 1. Warranty Documentation:
 - a. Provide Manufacturer Warranty.

1.4 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Handicap Accessible Products to meet ANSI/ICC A117 Accessible requirements.
 - 2. Meet NSF International Standards for materials or products that come into contact with drinking water, drinking water treatment chemicals, or both for chemical contaminants and impurities that are indirectly imparted to drinking water from products, components, and materials used in drinking water systems.

1.5 WARRANTY

- A. Manufacturer standard limited warranty on refrigeration system of unit.

PART 2 - PRODUCTS**2.1 MANUFACTURED UNITS**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Elkay Manufacturing Co, Oak Brook, IL www.elkay.com.
 - b. Halsey Taylor, Oak Brook, IL www.halseytaylor.com.

- c. Murdock Manufacturing (Acorn), City of Industry, CA www.murdockmfg.com.
 - d. Oasis, Tri Palm International, Columbus OH www.oasiswatercoolers.com.
- B. Design Criteria:
- 1. All drinking water products, components, and materials above and below grade used in drinking water systems must meet NSF International Standards for Lead Free.
 - 2. Interior exposed pipe, valves, and fixture trim shall be chrome plated.
- C. Materials:
- 1. Handicap Accessible Bi-Level Cooler and Bottle Filling Station:
 - a. Design Criteria:
 - 1) Vandal proof operating bar on front and both sides.
 - 2) Vandal proof operating bar on front and both sides.
 - 3) 8 GPH water at 50 deg F water cooled from 80°F inlet water and 90°F ambient per ASHRAE testing.
 - 4) 115-120 V, 60 Hz, single phase.
 - 5) Flexible bubbler.
 - 6) Built-In strainer.
 - 7) Meets state and federal requirements for both children or adults as defined by the Americans with Disabilities Act.
 - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Elkay: Model LZSTL8WSLK.
 - 2) Halsey Taylor: Model HTHB-HACG8BLPV-WF.
 - 3) Murdock Manufacturing: Model A172.8UBL-BF12.
 - 4) Oasis: Model PGEBFSL.

PART 3 - EXECUTION

3.1 INSTALLATION

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

3.2 CLEANING

- A. Polish chrome finish at completion of Project.

END OF SECTION

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. Section 26 2913: 'Enclosed Controllers' for magnetic starters and thermal protective devices not factory mounted integral part of mechanical equipment.
 - 7. Division 26: Raceway and conduit, unless specified otherwise, line voltage wiring, outlets, and disconnect switches.
 - 8. Slots and openings through floors, walls, ceilings, and roofs provided under other Divisions in their respective materials.

1.2 MECHANICAL DEMOLITION

- A. Disconnect, demolish, and remove mechanical systems, equipment, and components indicated to be removed.
 - 1. Piping to be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - 2. Piping to be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
 - 3. Ducts to be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
 - 4. Ducts to be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.
 - 5. Equipment to be Removed: Disconnect and cap services and remove equipment.
 - 6. Equipment to be Removed and Reinstalled: Disconnect and cap services and remove, clean and store equipment; when appropriate, reinstall, reconnect and make equipment operational.
 - 7. Equipment to be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
- B. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

1.3 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.
 - 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.

1.4 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.

1.5 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.

1.6 WARRANTY

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

PART 2 - PRODUCTS

2.1 COMPONENTS

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

- D. Valves:
 - 1. Valves of same type shall be of same manufacturer.

PART 3 - EXECUTION

3.1 INSTALLERS

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

3.2 EXAMINATION

- A. Drawings:
 - 1. HVAC Drawings show general arrangement of piping, ductwork, equipment, etc. Follow as closely as actual building construction and work of other trades will permit.
 - 2. Consider Architectural and Structural Drawings part of this work insofar as these drawings furnish information relating to design and construction of building. These drawings take precedence over HVAC Drawings.
 - 3. Because of small scale of Drawings, it is not possible to indicate all offsets, fittings, and accessories that may be required. Investigate structural and finish conditions affecting this work and arrange work accordingly, providing such fittings, valves, and accessories required to meet conditions.
- B. Verification Of Conditions:
 - 1. Examine premises to understand conditions that may affect performance of work of this Division before submitting proposals for this work. Examine adjoining work on which mechanical work is dependent for efficiency and report work that requires correction.
 - 2. No subsequent allowance for time or money will be considered for any consequence related to failure to examine site conditions.
 - 3. Ensure that items 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.

3.3 PREPARATION

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

3.4 INSTALLATION

- A. Interface With Other Work:
 - 1. Furnish sleeves, inserts, supports, and equipment that are to be installed by others in sufficient time to be incorporated into construction as work proceeds. Locate these items and see they are properly installed.

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

- b. Work piping into place without springing or forcing. Make piping connections to pumps and other equipment without strain at piping connection. Remove bolts in flanged connections or disconnect piping to demonstrate that piping has been so connected, if requested.
 - c. Make changes in direction with proper fittings.
 - d. Expansion of Thermoplastic Pipe:
 - 1) Provide for expansion in every 30 feet of straight run.
 - 2) Provide 12 inch offset below roof line in each vent line penetrating roof.
 - 3. Provide sleeves around pipes passing through concrete or masonry floors, walls, partitions, or structural members. Do not place sleeves around soil, waste, vent, or roof drain lines passing through concrete floors on grade. Seal sleeves with specified sealants.
 - a. Sleeves through floors shall extend 1/4 inch above floor finish in mechanical equipment rooms above basement floor. In other rooms, sleeves shall be flush with floor.
 - b. Sleeves through floors and foundation walls shall be watertight.
 - 4. Provide spring clamp plates (escutcheons) where pipes run through walls, floors, or ceilings and are exposed in finished locations of building. Plates shall be chrome plated heavy brass of plain pattern and shall be set tight on pipe and to building surface.
 - 5. Remove dirt, grease, and other foreign matter from each length of piping before installation.
 - a. After each section of piping used for movement of water or steam is installed, flush with clean water, except where specified otherwise.
 - b. Arrange temporary flushing connections for each section of piping and arrange for flushing total piping system.
 - c. Provide temporary cross connections and water supply for flushing and drainage and remove after completion of work.
- E. Penetration Firestops: Install Penetration Firestop System appropriate for penetration at HVAC system penetrations through walls, ceilings, roofs, and top plates of walls.
- F. Sealants:
- 1. Seal openings through building exterior caused by penetrations of elements of HVAC systems.
 - 2. Furnish and install acoustical sealant to seal penetrations through acoustically insulated walls and ceilings.

3.5 REPAIR / RESTORATION

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

3.6 FIELD QUALITY CONTROL

- A. Field Tests:
- 1. Perform tests on HVAC piping systems. Furnish devices required for testing purposes.
- B. Non-Conforming Work:
- 1. Replace material or workmanship proven defective with sound material at no additional cost to Owner.
 - 2. Repeat tests on new material, if requested.

3.7 SYSTEM START-UP

- A. Off-Season Start-up:
- 1. If Substantial Completion inspection occurs during heating season, schedule spring start-up of cooling systems. If inspection occurs during cooling season, schedule autumn start-up for heating systems.
 - 2. Notify Owner seven days minimum before scheduled start-up.
 - 3. Time will be allowed to completely service, test, check, and off-season start systems. During allowed time, train Owner's representatives in operation and maintenance of system.

4. At end of off-season start-up, furnish Owner with letter confirming that above work has been satisfactorily completed.
- B. Preparations that are to be completed before start up and operation include, but are not limited to, following:
1. Dry out electric motors and other equipment to develop and properly maintain constant insulation resistance.
 2. Make adjustments to insure that:
 - a. Equipment alignments and clearances are adjusted to allowable tolerances.
 - b. Nuts and bolts and other types of anchors and fasteners are properly and securely fastened.
 - c. Packed, gasketed, and other types of joints are properly made up and are tight and free from leakage.
 - d. Miscellaneous alignments, tightenings, and adjustments are completed so systems are tight and free from leakage and equipment performs as intended.
 3. Motors and accessories are completely operable.
 4. Inspect and test electrical circuitry, connections, and voltages to be properly connected and free from shorts.
 5. Adjust drives for proper alignment and tension.
 6. Make certain filters in equipment for moving air are new and of specified type.
 7. Properly lubricate and run-in bearings in accordance with Manufacturer's directions and recommendations.

3.8 CLEANING

- A. Clean exposed piping, ductwork, and equipment.
- B. No more than one week before Final Inspection, flush out bearings and clean other lubricated surfaces with flushing oil. Provide best quality and grade of lubricant specified by Equipment Manufacturer.
- C. Replace filters in equipment for moving air with new filters of specified type no more than one week before Final Inspection.

3.9 CLOSEOUT ACTIVITIES

- A. Instruction Of Owner:
 1. Instruct building maintenance personnel and Facility Manager in operation and maintenance of mechanical systems utilizing Operation And Maintenance Manual when so doing.
 - a. Minimum Instruction Periods:
 - 1) HVAC: Four (4) hours.
 - 2) Temperature Control: Two (2) 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. Do not operate pieces of equipment used for moving supply air without proper air filters installed properly in system.
- B. After start-up, continue necessary lubrication and be responsible for damage to bearings while equipment is being operated up to Substantial Completion.

END OF SECTION

SECTION 23 0529**HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Common hanger and support requirements and procedures for HVAC systems.
- B. Related Requirements:
 - 1. Section 05 0523: 'Metal Fastening' for quality and requirements for welding.
 - 2. Section 07 8400: 'Firestopping' for quality of Penetration Firestop Systems to be used on Project and submittal requirements.
 - 3. Slots and openings through floors, walls, ceilings, and roofs provided under other Divisions in their respective materials.
- C. Products Installed But Not Furnished Under This Section:
 - 1. Stencils and band colors of gas piping used in HVAC equipment.
- D. Related Requirements:
 - 1. Section 09 9124: 'Interior Painted Metal' for providing field painting of identification of piping used with HVAC equipment.
 - 2. Section 23 0553: 'Identification For HVAC Piping And Equipment' for HVAC piping and equipment identification signage requirements.
 - 3. Sections Under 09 9000 Heading: Painting of mechanical items requiring field painting.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Section 09 9124 to coordinate with Section 23 0529 for location of identification of HVAC piping and equipment to be field painted and Section 23 0553 for painting requirements of HVAC piping and equipment.
 - 2. Section 23 0529 to coordinate with Section 23 0553 for stencil and band color locations and identification requirements of HVAC piping and equipment for field application.

1.3 SUBMITTALS

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

PART 2 - PRODUCTS**2.1 ASSEMBLIES**

- A. Manufacturers:
 - 1. Class Two Quality Standard Approved Manufacturers. See Section 01 6200:
 - a. Anvil International, Portsmouth, NH www.anvilintl.com.
 - b. Cooper B-Line, Highland, IL www.cooperbline.com.
 - c. Erico International, Solon, OH www.erico.com.
 - d. Hilti Inc, Tulsa, OK www.hilti.com.
 - e. Minerallac, Hampshire, IL www.minerallac.com.
 - f. Thomas & Betts, Memphis, TN www.superstrut.com.
 - g. Unistrut, Wayne, MI www.unistrut.com.
- B. Performance:

C. Materials:

1. Hangers, Rods, Channels, Attachments, And Inserts:
 - a. Galvanized and UL approved for service intended.
 - b. Steel Deck Bracket:
 - 1) 6 inch length minimum.
 - 2) Class One Quality Standard: Unistrut P1000 with clamp nut.
 - 3) Acceptable Manufacturers: Hilti, Thomas & Betts.
 - 4) Equal as approved by Architect before installation. See Section 01 6200.
 - c. Equipment Support Channel:
 - 1) Class One Quality Standard: Unistrut P1000.
 - 2) Acceptable Manufacturers: Hilti, Thomas & Betts.
 - 3) Equal as approved by Architect before installation. See Section 01 6200.
 - d. Swivel Attachment:
 - 1) Class One Quality Standard: Unistrut EM3127.
 - 2) Acceptable Manufacturers: Hilti, Thomas & Betts.
 - 3) Equal as approved by Architect before installation. See Section 01 6200.

PART 3 - EXECUTION - NONE**END OF SECTION**

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

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

PART 2 - PRODUCTS**2.1 SYSTEMS**

- A. Description:
 - 1. Abbreviations for Pipe Stencils and Equipment Identification and Band Colors for Pipe Identification:
 - a. Apply stenciled symbols and color banding as follows. Extend color band 2 inches minimum beyond each side of stenciled symbols.

Pipe Type	Band Color	Symbol
Relief Vent	Carlsbad Canyon	RV
 - b. Apply continuous painting as follows:
 - 1) Mechanical Mezzanine And Exposed on Roof:

Pipe Type	Pipe Color
Gas	Yellow
- 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.
 - 3. Performance Requirements:
 - a. New Surfaces: MPI Premium Grade finish requirements.
 - b. Maintain specified colors, shades, and contrasts.
 - 4. Paint (one coat):
 - a. Primer:
 - 1) Ferrous Metal:
 - a) MPI 107, 'Primer, Rust-Inhibitive, Water Based'.
 - (1) Color: white.
 - b. Finish Coat (two coats):
 - 1) Ferrous Metal:
 - a) MPI 153, 'Light Industrial Coating, Interior, Water Based, Semi-Gloss (MPI Gloss Level 5)'.
 - 5. Labels:
 - a. Equipment Identification:
 - 1) Black formica, with white reveal when engraved.
 - 2) Lettering to be 3/16 inch high minimum.

6. Pipe Markers:
 - a. Rigid vinyl or polyester, 360 degree wrap around pipe markers.
 - b. Surface printed with UV ink and then thermoformed. Legend to include pipe contents and directional arrows.
 - c. Provide pipe markers for natural gas piping.
7. Tags:
 - a. Regardless of size, each valve shall have brass tag 1-1/2 inches by 3 inch minimum in size and 0.051 inch thick.

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. Thermostats and control panels in mechanical spaces.
 - c. Rooftop Units.
 - d. Unit Heaters.
 - e. Accessible exhaust fans.
 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. Pipe Markers:
 1. Wrap pipe marker around pipe with 1/2 inch minimum overlap. Use adhesive strip at overlap to adhere ends of marker together.
 2. Locate markers as follows:
 - a. Adjacent to each item of equipment.
 - b. At points of entry and exit where piping goes through wall.
 - c. On each riser and junction.
 - d. Every 25 feet maximum on long, continuous runs.
- C. Painting:
 1. New Surfaces:
 - a. Remove rust spots by sanding and immediately spot prime. If all traces of rust cannot be removed, apply rust blocker recommended by Paint Manufacturer before applying full primer coat.
 2. Leave equipment in like-new appearance.
 3. Only painted legends, directional arrows, and color bands are acceptable.
 4. Locate identifying legends, directional arrows, and color bands at following points on exposed piping of each piping system:
 - a. Adjacent to each item of equipment.
 - b. At point of entry and exit where piping goes through wall.
 - c. On each riser and junction.
 - d. Every 25 feet on long continuous lines.
 - e. Stenciled symbols shall be one inch high and black.

END OF SECTION

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

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

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

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

2.2 MATERIALS

- A. Thermal Wrap Duct Insulation:
 - 1. 1-1/2 inch thick fiberglass with factory-laminated, reinforced aluminum foil scrim kraft facing and density of 0.75 lb / per cu ft.
 - 2. Thermal Conductivity: 0.27 BTU in/HR SF deg F at 75 deg F 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 thick on all round ducts.
 - 2. Wrap insulation tightly on ductwork with circumferential joints butted and longitudinal joints overlapped minimum 2 inches.
 - a. Do not compress insulation except in areas of structural interference. Minimum thickness at corners shall be one inch thick.
 - b. Remove insulation from lap before stapling.
 - c. Staple seams at approximately 16 inches on center with outward clenching staples.
 - d. Seal seams with foil vapor barrier tape or vapor barrier mastic. Seal penetrations of facing to provide vapor tight system.

- B. Insulate outside of ceiling diffusers and diffuser drops same as ductwork.

END OF SECTION

SECTION 23 0933
ELECTRIC AND ELECTRONIC CONTROL SYSTEM FOR HVAC

PART 1 - GENERAL**1.1 SUMMARY****A. Includes But Not Limited To:**

1. Furnish and install automatic temperature control system as described in Contract Documents.
2. Furnish and install conductors and make connections to control devices, motors, and associated equipment.
3. Assist in air test and balance procedure.

B. Related Requirements:

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

1.2 SUBMITTALS**A. Action Submittals:**

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

B. Informational Submittals:

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

C. Closeout Submittals:

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

1.3 QUALITY ASSURANCE**A. Qualifications: Requirements of Section 01 4301 applies, but is not limited to the following:**

1. Installer:
 - a. Before bidding, obtain sponsorship from a local, Approved Distributor specified under PART 2 PRODUCTS of this specification. Initial requirements for sponsorship are:
 - 1) Receive LCBS Connect product training from Approved Distributor.
 - 2) Installer to provide Distributor sponsorship by submitting 'Certificate of Sponsorship' as Informational Submittal with bid. Certificate available as Attachment in this Specification.

PART 2 - PRODUCTS

2.1 SYSTEMS

A. Manufacturers:

1. Manufacturer Contact List:
 - a. 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.
 - g. Zimmerman Technologies, Renton, WA:
 - 1) Primary Contact: Tracy Zimmerman, (425) 255-1906, zimmtech@yahoo.com.

B. Distributors: Obtain LCBS Connect control devices, RP panels, sensors, actuators and other control equipment from following Sponsoring Approved Distributors. See Section 01 4301:

1. Utah:
 - a. Control Equipment Co: (800) 452-1457 howe@controlequiputah.com Ray Howe.
 - b. Building Controls & Solutions (801) 214-3313 Kathy.Wright@Building-Controls.com Kathy Wright.

C. Performance:

1. Design Criteria:
 - a. Honeywell LCBS Connect control system with cloud based gateway:
 - 1) General Requirements:
 - a) Controls multistage equipment, dehumidification and ventilation with 2 wire connection to controller interface location in occupied space.
 - b) Adjustable backlight to controller interface module from 15%-100%en after 30 seconds of setting adjustments.
 - c) System controllers can be programmed from the interface module or from the cloud service.
 - d) LCBS Connect controller utilizes echelon communication network with the controller located near the mechanical equipment and the system interface located in the occupied space.
 - e) System shall control outdoor ventilation air based upon system occupancy of electric / electronic actuation of dampers.
 - f) CO2 (Carbon Dioxide) sensors will open ventilation dampers only when CO2 exceeds 1000 ppm.
 - g) LCBS Connect devices access via internet Chrome browser via gateway.
 - h) Wired room temperature sensors may be added as specified.
 - 2) System Requirements:
 - a) Up to 3 Heat/2 Cool Heat Pumps; Up to 3 Heat/2 Cool Conventional Systems.
 - b) Tri-Lingual display (Selectable for English, Spanish, or French).
 - c) 18 to 30 Vac.
 - d) 50 Hz; 60 Hz.
 - e) System switch to include Auto changeover for Heat-Cool.
 - f) 7-Day Programming.
 - g) 365-Day Event Scheduling.
 - h) Display Security Lockout options.
 - i) Minimum/ Maximum Temperature Range Stops.
 - j) Configurable over-ride option.
 - k) Remote Access via internet.
 - l) Dehumidification setting range 40 to 80% RH.
 - b. Honeywell TrueZone panel enabled device(s):
 - 1) General Requirements: Zone Panel:

- a) Work in conjunction with LCBS Connect.
 - b) Control multiple zones on single fan coil unit (gas fired furnace with air conditioning or air handling unit with heat pump).
 - c) Keypad programming & checkout.
 - d) Work with conventional, heat pump or dual fuel applications.
 - e) Push wire terminals.
 - f) Add-a-zone panel expandable.
- 2) Dampers:
- a) Bypass damper installs in any orientation at any angle.
 - b) Bypass damper provides constant pressure relief regardless of blower speed.
 - c) Bypass damper provides visual damper percentage open.
 - d) Zone damper powered by 24VAC circuit from zone panel.
 - e) Zone damper adjustable range stops for consistent bleed setting.
 - f) Zone damper LED indicator lights (red closed, green open/ 3 wire applications).
 - g) Zone damper terminals have push terminals.
- D. Components:
- 1. Controller, Wall Module:
 - a. Controller and Display Kit:
 - 1) Category Four Approved Product. See Section 01 6200 for definitions of Categories:
 - a) Part Number Honeywell YCRL6438SR1000 consisting of following:
 - (1) Unitary Controller: Honeywell CRL6438SR1000.
 - (2) Wall Module: Honeywell TS120.
 - b) Wall Cover Plate: Honeywell. 50002883-001.
 - c) Discharge Air / Return Air Sensors: Honeywell C7041B2005 20k ohms.
 - d) Outdoor Air Sensor: Honeywell C7041F2006.
 - e) Indoor Air Sensor: Sylk bus network; Honeywell TR40, plain face
 - f) Averaging sensor: Sylk bus network; Honeywell TR40, plain face
 - g) Combination Temperature/CO2 Sensor: Honeywell TR-40, CO2, plain face
 - b. Internet Gateway Module(s): One (1) module per thirty (30) controllers.
 - 1) Category Four Approved Product. See Section 01 6200 for definitions of Categories:
 - a) LCBS Connect Gateway Module: Honeywell LGW1000.
 - c. Economizer: Honeywell W-7220 Controller or M7215A actuator or MS7503 Actuator as required to maintain economizer functionality
 - 2. Zone panel and Components:
 - a. Zone Panel: Honeywell TrueZone HZ432.
 - b. Zone Expansion Controller X4, where required: Honeywell TAZ-4H.
 - c. Zone Panel Transformer: AT175F1023.
 - d. Zone Discharge Air Temperature Sensor: Honeywell C7735A1000.
 - e. Zone Damper(s): Honeywell ARD (damper size) TZ round damper.
 - f. Zone Damper(s): Honeywell ZD (damper size) TZ rectangular damper.
 - g. Zone Bypass Damper: Honeywell CPRD (damper size).
 - 3. Sealant Compound:
 - a. Description:
 - 1) Non hardening waterproof, vapor proof, self-adhesive for hot or cold application for sealing conduit openings against drafts, dust moisture and noise.
 - b. Category Four Approved Product. See Section 01 6200 for definitions of Categories:
 - 1) Duct Seal Compound No. DS-130 by Gardner Bender, Menomonee Falls , WI.
www.gardnerbender.com.
 - 2) Thumb-Tite Sealing Compound No. 4216-92 by Nu-Calgon, St. Louis, MO
www.nucalgon.com.
 - 4. Transformer:
 - a. 120 / 24 V, 50VA Honeywell AT150F.
 - b. 120 / 24 V, 75VA Honeywell AT175F.
 - 5. Damper Actuators:
 - a. Electric type equipped for Class I wiring.
 - b. Shall not consume power during Unoccupied cycle or use chemicals or expandable media.

- c. Have built in spring return.
- d. Category Four Approved Product. See Section 01 6200 for definitions of Categories:
 - 1) Honeywell MS8105A1130 w/ End switch.
- 6. Conductors:
 - a. Color-coded and No. 16 and No. 12 AWG Type TWN, TFN, or THHN, stranded.
 - b. Controller Cable: 12, 8, or 4 conductor, 18AWG solid copper wire, insulated with high-density polyethylene. Conductors parallel enclosed in brown PVC jacket (22 AWG cable not allowed).
 - c. Echelon Network Ebus Communicating Cable:
 - 1) Class Two Quality Standard. See Section 01 6200:
 - a) CAT 4, 22 gauge (0.025 in), twisted pair, non-plenum and non-shielded cable.
- 7. CO₂ (Carbon Dioxide) Return Air Sensor:
 - a. Duct mount with display.
 - b. Category Four Approved Product. See Section 01 6200 for definitions of Categories:
 - 1) Honeywell: C7232B1006.
- 8. Combination Equipment and Thermal Overload Switch Panel:
 - a. CEO panel must be provided by approved panel builder. See Section 01 6200 for definitions of Categories
- 9. Current Sensor/Switch: Category Four Approved Product. See Section 01 6200 for definitions of Categories
 - a. Honeywell CSP-O-F10-001 and CTP10-050VDC001

2.2 Operation Sequences:

A. Summary:

- 1. Coordinate control functions, such as scheduling and supervisory-level global control, points list, and control sequences needed for installation as listed below.
- 2. Provide written documentation to archive system operation as accepted by Owner.

B. Schedules:

- 1. Occupancy Schedule and Control:
 - a. Schedules will be programmed via LCBS Connect Automation system. Coordinate with Owner occupied and unoccupied schedule times:
 - 1) Schedules will be adjustable via head end graphical user interface.
 - 2) Schedules will allow for seven (7) day programming with special events programming for holidays and other special events determined by Owner.
 - 3) Daily schedules will allow for at least four events per day.
 - 4) Remote wall module (where applicable) shall provide push button occupancy override to schedule.
 - a) Override time shall be one (1) hour (adjustable).
 - b) Wall module shall command controller to occupied mode and system shall control to occupied set point.

C. Set Points:

- 1. Occupied and Unoccupied Set Points:
 - a. Space temperature set points will be programmed via network or wall module. Coordinate with Owner occupied and unoccupied set points.
 - b. Set points will be adjustable via internet or wall module.
 - c. Some zones will have remote wall modules with set point capability. Maximum wall module set point deviation will be +/- 2 deg F (adjustable). Coordinate with owner which zones will allow for remote wall module set point deviation.
 - d. Unitary controllers shall provide automatic change over between heating and cooling operation.

D. Package Roof Top Unit (RTU):

- 1. Space Temperature Control:
 - a. LCBS Controller:

- 1) Monitor space temperature and compare it to space temperature set point.
 - 2) If controller is in occupied mode as determined by building schedule, controller shall use occupied cooling and heating set points.
 - 3) If controller is in unoccupied mode as determined by building schedule, controller shall use unoccupied cooling and heating set points.
 - 4) When space temperature falls below heating set point, gas heating will be brought on to maintain set point. Heating will be staged if applicable.
 - 5) When space temperature rises above cooling set point, controller shall enable DX system to provide cooling to maintain space temperature. Cooling will be staged if applicable. Controller will supply cooling demand.
 - 6) If equipped with economizer the package roof top controls will determine economizer operation.
 - 7) DDC controller will trend amount of time RTU is in "free cooling" operation.
 - 8) DDC controller shall report position of economizer damper via feedback or damper actuator end switch.
2. Zone panel and Components:
 - 1) General Requirements: Zone Panel:
 - a) Work in conjunction with specified thermostats.
 - b) Control multiple zones on single RTU.
 - c) Keypad programming & checkout.
 - d) Work with conventional, heat pump or dual fuel applications.
 - e) Push wire terminals.
 - 2) Dampers:
 - a) Bypass damper installs in any orientation at any angle.
 - b) Bypass damper provides constant pressure relief regardless of blower speed.
 - c) Bypass damper provides visual damper percentage open.
 - d) Zone damper powered by 24VAC circuit from zone panel.
 - e) Zone damper adjustable range stops for consistent bleed setting.
 - f) Zone damper LED indicator lights (red closed, green open/ 3 wire applications).
 - g) Zone damper terminals have push terminals.
3. Fan Control:
 - a. Occupied Mode:
 - 1) Supply fan shall run continuously when in occupied mode.
 - b. Unoccupied Mode:
 - 1) Supply fan shall run only when heating or cooling is needed.
 4. Safeties:
 - a. Unit shall operate subject internal safety controls, duct smoke detector, and fire alarm interlock (where applicable).
 - b. Upon detection of smoke by duct smoke detector or shutdown input by fire alarm system (where applicable), RTU shall shut down and close outside air dampers. RTU shall not resume normal operation until smoke alarm and/or fire alarm is reset.
- E. Evaporative Coolers And Unit Heaters:
1. Space Temperature Control:
 - a. LCBS Controller:
 - 1) Monitor space temperature and compare it to space temperature set point.
 - 2) If controller is in occupied mode as determined by building schedule, controller shall use occupied cooling and heating set points.
 - 3) If controller is in unoccupied mode as determined by building schedule, controller shall use unoccupied cooling and heating set points.
 - 4) When space temperature falls below heating set point, gas fired unit heater will be brought on to maintain space temperature set point.
 - 5) When space temperature rises above cooling set point, controller shall enable evaporative cooler to maintain space temperature.
- F. Building Automation:
1. Building Automation Gateway:

- a. Building automation shall provide web access, alarming, trending to all unitary devices for mechanical equipment.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Interface With Other Work:
 1. Calibrate room controllers as required during air test and balance. Insulate sensor J-box with fiberglass insulation; expandable/ foam insulation is NOT acceptable.
 2. Instruct air test and balance personnel in proper use and setting of control system components.
 3. Install low voltage electrical wiring in accordance with Division 26 of these Specifications.
- B. Echelon Communication: Ebus
 1. Ebus cable needs to be installed at least 12 inches from lighting, motors, or low voltage switching cables
- C. Zone Panel:
 1. Zone panel shall be mounted by mechanical equipment with associated LCBS module in close proximity but mounted 24 inches apart.
 2. Zone panel shall be mounted at eye level and accessible for visual inspection.
 3. Install discharge air sensor 6 feet downstream from a/c coil.
 4. Install OA sensor in fresh air duct.
 5. TOD relay for fresh air damper which is not part of zone panel shall be mounted in close proximity to panel and clearly labeled such.
 6. Zone panel shall be programmed for appropriate amount of zones and control.
 7. Zone dampers shall use three (3) wires for LED damper display.
 8. Power for zone transformer shall come from mechanical equipment for service switch disconnect.
 9. Zone and bypass dampers shall have actuation component positioned such as for visual damper position inspection.
 10. Set minimum zone damper position to 16 percent or setting number 1.
- D. Safety Controls: Interlock duct smoke detectors to keep heating, cooling, and system fan from operating when detector is energized.
- E. Mount damper actuators and actuator linkages external of airflow. Make certain dampers operate freely without binding or with actuator housing moving.
- F. Paste copy of record control wiring diagram on back of relay panel door cover for each multiple furnace system.

3.2 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.

3.3 SYSTEM STARTUP

- A. For systems with LCBS Controller.
 1. Contractor is responsible for a fully functioning control system accessible via internet web browser. Contractor is responsible to coordinate Network start up with assistance from local IT technician. Local IT technician shall provide available ports on network switch for LCBS gateway.

2. Contractor is responsible configuring all controllers with proper zone names, zone scheduling, proper Church conference / holiday scheduling, all to be coordinated with local FM manager. Set proper clock setting including day/month/year.
3. Set Heating / Cooling to proper stages
4. Set heat cycle rates to 9 cph and cooling to 4 cph.
5. Set DO1 relay to "Occupancy".
6. Set System switch operation to "Automatic" changeover.
7. Set fan switch operation to "ON".
8. Set minimum UnOcc start time for all days. No days shall be scheduled Unconfigured.
9. Set Occupied start times to match meeting start times; provided by local FM manager.
10. Place all zone over-ride durations to one (1) hour except for Bishop and Stake area which shall be set to two (2) hours.
11. Set Occupied default heating setpoints to 70 degrees, cooling setpoints to 74 degrees.
12. Set Unoccupied default heating setpoint to 60 degrees, cooling setpoints to 90 degrees.
13. Set each zone to applicable Holiday scheduling for General & Stake Conferences.

B. For systems with TrueZONE Zone Panel:

1. Contractor responsible for fully functioning zoning system connected to LCBS controller system.
2. Contractor responsible to configuring of zone panel.
3. Contractor responsible to coordinate Network start up with assistance from air balancer.

3.4 ADJUSTING

A. LCBS controller configuration settings; the following are configuration guidelines for consistent installations:

1. Temperature Units Fahrenheit/ Celsius
2. Equipment Type Conventional/heat pump.
 - a. Stages of Heat 1,2
 - b. Stages of Cool 1,2
 - c. Fan operation in heat mode Enable Fan w/ Heat
3. Equipment Options
 - a. Leave at Default
 - b. Heating Cycles per Hour 6-9 cph
 - c. Cooling Cycles per Hour 3-4 cph
4. Recovery
 - a. Leave at Default
5. Economizer / DLC
 - a. Configure as required by control equipment.
6. Sensor Selection
 - a. Set according to averaging sensors
 - b. Set to multi sensor "Smart" when averaging.
 - c. Set Occupancy Sensor to "Disable".
7. Terminal Assignment
 - a. Set according to equipment
 - b. Set Terminal DO1 to Occupancy to control fresh air damper based upon scheduled occupancy or over-ride.
8. Miscellaneous
 - a. Leave at default
9. Sensor setting
 - a. Leave at default
 - b. Set as Required
10. Configure Zone Name (display on Home Screen).
11. Set Password to ABCD.
12. Set Occupied Setpoint
13. Set Unoccupied Setpoint
14. Set Schedule
15. MENU/ Holiday-Event Scheduler / Custom Events/ Create new event.
 - a. Mountain Time Zone:

- 1) First Sunday in April: Unoccupied all zones for all day / every year.
- 2) First Sunday in April: Unoccupied all zones for all day / every year.
- 3) First Sunday in October: Unoccupied all zones for all day / every year.
- 4) First Sunday in October: Unoccupied all zones for all day / every year.

B. Zone Panel Configuration:

1. Configuration:
 - a. Conventional.
 - b. Cooling stages: (match equipment).
 - c. Heat stages: (match equipment).
 - d. RF enabled: (NO).
 - e. Zones Installed: (match number of zones).
 - f. Heat Staging Control: (percent Zones).
2. Advanced Configuration:
 - a. Heat Fan Control: (HVAC).
 - b. Purge Time: (2 minutes).
 - c. Fan in Purge: (HVAC).
 - d. Purge Dampers: (Unchanged).
 - e. Changeover delay: (15 minutes).
 - f. DA temperature Sensor: (Yes).
 - g. DA temperature High Limit: (140 degree).
 - h. DA Low Limit: (35 degree).
 - i. DAT MSTG Inhibit: (Yes).
 - j. MSTG OT Lockout: (No).
3. Save Changes.

3.5 CLOSEOUT ACTIVITIES

A. Instruction Of Owner:

1. Include as part of training required in Section 23 0501, following training:
 - a. Training shall be by personnel of installing company and utilize operator's manuals and as-built documentation.
 - b. Provide training in (2) two sessions including LCBS Connect sight & smart Apps for up to six (6) hours total:
 - 1) First session will occur between system completion and Substantial Completion.
 - 2) Second session will occur within forty-five (45) days of Substantial Completion when agreed upon by Owner.
 - c. Training shall include sequence of operation review, selection of displays, modification of schedules and setpoints, troubleshooting of sensors, etc, as follows:
 - 1) Control System Overview:
 - a) Show access to system through both individual controllers and Internet browser and how network works. Scheduling building at minimum for Stake and General Conference, special events.
 - 2) Controller Programming from Keypad: Instructions on developing setpoints and schedules and adjusting local zone temperatures.
 - 3) Web Internet training with local Facilities Manager during two (2) sessions.
 - a) Review all features accessible from the 'Settings' tab including Alarm points, user access, scheduling and humidity setpoints (where applied).

END OF SECTION

ATTACHMENTS

CERTIFICATE OF SPONSORSHIP

Electric and Electronic Control System for HVAC Installer

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

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

INSTALLER INFORMATION (To be filled out by Installer):

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

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

Sponsoring Approved Honeywell Distributor Name: _____

Signature: _____ Printed Signature: _____

Date: _____

END OF SECTION

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

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

1.2 REFERENCES

- A. Reference Standards:
 - 1. Sheet Metal And Air Conditioning Contractors' National Association / American National Standards Institute:
 - a. SMACNA, 'HVAC Duct Construction Standards - Metal and Flexible' (4th Edition).

1.3 ADMINISTRATIVE REQUIREMENTS

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

1.4 SUBMITTALS

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

PART 2 - PRODUCTS**2.1 ASSEMBLIES**

- A. Performance:
 - 1. Design Criteria:
 - a. Standard Ducts: Construction details not specifically called out in Contract Documents shall conform to applicable requirements of SMACNA, 'HVAC Duct Construction Standards - Metal and Flexible'.
- B. Materials:
 - 1. Duct Hangers:
 - a. One inch by 18 ga galvanized steel straps or steel rods as shown on Drawings, and spaced not more than 96 inches 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'.
 - 4. Section 23 0933: 'Electric And Electronic Control System For HVAC':

1.2 REFERENCES

- A. Association Publications:
 - 1. Sheet Metal And Air Conditioning Contractors' National Association / American National Standards Institute:
 - 2. SMACNA, 'HVAC Duct Construction Standards - Metal and Flexible' (4th Edition).
- B. Reference Standards:
 - 1. ASTM International:
 - a. ASTM A653/A653M-18, 'Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process'.
 - b. ASTM E84-18b, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
 - 2. Underwriters Laboratories, Inc.:
 - a. UL 723: 'Standard for Safety Test for Surface Burning Characteristics of Building Materials'; (11th Edition - 2018).

1.3 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Duct Sealer:
 - a. Meet Class A flame spread rating in accordance with ASTM E84 or UL 723.
 - b. Handle, store, and apply materials in compliance with applicable regulations and material safety data sheets (MSDS).

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Storage and Handling Requirements:
 - 1. Duct Sealer:
 - a. Handle, store, and apply materials in compliance with applicable regulations and material safety data sheets (MSDS).
 - b. Handle to prevent inclusion of foreign matter, damage by water, or breakage.
 - c. Store in a cool dry location, but never under 35 deg F or subjected to sustained temperatures exceeding 110 deg F 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 or subjected to sustained temperatures exceeding 110 deg F or as per Manufacturer's written recommendations.
 - b. Do not apply when rain or freezing temperatures will occur within seventy two (72) hours.

PART 2 - PRODUCTS

2.1 SYSTEM

A. Materials:

1. Sheet Metal:
 - a. Fabricate ducts, plenum chambers and casings of zinc-coated, lock-forming quality steel sheets meeting requirements A653/A653M, with G 60 coating.
2. Duct Sealer For Interior Ducts:
 - a. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Duct Butter or ButterTak by Cain Manufacturing Co Inc, Pelham, AL
www.cainmfg.com.
 - 2) DP 1010, DP 1030 or DP 1015 by Design Polymerics, Fountain Valley, CA
www.designpoly.com.
 - 3) PROseal, FIBERseal, EVERseal, or EZ-seal by Ductmate Industries, Inc., Charleroi, PA
www.ductmate.com.
 - 4) SAS by Duro Dyne, Bay Shore, NY or Duro Dyne Canada, Lachine, QB
www.durodyne.com.
 - 5) Iron Grip 601 by Hardcast Inc, Wylie, TX www.hardcast.com.
 - 6) MTS 100 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 dimension having acoustic duct liner need not be cross-broken or beaded. Cross-break unlined ducts, duct panels larger than 48 inch vertical and horizontal sheet metal barriers, duct offsets, and elbows, or bead 12 inches 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.
 - 2) Duct with height or width over 36 inches shall be fabricated using SMACNA T-24 flange joints or of pre-fabricated systems as follows:
 - a) Ducts with sides over 36 inches up to 48 inches: Transverse duct joint system by Ductmate / 25, Elgen, Ward, or WDCI (SMACNA Class 'F' joint).
 - b) Ducts 48 inch And Larger: Ductmate / 35, Elgen, or WDCI (SMACNA Class 'J' transverse joint).

- c) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (1) Ductmate Industries Inc, Charleroi, PA www.ductmate.com or Ductmate Canada Ltd, Burlington, ON (905) 332-7678.
 - (2) Ward Industries Inc, Bensonville, IL www.wardind.com.
 - (3) Elgen Manufacturing Company, Inc., East Rutherford, NJ www.elgenmfg.com.
- c. Round Duct:
 - 1) Spiral Seam:
 - a) 28 ga minimum for ducts up to and including 14 inches in diameter.
 - b) 26 ga minimum for ducts over 14 inches and up to and including 26 inches in diameter.
 - 2) Longitudinal Seam:
 - a) 28 ga minimum for ducts up to and including 8 inches in diameter.
 - b) 26 ga minimum for ducts over 8 inches and up to 14 inches in diameter.
 - c) 24 ga minimum for ducts over 14 inches up to and including 26 inches in diameter.

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 INSTALLATION

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

3.3 FIELD QUALITY CONTROL

- A. Field Tests:
 - 1. Air Test and Balance Testing as specified in Section 01 4546: 'Duct Testing, Adjusting, and Balancing'.
- B. Non-Conforming Work:
 - 1. Reseal transverse joint duct leaks and seal longitudinal duct joint leaks discovered during air test and balance procedures at no additional cost to Owner.

END OF SECTION

SECTION 23 3300**AIR DUCT ACCESSORIES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install duct accessories in specified ductwork as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 23 3001: 'Common Duct Requirements'.

1.2 REFERENCES

- A. Reference Standards:
 - 1. ASTM International:
 - a. ASTM A653/A653M-18, 'Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process'.
 - b. ASTM C1071-16, 'Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material)'.
 - c. ASTM C1338-14, 'Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings'.

PART 2 - PRODUCTS**2.1 ACCESSORIES**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. AGM Industries, Brockton, MA www.agmind.com.
 - b. Air Balance Inc, Holland, OH www.airbalance.com.
 - c. Air 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 Polymerics, 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 thick, 1-1/2 lb density fiberglass conforming to requirements of ASTM C1071. Liner will not support microbial growth when tested in accordance with ASTM C1338.
- 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) ToughGard by CertainTeed.
 - b) Duct Liner E-M by Knauf Fiber Glass.
 - c) Akousti-Liner by Manson Insulation.
 - d) Quiet R by Owens Corning.
 - e) Linacoustic RC by Johns-Manville.

b. Adhesive:

- 1) Category Four Approved Water-Based Products. See Section 01 6200 for definitions of Categories:
 - a) Cain: Hydrotak.
 - b) Design Polymeric: DP2501 or DP2502 (CMCL-2501).
 - c) Duro Dyne: WSA.
 - d) Elgen: A-410-WB.
 - e) Hardcast: Coil-Tack.
 - f) Hercules: Mighty Tough Adhesives MTA500 or MTA600.
 - g) Miracle / Kingco: PF-101.
 - h) Mon-Eco: 22-67 or 22-76.
 - i) Polymer Adhesive: Glasstack #35.
 - j) Techno Adhesive: 133.
 - k) McGill AirSeal: Uni-tack.
- 2) Category Four Approved Solvent-Based (non-flammable) Products. See Section 01 6200 for definitions of Categories:
 - a) Cain: Safetak.
 - b) Duro Dyne: FPG.
 - c) Hardcast: Glas-Grip 648-NFSE.
 - d) Miracle / Kingco: PF-91.
 - e) Mon-Eco: 22-24.
 - f) Polymer Adhesive: Q-Tack.
 - g) Techno Adhesive: 'Non-Flam' 106.
- 3) Category Four Approved Solvent-Based (flammable) Products. See Section 01 6200 for definitions of Categories:
 - a) Cain: HV200.
 - b) Duro Dyne: MPG.
 - c) Hardcast: Glas-Grip 636-SE.
 - d) Miracle / Kingco: PF-96.
 - e) Mon-Eco: 22-22.
 - f) Polymer Adhesive: R-Tack.

- g) Techno Adhesive: 'Flammable' 106.
- c. Fasteners:
 - 1) Adhesively secured fasteners not allowed.
 - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) AGM Industries: 'DynaPoint' Series RP-9 pin.
 - b) Cain.
 - c) Duro Dyne.
 - d) Gripnail: May be used if each nail is installed by 'Grip Nail Air Hammer' or by 'Automatic Fastener Equipment' in accordance with Manufacturer's Dampers And Damper Accessories:
- d. 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.
- e. 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.
- f. Volume Dampers:
 - 1) Rectangular Duct:
 - a) Factory-manufactured 16 ga galvanized steel, single blade and opposed blade type with 3/8 inch axles and end bearings. Blade width 8 inches maximum. Blades shall have 1/8 inch clearance all around.
 - b) Damper shall operate within acoustical duct liner.
 - c) Provide channel spacer equal to thickness of duct liner.
 - d) Dampers above removable ceiling and in Mechanical Rooms shall have locking quadrant on bottom or side of duct. Otherwise, furnish with concealed ceiling damper regulator and cover plate.
 - e) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (1) Air-Rite: Model CD-2.
 - (2) American Warming: VC-2-AA.
 - (3) Arrow: OBDAF-207.
 - (4) C & S: AC40.
 - (5) Cesco: AGO.
 - (6) Daniel: CD-OB.
 - (7) Greenheck: VCD-20.
 - (8) Nailor: 1810 or 1820.
 - (9) Pottorff: CD-42.
 - (10) Ruskin: MD-35.
 - (11) United Enertech: MD-115.
 - (12) Utemp: CD-OB.
 - 2) Round Duct:
 - a) Factory-manufactured 20 ga galvanized steel, single blade with 3/8 inch axles and end bearings.
 - b) For use in outside air ducts.
 - c) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (1) Air Balance: Model AC-22.
 - (2) Air-Rite: Model CD-8.
 - (3) American Warming: V-22.
 - (4) Arrow: Type-70.
 - (5) C & S: AC21R.

- (6) Cesco: MGG.
 - (7) Nailor: 1890.
 - (8) Pottorff: CD-21R.
- 2. Air Turns:
 - a. Single thickness vanes. Double thickness vanes not acceptable.
 - b. 4-1/2 inch wide vane rail. Junior vane rail not acceptable.
- 3. Branch Tap for Flexible Ductwork:
 - a. Factory-manufactured rectangular-to-round 45 degree leading tap fabricated of 24 ga 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 minimum
 - 2) 3/8 inch minimum square rod with brass damper bearings at each end.
 - 3) Heavy-duty locking quadrant on 1-1/2 inch 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 long mechanical fasteners 12 inches on center maximum unless detailed otherwise on Drawings. Pin all duct liner.
 - b. Accurately cut liner and thoroughly coat ends with adhesive. Butt joints tightly. Top and bottom sections of insulation shall overlap sides. If liner is all one piece, folded corners shall be tight against metal. Ends shall butt tightly together.
 - c. Coat longitudinal and transverse edges of liner with adhesive.
 - 2. Air Turns:
 - a. Permanently install vanes arranged to permit air to make abrupt turn without appreciable turbulence, in 90 degree elbows of above ground supply and return ductwork.
 - b. Quiet and free from vibration when system is in operation.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Duct Liner:
 - 1. Furnish and install acoustic lining in following types of rectangular ducts unless noted otherwise on Contract Documents:
 - a. Supply air.
 - b. Return air.
 - c. Mixed air.
 - d. Transfer air.
 - e. Relief air.
 - f. Exhaust air.
 - g. Elbows, fittings, and diffuser drops greater than 12 inches in length.
 - 2. Do not install acoustic lining in round ducts.
- B. 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' (2018 or the most recent edition adopted by AHJ).
 - 2. Underwriters Laboratories:
 - a. UL 181, 'Factory-Made Ducts and Air Connectors' (11th Edition).
 - b. UL 181B, 'Closure Systems for Use With Flexible Air Ducts and Air Connectors' (3rd Edition).

PART 2 - PRODUCTS**2.1 SYSTEM**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. JP Lamborn Co., Fresno CA www.jpflex.com.
 - b. Flexmaster USA Inc, Houston, TX www.flexmasterusa.com or Flexmaster Canada Ltd, Richmond Hill, ON (905) 731-9411.
 - c. Thermaflex by Flexible Technologies, Abbeville, SC or Mississauga, ON www.thermaflex.net.
- B. Materials:
 - 1. Ducts:
 - a. Formable, flexible, circular duct which shall retain its cross-section, shape, rigidity, and shall not restrict airflow after bending.
 - b. Insulation:
 - 1) Nominal 1-1/2 inches, 3/4 lb per cu ft 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 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 60 inch maximum lengths.
- B. Make duct connections by coating exterior of duct collar for 3 inches 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.
 - f. Twin City: T

PART 3 - EXECUTION**3.1 INSTALLATION**

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

END OF SECTION

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SECTION 23 3713**DIFFUSERS, REGISTERS, AND GRILLES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install diffusers, registers, and grilles connected to ductwork as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 23 3001: 'General Duct Requirements'.

1.2 SUBMITTALS

- A. Maintenance Material Submittals:
 - 1. Tools: Leave tool for removing core of each different type of grille for building custodian.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Manufacturer Contact List:
 - 1. Carnes Co, Verona, MI www.carnes.com.
 - 2. Krueger Air System Components, Richardson, TX www.krueger-hvac.com.
 - 3. Metal*Aire by Metal Industries Inc, Clearwater, FL www.metalaire.com.
 - 4. Nailor Industries Inc, Houston, TX or Weston, ON www.nailor.com.
 - 5. Price Industries Inc, Suwanee, GA www.price-hvac.com or E H Price Ltd, Winnipeg, MB (204) 669-4220.
 - 6. Titus, Richardson, TX www.titus-hvac.com.
 - 7. Tuttle & Bailey, Richardson, TX www.tuttleandbailey.com.

2.2 MANUFACTURED UNITS

- A. Lay-In Ceiling Diffusers:
 - 1. Finish: White baked enamel.
 - 2. Removable inner core assembly.
 - 3. Performance Standard: Titus TDC 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. Hard Ceiling Diffusers:
 - 1. Finish: White baked enamel.
 - 2. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a. Carnes: SKSA.
 - b. Krueger: SH Frame F21.
 - c. Metal*Aire: 5500S-2.
 - d. Nailor: 6500B.
 - e. Price: SMD.
 - f. Titus: TDC Border Type 6.
 - g. Tuttle & Bailey: MS.

- C. Ceiling Return, Transfer, and Exhaust Grilles:
 - 1. Finish: Off-white baked enamel.
 - 2. 1/2 inch spaced steel blades, 35 degree deflection angle.
 - 3. Class One Quality Standard:
 - a. Titus 355RL or Titus 355RS.
 - 1) Carnes.
 - 2) Kreuger.
 - 3) Metal*Aire.
 - 4) Nailor.
 - 5) Price.
 - 6) Titus.
 - 7) Tuttle & Bailey.
- D. Ceiling Return And Transfer Grilles:
 - 1. Finish: White baked enamel.
 - 2. 1/2 inch by 1/2 inch aluminum cove.
 - 3. Class One Quality Standard: Titus 50F-3.
 - a. Carnes.
 - b. Kreuger.
 - c. Metal*Aire.
 - d. Nailor.
 - e. Price.
 - f. Titus.
 - g. 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 3723**HVAC GRAVITY VENTILATORS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install roof vents as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 23 3001: 'Common Duct Requirements'.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Manufacturer List:
 - 1. Air-Rite Manufacturing, Bountiful, UT (801) 295-2529.
 - 2. Breidert Air Products, Jacksonville, FL www.breidert.com.
 - 3. Carnes Company, Verona, WI www.carnes.com.
 - 4. Greenheck Fan Corporation, Schofield, WI www.greenheck.com.
 - 5. Loren Cook Co, Springfield, MO www.lorencook.com.
 - 6. United Enertech Corporation, Chattanooga, TN www.unitedenertech.com.
 - 7. Vent Products Co, Inc, Chicago, IL www.ventprod.com.

2.2 MANUFACTURED UNITS

- A. Louvered Penthouses:
 - 1. Fabricated from (0.081 inch) extruded aluminum.
 - a. All welded construction.
 - b. Screws or rivets will not be allowed.
 - 2. Blades:
 - a. Horizontal at 45 degree angle with return bends at upper edges.
 - b. Welded, mitered corners for continuous blade effect.
 - 3. Bird Screens: 1/2 inch square mesh 16 ga aluminum in extruded aluminum, rewirable frames on interior of louvers.
 - 4. Penthouse Finish: Clear anodized aluminum.
 - 5. Curbs:
 - a. Galvanized steel, insulated, factory-fabricated curb.
 - b. Insulation: Minimum 1-1/2 inches thick, 3 lb density fiber glass.
 - c. Curb Extension: 8 inches above finished roof level.
 - 6. Provide automatic back draft damper on Relief Air Penthouses. Provide motorized damper where indicated on Drawings.
 - 7. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a. Air-Rite Manufacturing: Model LPE-1.
 - b. Breidert: Model RLX.
 - c. Carnes: GLAB.
 - d. Cook: Type TRE.
 - e. Greenheck: WIH/WRH.
 - f. United Enertech: Model PEL-4.
 - g. Vent Products: Model 7100.
- B. Hooded Gravity Relief Vents:
 - 1. Aluminum precision formed, locked rib, construction.
 - 2. Heavy gauge galvanized steel support members.
 - 3. 1/2 inch galvanized mesh bird screen.
 - 4. Motorized Damper: Internally mounted, 120 VAC, equal to WD-100 by Greenheck.
 - 5. Factory supplied roof curb.
 - 6. Performance Standard: Model FHR by Greenheck.
 - 7. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a. Breidert Air Products.

- b. Carnes.
- c. Greenheck.

PART 3 - EXECUTION: Not Used

END OF SECTION

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

- A. Includes But Not Limited To:
 - 1. General electrical system requirements and procedures.
 - 2. Perform excavating and backfilling work required by work of this Division as described in Contract Documents.
 - 3. Make electrical connections to equipment provided under other Sections.
- B. Products Furnished But Not Installed Under This Section:
 - 1. Anchor bolts and templates for exterior lighting equipment bases.
- C. Related Requirements:
 - 1. Section 01 3200: 'Construction Process Documentation' for scheduling of equipment and materials removed by Owner.
 - 2. Section 02 4119: 'Selective Structure Demolition' for salvage of existing electrical items to be reused or recycled.

1.2 REFERENCES

- A. Reference Standards:
 - 1. National Fire Protection Association / American National Standards Institute:
 - a. NFPA 70, 'National Electrical Code (NEC)' (2017 or most recent edition adopted by AHJ).
 - 2. National Electrical Manufacturing Association Standards (NEMA):
 - a. NEMA 250-2018, 'Enclosure for Electrical Equipment (1000 Volts Maximum)'.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate with Owner for equipment and materials to be removed by Owner.
- B. Sequencing:
 - 1. Include detailed sequence of individual electrical demolition operations on Construction Schedule specified in Section 01 3200.

1.4 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Provide following information for each item of equipment:
 - 1) Catalog Sheets.
 - 2) Assembly details or dimension drawings.
 - 3) Installation instructions.
 - 4) Manufacturer's name and catalog number.
 - 5) Name of local supplier.
 - b. Furnish such information for following equipment:
 - 1) Section 26 5100: 'Interior Lighting Fixtures'.
 - 2) Section 26 5200: 'Emergency Lighting' for battery units.
 - c. Do not purchase equipment before approval of product data.

2. Shop Drawings:
 - a. Submit on following equipment:
 - 1) Low voltage relay switching system for lighting.
 - b. Indicate precise equipment to be used, including all options specified. Indicate wording and format of nameplates where applicable. Submit in three-ring binder with hard cover.
- B. Informational Submittals:
 1. Test And Evaluation Reports:
 - a. Report of site tests, before Substantial Completion.
 2. Qualification Statement:
 - a. Electrical Subcontractor:
 - 1) Provide Qualification documentation if requested by Architect or Owner.
 - b. Installer:
 - 1) Provide Qualification documentation if requested by Architect or Owner.
- C. Closeout Submittals:
 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Operations and Maintenance Data:
 - 1) Provide operating and maintenance instructions for each item of equipment submitted under Product Data.
 - b. Record Documentation:
 - 1) Manufacturers documentation:
 - a) Manufacturer's literature.
 - b) Include copy of approved shop drawings.

1.5 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 1. NEC and local ordinances and regulations shall govern unless more stringent requirements are specified.
 2. Material and equipment provided shall meet standards of NEMA or UL and bear their label wherever standards have been established and label service is available.
- B. Qualifications: Requirements of Section 01 4301 applies, but not limited to following:
 1. Electrical Subcontractor:
 - a. Company specializing in performing work of this section.
 - 1) Minimum five (5) years experience in electrical installations.
 - 2) Minimum five (5) satisfactorily completed installations in past three (3) years of projects similar in size, scope, and complexity required for this project before bidding.
 - b. Upon request, submit documentation.
 2. Installer:
 - a. Licensed for area of Project.
 - b. Designate one (1) individual as project foremen who shall be on site at all times during installation and experienced with installation procedures required for this project.
 - c. Upon request, submit documentation.

PART 2 - NOT USED

PART 3 - EXECUTION

3.1 INSTALLERS

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

3.2 EXAMINATION

- A. Verification Of Conditions:
 - 1. Confirm dimensions, ratings, and specifications of equipment to be installed and coordinate these with site dimensions and with other Sections.
- B. Evaluation And Assessment:
 - 1. All relocations, reconnections, and removals are not necessarily indicated on Drawings. Include such work without additional cost to Owner.

3.3 PREPARATION

- A. Disconnect equipment that is to be removed or relocated. Carefully remove, disassemble, or dismantle as required, and store in approved location on site, existing items to be reused in completed work.
- B. Where affected by demolition or new construction, relocate, extend, or repair raceways, conductors, outlets, and apparatus to allow continued use of electrical system. Use methods and materials as specified for new construction.
- C. Perform drilling, cutting, block-offs, and demolition work required for removal of necessary portions of electrical system. Do not cut joists, beams, girders, trusses, or columns without prior written permission from Architect.
- D. Remove concealed wiring abandoned due to demolition or new construction. Remove circuits, conduits, and conductors that are not to be re-used back to next active fixture, device, or junction box.
- E. Patch, repair, and finish surfaces affected by electrical demolition work, unless work is specifically specified to be performed under other Sections of the specifications.

3.4 INSTALLATION

- A. General:
 - 1. Locations of electrical equipment shown on Drawings are approximate only. Field verify actual locations for proper installation.
 - 2. Coordinate electrical equipment locations and conduit runs with those providing equipment to be served before installation or rough in.
 - a. Notify Architect of conflicts before beginning work.
 - b. Coordinate locations of power and lighting outlets in mechanical rooms and other areas with mechanical equipment, piping, ductwork, cabinets, etc, so they will be readily accessible and functional.
 - 3. Work related to other trades which is required under this Division, such as cutting and patching, trenching, and backfilling, shall be performed according to standards specified in applicable Sections.

3.5 FIELD QUALITY CONTROL

- A. Field Tests:
 - 1. Test systems and demonstrate equipment as working and operating properly. Notify Architect before test. Rectify defects at no additional cost to Owner.
 - 2. Measure current for each phase of each motor under actual final load operation, i.e. after air balance is completed for fan units, etc. Record this information along with full-load nameplate current rating and size of thermal overload unit installed for each motor.

3.6 CLEANING

- A. Remove obsolete raceways, conductors, apparatus, and lighting fixtures promptly from site and dispose of legally.

3.7 CLOSEOUT ACTIVITIES

- A. Training:
 - 1. Provide competent instructor for three (3) days to train Owner's maintenance personnel in operation and maintenance of electrical equipment and systems. Factory representatives shall assist this instruction as necessary. Schedule instruction period at time of final inspection.

END OF SECTION

SECTION 26 0519**LINE-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Quality of conductors used on Project except as excluded below.
- B. Related Requirements:
 - 1. Section 26 0501: 'Common Electrical Requirements'.

1.2 REFERENCES

- A. Definitions:
 - 1. Line Voltage: Over 70 Volts.
- B. Reference Standards:
 - 1. National Fire Protection Association:
 - a. NFPA 70, 'National Electric Code (NEC)' (2017 or most recent edition adopted by AHJ including all applicable amendments and supplements).

PART 2 - PRODUCTS**2.1 SYSTEMS**

- A. Line Voltage Conductors:
 - 1. Copper with AWG sizes as shown:
 - a. Minimum size shall be No. 12 except where specified otherwise.
 - b. Conductor size No. 8 and larger shall be stranded.
 - 2. Insulation:
 - a. Standard Conductor Size No. 10 And Smaller: 600V type THWN or XHHW (75 deg F (24 deg C)).
 - b. Standard Conductor Size No. 8 And Larger: 600V Type THW, THWN, or XHHW (75 deg F (24 deg C)).
 - c. Higher temperature insulation as required by NFPA 70 or local codes.
 - 3. Colors:
 - a. 208Y / 120 V System:
 - 1) Black: Phase A.
 - 2) Red: Phase B.
 - 3) Blue: Phase C.
 - 4) Green: Ground.
 - 5) White: Neutral.
 - b. 480Y / 277 Volt System:
 - 1) Brown: Phase A.
 - 2) Orange: Phase B.
 - 3) Yellow: Phase C.
 - 4) Gray: Neutral.
 - 5) Green: Ground.
 - c. Conductors size No. 10 and smaller shall be colored full length. Tagging or other methods for coding of conductors size No. 10 and smaller not allowed.

- d. For feeder conductors larger than No. 10 at pull boxes, gutters, and panels, use painted or taped band or color tag color-coded as specified above.
- B. Line Voltage Cables:
 - 1. Metal Clad Cable (MC) may be used as restricted below:
 - a. Copper conductors.
 - b. Sizes #12 through #8.
 - c. Use only in indoor dry locations where:
 - 1) Not subject to damage.
 - 2) Not in contact with earth.
 - 3) Not in concrete.
- C. Standard Connectors:
 - 1. Conductors No. 8 And Smaller: Steel spring wire connectors.
 - 2. Conductors Larger Than No. 8: Pressure type terminal lugs.
 - 3. Connections Outside Building: Watertight steel spring wire connections with waterproof, non-hardening sealant.

PART 3 - EXECUTION

3.1 INSTALLATION

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

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

END OF SECTION

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SECTION 26 0526**GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install grounding for electrical installation as described in Contract Documents except as excluded below.
- B. Related Requirements:
 - 1. Section 26 0501: 'Common Electrical Requirements'.

1.2 REFERENCES

- A. Reference Standards:
 - 1. Institute of Electrical and. Electronics Engineers (IEEE):
 - a. IEEE 837-2014, 'Standard for Qualifying Permanent Connections Used in Substation Grounding'.
 - 2. National Fire Protection Association:
 - a. NFPA 70, 'National Electric Code (NEC)' (2017 or most recent edition adopted by AHJ including all applicable amendments and supplements).
 - b. NFPA 780, 'Standard for the Installation of Lightning Protection Systems' (2014 or latest approved edition).
 - 3. Telecommunications Industry Association:
 - a. TIA-942 A, 'Telecommunications Infrastructure Standard for Data Centers' (2014).
 - 4. Section 27 1116: 'Communications Cabinets, Racks, Frames, and Enclosures'.
 - 5. Section 27 1501: 'Communications Horizontal Cabling' for cables for Telephone and Data Systems.

1.3 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Requirements of Section 27 1501 applies, but is not limited to following:
 - a. Cable assemblies shall be UL / CE Listed and CSA Certified. Cables shall be a distinctive green or green/yellow in color, and all jackets shall be UL, VW-1 flame rated.
 - b. Grounding shall conform to all required Commercial Building Grounding and Bonding Requirements for Telecommunications, Electrical Codes, and Manufacturer's grounding requirements.
 - 2. Systems shall be installed per NFPA 780 and NFPA 70.
 - 3. All Bonds shall comply with most current version of IEEE 837 Standard.
- B. Qualifications: Requirements of Section 01 4301 applies, but is not limited to following:
 - 1. Installers Qualifications:
 - a. Grounding and Bonding:
 - 1) Licensed electrical contractor shall perform installation and termination of main bonding conductor to building service entrance ground.
 - 2) Licensed in State that Work is to be performed.

PART 2 - PRODUCTS

2.1 SYSTEM

- A. Manufacturers:
 - 1. Type One Acceptable Products:
 - a. 'Cadweld' by Erico International, Solon, OH www.erico.com.
 - b. 'ThermOweld' by Continental Industries, Tulsa, NE www.conind.com.
 - c. Equal as approved by Architect before bidding. See Section 01 6200.
- B. Performance:
 - 1. Design Criteria:
 - a. Size materials as shown on Drawings and in accordance with applicable codes.
 - b. Bonding System Workmanship:
 - 1) The ground/earthing system shall be designed for high reliability and shall meet following criteria:
 - a) Local electrical codes shall be adhered to.
 - b) All grounding/earthing conductors shall be copper.
 - c) Regulatory Agency Sustainability Approvals requirements are required.
- C. Materials:
 - 1. Grounding And Bonding Jumper Conductors: Bare copper or with green insulation.
 - 2. Make grounding conductor connections to ground rods and foundation ground loop using approved bolted clamps listed for such use.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. 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. Non-current-carrying metal parts of fixed equipment such as lighting fixtures.
- B. Pull grounding conductors in non-metallic raceways, in flexible steel conduit exceeding 72 inches (1 800 mm) in length, and in flexible conduit connecting to mechanical equipment.
- C. Provide grounding bushings on all feeder conduit entrances into panelboards and equipment enclosures.
- D. Bond conduit grounding bushings to enclosures with minimum #10 AWG conductor.
- E. Connect equipment grounds to building system ground.
 - 1. Use same size equipment grounding conductors as Phased conductors up through #10 AWG.
 - 2. Use NEC Table 250-95 for others unless noted otherwise in Drawings.

3.2 FIELD QUALITY CONTROL

- A. Field Inspections:
 - 1. Notify Architect for inspection two (2) days minimum before placing concrete over grounding conductor.
 - 2. Grounding Well integrity shall be tested separately and together with Lightning Protection System integrity.

END OF SECTION

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

- A. Includes But Not Limited To:
 - 1. Quality of material and installation procedures for raceway, boxes, and fittings used on Project but furnished under other Divisions.
 - 2. Furnish and install raceway, conduit, and boxes used on Project not specified to be installed under other Divisions.
 - 3. Furnish and install air-vapor barrier boxes as described in Contract Documents.
 - 4. Furnish and install main electrical service raceway as described in Contract Documents and comply with electrical utility company requirements.
 - 5. Furnish and install main telephone service raceway as described in Contract Documents and comply with telephone company requirements.
- B. Related Requirements:
 - 1. Section 26 0501: 'Common Electrical Requirements' for general electrical requirements'.

1.2 REFERENCES

- A. Reference Standards:
 - 1. National Fire Protection Association:
 - a. NFPA 70, 'National Electric Code (NEC)' (2017 or most recent edition adopted by AHJ including all applicable amendments and supplements).

PART 2 - PRODUCTS**2.1 SYSTEM**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Cooper B-Line, Highland, IL www.b-line.com.
 - b. Hubbell Incorporated, Milford, CT www.hubbell-wiring.com or Hubbell Canada Inc, Pickering, ON (905) 839-4332.
 - c. Square D, Palatine, IL www.squared.com.
 - d. Thomas & Betts, Memphis, TN www.tnb.com or Thomas & Betts Ltd, Iberville, PQ (450) 347-5318.
 - e. Walker Systems Inc, Williamstown, WV (800) 240-2601 or Walker Systems Inc / Wiremold Canada Inc, Fergus, ON (519) 843-4332.
 - f. Wiremold Co, West Hartford, CT www.wiremold.com.
- B. Materials:
 - 1. Raceway And Conduit:
 - a. Sizes:
 - 1) **3/4 inch (19 mm)** for exterior use, unless indicated otherwise.
 - 2) **1/2 inch (13 mm)** for interior use, unless indicated otherwise.
 - b. Types: Usage of each type is restricted as specified below by product.
 - 1) Galvanized rigid steel or galvanized intermediate metal conduit (IMC) is allowed for use in all areas. Where in contact with earth or concrete, wrap buried galvanized rigid steel and galvanized IMC conduit and fittings completely with vinyl tape.

- 2) Galvanized Electrical Metallic Tubing (EMT) 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) Listed, Liquid-Tight Flexible Metal Conduit:
 - a) Use in outdoor final connections to mechanical equipment, length not to exceed **36 inches (900 mm)**.
- 4) Pre-wired **3/8 Inch (9.5 mm)** Flexible Fixture Whips: Allowed only for connection to recessed lighting fixtures, lengths not to exceed **72 inches (1 800 mm)**.
- c. Prohibited Raceway Materials:
 - 1) Aluminum conduit.
 - 2) Armored cable type AC (BX) cable.
2. Raceway And Conduit Fittings:
 - a. Rigid Steel Conduit And IMC: Threaded and designed for conduit use.
 - b. EMT:
 - 1) Compression type.
 - 2) Steel set screw housing type.
 - c. Flexible Steel Conduit: Screw-in type.
 - d. Liquid-tight Flexible Metal Conduit: Sealtite type.
 - e. Expansion fittings shall be equal to OZ Type AX sized to raceway and including bonding jumper.
 - f. 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.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification Of Conditions:
 1. Confirm dimensions, ratings, and specifications of materials to be installed and coordinate these with site dimensions and with other Sections.

3.2 INSTALLATION

- A. Interface With Other Work:
 1. Before rough-in, verify locations of boxes with work of other trades to insure that they are properly located for purpose intended.
- B. Conduit And Raceway:
 1. Conceal raceways within ceilings, walls, and floors, except at Contractor's option, conduit may be exposed on walls or ceilings of mechanical equipment areas and above acoustical panel suspension ceiling systems. Install exposed raceway runs parallel to or at right angles to building structure lines.

2. Seal all raceways penetrating fire rated walls, ceilings and barriers. See Section 07 8400.
 3. Keep raceway runs **6 inches (150 mm)** minimum from hot water pipes.
 4. Make no more than four quarter bends, 360 degrees total, in any conduit run between outlet and outlet, fitting and fitting, or outlet and fitting.
 - a. Make bends and offsets so conduit is not injured and internal diameter of conduit is not effectively reduced.
 - b. Radius of curve shall be at least minimum indicated by NFPA 70.
 5. Cut conduit smooth and square with run and ream to remove rough edges. Cap raceway ends during construction. Clean or replace raceway in which water or foreign matter have accumulated.
 6. 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.
 7. 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.
 8. 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.
 9. 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.
- C. Boxes:
1. Boxes shall be accessible and installed with approved cover.
 2. Do not locate device boxes that are on opposite sides of framed walls in the same stud space. In other wall construction, do not install boxes back to back.
 3. Locate boxes so pipes, ducts, or other items do not obstruct outlets.
 4. Install outlets flush with finished surface and level and plumb.
 5. Support switch boxes larger than two-gang with side brackets and steel bar hangers in framed walls.
 6. At time of substantial completion, install blank plates on uncovered outlet boxes that are for future use.
 7. Location:
 - a. Install boxes at door locations on latch side of door, unless explicitly shown otherwise on Contract Drawings. Verify door swings shown on electrical drawings with architectural drawings, and report discrepancies to Architect before rough-in. Distance of box from jamb shall be **6 inches (150 mm)** from door jamb.

- b. Properly center boxes located in walls with respect to doors, panels, furring, trim and consistent with architectural details. Where two or more outlets occur, space them uniformly and in straight lines with each other, if possible.
- c. Center ceramic tile boxes in tile.

END OF SECTION

SECTION 26 0613**ELECTRICAL EQUIPMENT MOUNTING HEIGHT SCHEDULE****PART 1 - GENERAL: Not Used****PART 2 - PRODUCTS: Not Used****PART 3 - EXECUTION****3.1 INSTALLATION**

- A. Unless otherwise indicated, mount center of outlets or boxes at following heights above finish floor. Refer special conditions to Architect before rough-in and locate outlet under his direction.
- B. Mounting Heights:
1. HVAC:
 - a. Temperature Control Junction Boxes: As indicated on Drawings.
 - b. Thermostats not mounted in occupied space: As indicated on Drawings.
 - c. Remote Temperature Sensors and thermostats mounted in occupied space:
 - 1) Wall-Mounted 50 inches (1 270 mm) to top.
 - d. Indoor Motor Disconnects: 60 inches (1 525 mm).
 - e. Outdoor Motor Disconnects: As indicated on Drawings.
 - f. Motor Controls: 60 inches (1 525 mm).
 2. Plumbing:
 - a. Electric Water Cooler Outlets: Mount so outlet and cord are hidden by water cooler and outlet is accessible for resetting for GFCI trip.
 3. Electrical:
 - a. Distribution Panels: 72 inches (1 830 mm) to top.
 - b. Receptacles: 18 inches (450 mm).
 - c. Wall Switches: 42 inches (1 065 mm).
 - d. Wall-Mounted Exit Lights: 90 inches (2 285 mm).
 - e. Emergency Lighting Units: 60 inches (1 525 mm).
 4. Communications
 - a. Sound Distribution System Components: As indicated on Drawings.
 - b. Satellite Distribution System Components: As indicated on Drawings.
 - c. TV Distribution System Components: As indicated on Drawings.
 - d. Computer and TV: 18 inches (450 mm).
 - e. Telephone / Data Terminal Boards: 72 inches (1 800 mm) to top.
 - f. Telephones (wall type): 60 inches (1 500 mm).
 - g. Telephones (desk type): 18 inches (450 mm).
 - h. Telephone / Data (desk type): 18 inches (450 mm).
 - i. Data (desk type): 18 inches (450 mm).

END OF SECTION

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SECTION 26 2417**CIRCUIT-BREAKER PANELBOARDS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install circuit-breaker panelboards as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 26 0501: 'Common Electrical Requirements'.

1.2 REFERENCES

- A. Reference Standards:
 - 1. National Fire Protection Association:
 - a. NFPA 70E: 'Standard for Electrical Safety in the Workplace' (2018 or most recent edition adopted by AHJ).

PART 2 - PRODUCTS**2.1 EQUIPMENT**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Cutler-Hammer Inc, Pittsburgh, PA www.eatonelectric.com.
 - b. General Electric Industrial Systems, Charlotte, NC www.geindustrial.com.
 - c. Siemens Energy & Automation, Alphrata, GA www.sea.siemens.com.
 - d. Square D Co, Palatine, IL www.us.squared.com.
- B. Performance:
 - 1. Capacities:
 - a. Lighting And Appliance Panelboards:
 - 1) Minimum integrated equipment short circuit rating of 10,000 amperes for 120 / 208 Volts.
- C. Material:
 - 1. Circuit-breaker type.
 - 2. Galvanized steel cabinets
 - 3. Bussing and lugs arranged as required.
 - 4. Multi-pole circuit-breakers shall be common trip.
 - 5. Circuit-breakers shall be molded case thermal magnetic type with inverse time characteristics.
 - 6. Lighting And Appliance Panelboards:
 - a. Plug-on or bolt-on breakers. Multi-pole breakers shall be common trip.
 - b. Factory installed or provided circuit number identification for each breaker and space.
 - c. Cabinets shall be locking type with no exposed latches or screws when door is closed. Key panels alike and provide minimum of three keys.
 - d. Minimum dimensions of 20 inches (500 mm) wide by 5-3/4 inches (146 mm) deep.
 - e. Space designation on Drawings indicates bus hardware and panelboard capacity for future acceptance of one 20 Amp, single-pole circuit-breaker.

- f. Breakers specified to be shunt trip and shall include shunt trip accessories to remotely trip breaker using separate 120 V power source. Trip coil shall include coil-clearing contact to break coil current when breaker opens.
 - g. Use equipment from same manufacturer as main panelboard.
 - h. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Type PRL1a by Cutler-Hammer.
 - 2) Type AL or AQ by General Electric.
 - 3) Type P1 by Siemens.
 - 4) Type NQOD by Square D.
7. Labels:
- a. All Panelboards shall be labeled with Arc-Flash Hazard Information per NFPA 70E 130.5 including:
 - 1) Nominal system voltage.
 - 2) Arc flash boundary.
 - 3) Available incident energy.
 - 4) Working distance.
 - 5) Minimum arc rating of clothing.
 - 6) Level of PPE.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification Of Conditions:
 - 1. Examine wall framing and verify framing for proper spacing for installation of panelboard(s).
 - a. Notify Architect of improper spacing in writing.
- B. Contractor shall be responsible for performing required calculations to determine ARC Flash Hazards and providing all appropriate labeling per NFPA 70E.

3.2 INSTALLATION

- A. Label panelboards with **1/16 inch (1.6 mm)** thick laminated plastic composition material with contrasting color core. Engraved letters shall be **1/4 inch (6 mm)** high.
- B. Provide typewritten circuit schedules in lighting and distribution panelboards to identify load served by each branch breaker.
- C. Arrange conductors neatly within panelboards.
- D. Secure to structure in accordance with requirements of Project seismic design category.

3.3 PROTECTION

- A. Protect panelboards and interior components from paint, gypsum board compound, dirt, dust, and other foreign matter during construction.

END OF SECTION

SECTION 26 2726**WIRING DEVICES****PART 1 - GENERAL****1.1 SUMMARY**

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

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. Legrand, West Hartford, CT www.legrand.us.com or Vaughan, ON www.legrand.ca.com.
 - i. Lutron Electronics Co Inc, Coopersburg, PA www.lutron.com.
 - j. Ortronics, New London, CT www.ortronics.com.
 - k. Paragon Electric Co Inc, Carol Stream, IL www.icca.invensys.com/paragon or Paragon Electric, Mississauga, ON (800) 951-5526 or (905) 890-5956.
 - l. Pass & Seymour, Syracuse, NY www.passandseymour.com or Pass & Seymour Canada Inc, Concord, ON (905) 738-9195.
 - m. Philips Lighting Co, Somerset, NJ www.lighting.philips.com/nam or Philips Lighting Canada, Scarborough, ON (416) 292-3000.
 - n. Red Dot div of Thomas & Betts, Memphis, TN www.tnbcom.
 - o. Schneider Electric North America, Palatine, IL www.schneider-electric.com (847) 397-2600.
 - p. Sensorswitch, Wallingford, CT www.sensorswitch.com.
 - q. Siemon Company, Watertown, CT www.siemon.com.
 - r. Square D Co, Palatine, IL www.squared.com.
 - s. Suttle, Hector, MN www.suttleonline.com.
 - t. Tork Inc, Mount Vernon, NY www.tork.com.
 - u. Watt Stopper Inc, Santa Clara, CA www.wattstopper.com.
 - 2. Product Options:
 - a. Faces shall be nylon where available.
 - b. Devices of single type shall be from same Manufacturer.
 - c. Devices are listed as white. Use white devices on light colored walls, brown on dark colored walls, and black on black walls.
- B. Switches:
 - 1. Standard Style:

- a. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) 20 AMP, single pole:
 - a) Cooper: 2221V.
 - b) Hubbell: HBL1221-I.
 - c) Pass & Seymour: 20AC1-I.
 - d) Leviton: 1221-2I.
 - 2) Two Pole:
 - a) Cooper: 2222V.
 - b) Hubbell: HBL1222-I.
 - c) Pass & Seymour: 20AC2-I.
 - d) Leviton: 1222-2I.
 - 3) Three Way:
 - a) Cooper: 2223V.
 - b) Hubbell: HBL1223-I.
 - c) Pass & Seymour: 20AC3-I.
 - d) Leviton: 1223-2I.
 - 4) Four Way:
 - a) Cooper: 2224V.
 - b) Hubbell: HBL1224-I.
 - c) Pass & Seymour: 20AC4-I.
 - d) Leviton: 1224-2I.
 - 5) Pilot Switch:
 - a) Hubbell: HBL1221-PL.
 - b) Pass & Seymour: 20AC1-RPL.
 - c) Leviton: 1221-PLR.
 - 6) Lighted Toggle Switch:
 - a) Single Pole:
 - (1) Cooper: 2221-LTV.
 - (2) Hubbell: HBL1221-IL.
 - (3) Pass & Seymour: 20AC1-ISL.
 - (4) Leviton: 1221-LHI.
 - b) Three Way:
 - (1) Cooper: 2223-LTV.
 - (2) Hubbell: HBL1223-IL.
 - (3) Pass & Seymour: 20AC3-ISL.
 - (4) Leviton: 1223-7LC.
- C. Receptacles:
- 1. Standard Style:
 - a. 15 AMP, specification grade, back and side wired, self grounding, tamper resistant.
 - b. Verified by UL to meet Fed Spec WC-596F.
 - c. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Cooper: TR5262.
 - 2) Hubbell: BR20.
 - 3) Leviton: TBR20.
 - 4) Pass & Seymour: TR20.
 - 2. Ground Fault Circuit Interrupter (GFCI):
 - a. 15 AMP, specification grade, tamper resistant.
 - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Cooper: GF15W.
 - 2) Hubbell: GF5252WA.
 - 3) Leviton: 8599-W.
 - 4) Pass & Seymour: 1594-W.
- D. Plates:
- 1. Standard Cover Plates:
 - a. Office / Occupied Areas:
 - 1) Nylon or high impact resistant thermoplastic.
 - 2) Color shall match wiring device.
 - b. All Other: Steel.

- c. Ganged switches shall have gang plates.
 - d. Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories:
 - 1) Cooper.
 - 2) Hubbell.
 - 3) Leviton.
 - 4) Pass & Seymour.
- E. Exhaust Fans
- a. Custodian Room:
 - 1) 24-hour, in-wall, multiple automatic ON-OFF settings.
 - 2) Products.
 - a) Intermatic: E1020.
 - b) Tork: 701A.
 - b. Serving Area:
 - 1) 0-60 minute, no hold position.
 - 2) Products.
 - a) Intermatic: FD60MWC.
 - b) Tork: A560MW.
- F. Occupancy Sensors: (Wattstopper Only)
- 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) Watt Stopper:
 - a) Sensor: W-500A.
 - b) Relay / Transformer: BZ-150.
 - c. Provide manual ON and OFF momentary override switches. Refer to Contract Drawings for number of switches.
 - 2. Ceiling, dual technology type.
 - a. Complete with sensor and relay / transformer.
 - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Watt Stopper:
 - a) Sensor: DT-305.
 - b) Relay / Transformer: BZ-150.
 - c. Provide manual ON and OFF momentary override switches. Refer to Contract Drawings for number of switches.
- G. Wall Switch Dimming Occupancy Sensors: (Wattstopper Only)
- a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.
 - b. Unless otherwise indicated or required to control the load indicated on drawings, provide line voltage units with self-contained relay.
 - c. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).
 - d. Manual-Off Override Control: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.
 - e. Finish: Match finishes specified for wiring devices in Section 26 2726, unless otherwise indicated.
 - f. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Watt Stopper:
 - a) Watt Stopper: PW-301.

PART 3 - EXECUTION

3.1 INSTALLATION

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

END OF SECTION

SECTION 26 2816**ENCLOSED SWITCHES AND CIRCUIT BREAKERS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install disconnects as described in Contract Documents, except those provided integral with equipment.
- B. Related Requirements:
 - 1. Section 26 0501: Common Electrical Requirements.

PART 2 - PRODUCTS**2.1 ASSEMBLIES**

- A. Manufacturers:
 - 1. Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories.
 - a. Disconnects: Same as Manufacturer of Project's main panelboard.
 - b. Fuses.
 - 1) Cooper Bussmann, Ellisville, IL www.cooperbussmann.com.
 - 2) Edison Fuse, Ellisville, IL (314) 391-3443.
 - 3) Ferraz Shawmut, Newburyport, MA www.ferrazshawmut.com.
 - 4) Littelfuse Inc, Des Plaines, IL www.littelfuse.com.
- B. Disconnects:
 - 1. Heavy-duty quick-make, quick-break type, non-fused unless indicated otherwise.
 - 2. Provide interlock to prevent opening of door when switch is in ON position.
 - 3. Provide means to lock switch in OFF position with padlock.
 - 4. Disconnects for motor circuits shall be horsepower rated.
 - 5. Disconnects For Furnace Units And Unit Heaters: Provide manual starter with thermal overload relay. Provide overload relay to match motor full load amps.
- 6. Enclosures:
 - a. Interior: NEMA / CEMA Type 1.
 - b. Exterior: NEMA / CEMA Type 3R.
- 7. Fuses:
 - a. Fuse fused disconnects with dual-element time delay fuses and equip with rejection type fuse holders.
 - b. Fuses on Project shall be from single manufacturer.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Label disconnects to indicate equipment served, such as Condensing Unit CU-1. Use **1/16 inch (1.6 mm)** thick laminated plastic composition material with contrasting color core. Engraved letters shall be **1/4 inch (6 mm)** high. Attach labels with screws.
- B. Install furnace disconnects on furnace at location where it is accessible from front of unit and it does not interfere with unit's operation.

END OF SECTION

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

- A. Includes But Not Limited To:
 - 1. Furnish and install lighting system as described in Contract Documents, complete with lamps.
- B. Related Requirements:
 - 1. Section 26 0501: 'Common Electrical Requirements'.
 - 2. Section 26 5121: 'Interior Lighting: LED Dimming Drivers'.

1.2 REFERENCES

- A. Reference Standards:
 - 1. American National Standards Institute (ANSI):
 - a. ANSI C78.377-2017, 'American National Standard for Electric Lamps: Specification for the Chromaticity of Solid State Lighting Products'.
 - 2. Federal Communications Commission (FCC):
 - a. Code of Federal Regulations (CFR):
 - 1) FCC 47 CFR Part 18, 'Industrial, Scientific, and Medical Equipment'.
 - 3. Institute of Electrical and. Electronics Engineers (IEEE):
 - a. IEEE C62.41.1-2002, 'Guide on the Surge Environment in Low-Voltage (1000 V and Less) AC Power Circuits'.

PART 2 - PRODUCTS**2.1 ASSEMBLIES**

- A. Manufacturers:
 - 1. 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. Lamps:
 - a. LED Lamps and Fixtures:
 - 1) Replacement Lamps shall have minimum efficiency of 70 lm / W per LM 79.
 - 2) Integral LED Lamps shall have minimum efficiency of 90 lm / W per LM 79.
 - 3) Provide minimum rated life of 50,000 per LM 80 and LM 70 standards.
 - 4) Color Temperature: 3000k.
 - 5) Provide full spectrum color index of 65.
 - 3. Daylight Lighting Switching System:
 - a. Complete system enabling control of up to six 277V circuits by daylighting photocell mounted in skylight.
 - b. System components include, but are not limited to, following items. Except for photocell, install components in single, locking enclosure:
 - 1) 20 to 2000 foot candle photocell with necessary mounting hardware.

- 2) Control relays or contactors and transformers for up to six circuits
- 3) Sensor controller with HIGH, LOW, and DEAD BAND adjustments.
- c. Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories:
 - 1) Watt Stopper.
- C. Factory Assembly:
 1. Fixtures shall be fully assembled complete with necessary wiring, sockets, lamps, reflectors, ballasts, auxiliaries, plaster frames, recessing boxes, hangers, supports, lenses, diffusers, and other accessories essential for complete working installation.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Interface With Other Work:
 1. Coordinate with Sections under 09 5000 heading to obtain symmetrical arrangement of fixtures in acoustic tile ceiling as shown on Reflected Ceiling Plan in Contract.
 2. In mechanical equipment rooms, coordinate locations of light fixtures with equipment locations to provide proper room illumination without obstruction. Suspend fixtures that must be mounted below pipes, ducts, etc, with chains or other Architect approved method.
- B. Securely mount fixtures. Support fixtures weighing **50 lbs (23 kg)** or more from building framing or structural members.
- C. Fasten lay-in fluorescent fixtures to ceiling suspension system on each side with bolts, screws, rivets, or clips. In addition, connect lay-in fixtures with four (4) No. 12 gauge diagonal wires with three (3) turns each end per fixture minimum to building framing or structural members. Connect to opposing corners of fixture. Wires may be slightly slack. Make final conduit connections to lay-in fluorescent fixtures with specified flexible conduit or flexible fixture whips.
- D. Where fixtures are shown installed end to end, provide suitable connectors or collars to connect adjoining units to appear as a continuous unit.
- E. Where recessed fixtures are to be installed, provide openings, plaster rings, etc, of exact dimensions for such fixtures to be properly installed. Coordinate fixture installation with ceiling type and thickness. Terminate circuits for recessed fixtures in an extension outlet box near fixture and connect with specified flexible conduit.
- F. Do not locate 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

SECTION 26 5200**EMERGENCY LIGHTING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install emergency battery units as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 26 0501: 'Common Electrical Requirements'.

PART 2 - PRODUCTS**2.1 SYSTEMS**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Beghelli, Miramar, FL www.beghelliusa.com.
 - b. Bodine Emergency Lighting, Collierville, TN www.bodine.com
 - c. Dual-Lite, Cheshire, CT www.dual-lite.com.
 - d. Iota Engineering Co, Tucson, AZ www.iotaengineering.com
 - e. Lightolier, Fall River, MA www.lightolier.com.
 - f. Lithonia Lighting, Conyers, GA www.lithonia.com.
 - g. McPhilben / Day-Brite Lighting, Tupelo, MS www.mcphilben.com.
 - h. Sure-Lites / Cooper Lighting, Elk Grove, IL www.cooperlighting.com.
- B. Materials:
 - 1. Fluorescent Battery Packs:
 - a. Design Criteria:
 - 1) Batteries shall be long life nickel cadmium type.
 - 2) Complete with charging indicator light and test switch.
 - 3) Components shall be fully concealed and easily accessible for maintenance or replacement.
 - 4) Factory installed in lighting fixture, or field installed to same standards.
 - b. Lighting Fixtures:
 - 1) Battery pack shall operate one (1) lamp at approximately 600 lumens initially and 60 percent minimum of initial lumens after ninety (90) minutes.
 - 2) Charger shall be capable of full recharge in twenty four (24) hours.
 - c. Class Two Quality Products: See Section 01 4301 for Manufacturer Qualifications and Section 01 6200:
 - 1) Any Manufacturer that conforms to Contract Documents requirements.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Battery Packs:
 - 1. General:
 - a. Wire so unit can be tested with lights on.

- b. Wire so lamps in normal mode are switched off with other lighting in area. Connect unit to unswitched conductor of normal lighting circuit.
- 2. Linear Lighting Fixtures:
 - a. Install in ballast channel of fixture with charging indicator light and test switch mounted on fixture end, or visible and accessible through lens.

END OF SECTION

**SECTION 27 1501
COMMUNICATIONS HORIZONTAL CABLING**

PART 1 GENERAL**1.01 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish, install, and test communications horizontal cabling as described in Contract Documents including following:
 - a. Cables and related terminations.
 - b. Patch cords and modular connectors.
 - c. Surface raceway and outlet poles.
 - d. Support and grounding hardware.
 - e. UTP Cable.
 - f. UTP Patch cords.
 - g. UTP Connector Modules.
 - h. Installation and testing of Owner Furnished Network Equipment.
- B. Related Requirements:
 - 1. Division 26: Raceways and surface boxes.
 - 2. Section 07 8400: 'Firestopping' for furnishing and installation of firestopping.
 - 3. Section 26 0526: 'Grounding And Bonding For Electrical Systems' for installation and termination.
 - 4. Section 27 1116: 'Communications Cabinet, Racks, Frames, and Enclosures'.
 - 5. Section 27 4117: 'Video And Satellite Distribution Systems'.
 - 6. Section 27 4118: 'Audio Systems'.
- C. Products Installed But Not Furnished Under This Section:
 - 1. Owner Furnished Network Equipment as specified on TT (Technology Telecommunication) and TA (Technology Audiovisual) Drawings as shown in Contract Documents including:
 - a. Internet Firewall.
 - b. ISP Modem.
 - c. Network Switch.
 - d. Wireless Access Port.
- D. Related Requirements:
 - 1. Section 01 6400: Owner will provide Network Equipment as specified on TT (Technology Telecommunication) and TA (Technology Audiovisual) Drawings as shown in Contract Documents. Contract Documents establishes quality of materials and installation for information of Contractor, Architect, and Owner's Representatives. Design Criteria in PART 2 of this Section identifies Contractor's responsibility for Owner Network Equipment.

1.02 REFERENCES

- A. Association Publications:
 - 1. Building Industry Consulting Service International (BISCI):
 - a. Information Technology Systems Installation Methods Manual (ITSIMM) (8th Edition).
 - b. Telecommunications Distribution Methods Manual (TDMM) (14th Edition).
 - c. Information Transport Systems Installation Methods Manual (ITSIMM) (7th Edition)
 - 2. Institute of Electrical and Electronics Engineers:
 - a. IEEE 802.3, 'Standard for Ethernet'.
 - b. IEEE 1100-2005, 'Recommended Practice for Powering and Grounding Electric Equipment'.
 - 3. Telecommunications Industry Association:
 - a. TIA TSB-162-B, 'Telecommunication Cabling Guidelines for Wireless Access Points' (Revision A, 2021).

B. Reference Standards:

1. National Fire Protection Association:
 - a. NFPA 70, 'National Electrical Code (NEC)' (2023 or most recent edition adopted by AHJ).
2. Canadian Standards Association:
 - a. CSA C22.1-18, 'Canadian Electrical Code, part I (21st Edition), safety standard for electrical installations.
3. Telecommunications Industry Association:
 - a. ANSI/TIA-568.1 'Commercial Building Telecommunications Infrastructure Standard' (Revision D, 2019)
 - b. ANSI/TIA-568.2, 'Balanced Twisted-Pair Telecommunications Cabling and Components Standards' (Revision D, 2018).
 - c. ANSI/TIA-568.4 'Broadband Coaxial Cabling and Components Standard (Revision D, 2017)
 - d. ANSI/TIA-606, 'Administration Standard for Telecommunications Infrastructure' (Revision C, 2017).
 - e. ANSI/TIA-607, 'Telecommunications Bonding and Grounding (Earthling) for Customer Premises' (Revision D, 2019).
 - f. ANSI/TIA-758, 'Customer-Owned Outside Plant Telecommunication Infrastructure Standard' (Revision B, 2012).
 - g. ANSI/TIA-1152, 'Requirements for Field Test Instruments and Measurements for Balanced Twisted-Pair Cabling' (Revision A 2016).
4. Underwriters Laboratories:
 - a. UL 94: Standard for Test for Flammability of Plastic Materials for Parts in Devices and Appliances (March 2013 6th Edition).
 - 1) 94HB, 'Horizontal Burn Test'.

1.03 ADMINISTRATIVE REQUIREMENTS**A. Coordination:**

1. Coordinate with Project Manager and/or Facility Manager well in advance of Substantial Completion for installation of all Owner Furnished Network Equipment.

1.04 SUBMITTALS**A. Action Submittals:**

1. Product Data:
 - a. Provide Manufacturer's documentation, installation instructions, and descriptive information on each piece of equipment to be used.
2. Shop Drawings:
 - a. Provide sample of labeling system reflecting approved label scheme for cable installation for racks, cables, panels, and outlets.

B. Informational Submittals:

1. Certificates:
 - a. Provide Installer certificates of qualifications required.
2. Design Data:
 - a. Identification and labeling:
 - 1) Provide labeling system for cable installation to be approved by Owner.
 - (a) Clearly identify all components of system: racks, cables, panels and outlets.
 - (b) Designate cables origin and destination and unique identifier for cable within facility by room number and port count.
 - (c) Racks and patch panels shall be labeled to identify location within cable system infrastructure.
 - b. After system installation, provide documentation set to Consulting Engineer/Architect for approval.
3. Tests And Evaluation Reports:

- a. Submit documentation within ten (10) working days of completion of each testing phase. This is inclusive of all test results and record drawings.
 - b. Draft drawings may include annotations done by hand. Final copies of all drawings shall be submitted within thirty (30) working days of completion of each testing phase.
 - c. At request of Consulting Engineer, provide copies of original test results.
- 4. Field Quality Control Submittals:
 - a. Architect will provide floor plans in paper and electronic formats on which record documentation information can be recorded.
- 5. Qualification Statements:
 - a. Letter from Manufacturer certifying level of training and experience of Installer.
- C. Closeout Submittals:
 - 1. Include following information in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Operations and Maintenance Data:
 - 1) Provide operating and maintenance instructions for each item of equipment submitted under Product Data.
 - b. Warranty Documentation:
 - 1) Final, executed copy of Warranty.
 - c. Record Documentation:
 - 1) Manufacturers documentation:
 - (a) Manufacturer's literature or cut sheet.
 - 2) Tests and evaluation reports.
 - 3) As-built Documentation:
 - (a) Provide record document to include cable routes and outlet locations.
 - (b) Sequential number shall identify outlet locations.
 - (c) Numbering, icons, and drawing conventions used shall be consistent throughout all documentation.
 - (d) Provide labeling system information.

1.05 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. System shall meet approval of authority having jurisdiction (AHJ). NEC and State and/or local ordinances and regulations shall govern unless more stringent requirements are specified.
 - 2. Meet all TIA/EIA commercial building wiring standards.
 - 3. Meet Telecommunications Distribution Methods Manual (TDMM) (14th Edition) requirements for installation and testing.
 - 4. All Networks shall be installed per applicable standards and manufacturer's guidelines.
 - 5. Cable assemblies shall be UL / CE Listed and CSA Certified. Cables shall be a distinctive green or green/yellow in color, and all jackets shall be UL, VW-1 flame rated.
 - 6. Grounding shall conform to all required Commercial Building Grounding and Bonding Requirements for Telecommunications, Electrical Codes, and Manufacturer's grounding requirements.
- B. Qualifications: Requirements of Section 01 4301 applies, but is not limited to following:
 - 1. Manufacturer Qualifications:
 - a. Provide single source for all products of system:
 - 1) KeyConnect by Belden.
 - 2) Netkey by Panduit.
 - 3) System 6 by Siemon.
 - 4) Uniprise Media 6 by CommScope.
 - 2. Installers Qualifications:
 - a. Approved and Certified by Manufacturer (installation and maintenance trained):
 - 1) Belden Certified System Vendor (CSV).

- (a) Belden Certified LDS Partner.
- 2) CommScope Certified Business Partner.
 - (a) CommScope Certified LDS Partner.
- 3) Panduit Certified Installer (PCI).
- 4) Siemon Certified Installers (CI).
- b. Three (3) year experience with similar projects. Provide documentation.

1.06 WARRANTY

- A. Special Warranty:
 - 1. Cabling System:
 - a. Provide warranty for permanent link cabling system to meet Category 6A standard requirements for structured cabling system for twenty (20) years.
 - 2. Installer Warranty:
 - a. Installer guarantees that all work is in accordance with all express and implied requirements of Contract Documents, that all work is of good quality, and further warrants work and material for period of (1) year from date of substantial completion of project, unless longer period of time is specified in Contract. All work not conforming to these requirements, may be considered defective:
 - 1) If, within one (1) year after substantial completion of work, or within such longer period of time as may be prescribed by law or by terms of any warranty in Contract, any of work is found to be defective or not in accordance with Contract, Installer shall at Installer cost correct it promptly after receipt of written notice from Owner.
 - 2) Installer's obligation shall survive termination of Contract.
 - 3) Owner shall give such notice within reasonable time after discovery of condition.
 - b. Installer warrants to Owner that all materials and equipment furnished under this Contract shall be new unless otherwise specified, free from faults and defects and in conformance with Contract Documents:
 - 1) Contractor shall secure manufacturer's warranties and deliver copies thereof to Owner upon completion of work.
 - 2) All such warranties shall commence from date of substantial completion and will not in any way reduce Installer's responsibilities under this Contract.
 - 3) Whenever guarantees or warranties are required by specifications for longer period than one year, such longer period shall govern.
 - c. Installer will provide twenty (20) year minimum end to end manufacturer warranty.

PART 2 PRODUCTS

2.01 OWNER-FURNISHED PRODUCTS

- A. Products. See Section 01 6200:
 - 1. Owner Furnished Network Equipment as specified on TT (Technology Telecommunication) and TA (Technology Audiovisual) Drawings as shown in Contract Documents including:
 - a. Internet Firewall.
 - b. ISP Modem.
 - c. Network Switch(es).
 - d. Wireless Access Points.
 - 2. Coordination:
 - a. Coordinate installation of all Owner Furnished Network Equipment including but limited to:
 - 1) Installation and configure devices in accordance with Owner requirements.
 - 2) Proper set-up of network equipment.
 - 3) Owner Furnished internet service to building prior to final installation of AV and Voice Data Equipment.
 - 4) Testing of network equipment.

2.02 SYSTEMS

A. Manufacturers:

1. Approved Manufacturers and Products. See Section 01 6200:
 - a. Belden, St. Louis, MO www.belden.com.
 - b. Panduit Corporation, Tinley Park IL www.panduit.com.
 - c. Systimax Solutions, a CommScope Company, Hickory, NC www.systimax.com.
 - d. The Siemon Company, Watertown, CT www.siemon.com.

B. Design Criteria:

1. Must install single manufacture as complete permanent link.
 - a. Category 6A minimum compliance margin on all parameters beyond category 6 and Power Sum ACR out to 550 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.
5. Install, terminate, test, and guarantee each drop according to customer all applicable standards and customer preferences.
6. Horizontal cables will be rated Category 6A (500 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 6A rated jacks to populate modular 48 port 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 6A.
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 6A:

- (b) Eight position modules required in all work areas and shall exceed connector requirements of TIA Category 6A standard.
 - (c) Prove termination cap with strain relief on cable jacket, ensure cable twists are maintained to within 1/8 inch (3 mm) and include wiring scheme label. Wiring scheme label shall be available with TIA-568 wiring schemes.
 - (d) Terminations shall use for TIA-568 wiring scheme.
 - (e) Modules shall terminate 4 pair 23 100-ohm solid unshielded twisted pair cable.
 - (f) Modules shall meet ISO 11801 standard including complying with intermateability standard IEC 60603-7 for backward compatibility.
 - (g) Category 6A modules shall have UL and CSA approval.
 - (h) Modules shall have ETL verified Category 6A performance and ISO 11801 Class E performance in both basic and channel links.
 - (i) Modules shall be universal in design, accepting 2, 3, or 4 pair modular plugs without damage to outer jack contacts.
 - (j) Modules shall be able to be re-terminated minimum of 10 times and be available in 11 standard colors for color-coding purposes.
 - (k) Jack shall snap into all outlets and patch panels.
 - (l) Module shall include black base to signify Category 6A 500 MHz performance.
- 3) Patch Cords:
 - (a) Category 6A 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 6A 23-AWG stranded UTP cable.
 - (c) Each patch cord shall be one hundred (100) percent performance tested at factory in channel test to ANSI/TIA Category 6A 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 ANSI/TIA-568 Category 6A and ISO 11801 for Class E cable requirements.
 - 2) ETL tested and verified for Category 6A 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 – 0.295 inch (7.49 mm) 0.260"; Plenum – 0.295 inch (7.49 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), 1000BASE-T (Gigabit Ethernet), 10GBASE-T; 1.2Gb/s ATM; Token Ring 4/16; digital video; HDBaseT and broadband/baseband: PoE; PoE+; PoE++ .
 - 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 6A 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 ANSI/TIA Category 6A 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 6A 23-AWG stranded UTP cable.
 - f. Patch cords shall be one hundred (100) percent performance tested at factory in channel test to Category 6A standard.
4. Patch Panels:
 - a. Four-pair Category 6A 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 ANSI/TIA-568 wiring configurations.
 - c. Patch panels shall have removable 6-port design that allows 6-port module to be removed without disrupting other ports.
 - d. Integral cable tie mounts shall be included in panel for cable management on back of panel.
 - e. Port and panels shall be easy to identify with write-on areas and optional label holder for color-coded labels.
 - f. Rack mountable patch panels shall mount to standard 19 inches (480 mm) rack.
5. Grounding and Bonding:
 - a. Provide Telecommunications Bonding Backbone:
 - 1) Ground all telecommunications cable shields, equipment, racks, cabinets, raceways, and other associated hardware that has potential to act as current carrying conductor.
 - 2) Install telecommunication Bonding Backbone independent of building's electrical and building ground.
 - 3) Designed in accordance with recommendations contained in TIA-607 Telecommunications Bonding and Grounding Standard.

- b. All wires used for telecommunications grounding purposes shall be identified with green insulation:
 - 1) Non-insulated wires shall be identified at each termination point with wrap of green tape.
 - 2) All cables and bus bars shall be identified and labeled as required.
- 6. Firestopping: Furnish and install firestopping as per Section 07 8400.

PART 3 EXECUTION

3.01 INSTALLATION

- A. General:
 - 1. Install communications system in accordance with Manufacturer's written instructions, and complying with applicable portions of NEC 'Standard of Installation'.
- B. Work Area Outlets:
 - 1. Cables shall be coiled in in-wall or surface-mount boxes if adequate space is present to house cable coil without exceeding Manufacturers bend radius.
 - a. No more than 12 inches (300 mm) of UTP slack shall be stored in in-wall box, modular furniture raceway, or insulated walls.
 - b. Excess slack shall be loosely configured and stored in ceiling above each drop location when there is not enough space present in outlet box to store slack cable.
 - 2. Cables shall be dressed and terminated in accordance with TIA-568, Manufacturer's recommendations, and best industry practices.
 - 3. Cables shall be bundled using Velcro straps at least 0.25 inch (6.35 mm) wide. Use of plastic wire ties or zip ties is not allowed on project.
 - 4. Pair untwist at termination shall not exceed 0.125 inch (3.175 mm).
 - 5. Bend radius of cable in termination area shall not be less than 4 times outside diameter of cable.
 - 6. Cable jacket shall be maintained to within one inch (25 mm) of termination point.
 - 7. Data / voice jacks, unless otherwise noted in Contract Documents, shall be located on each faceplate.
 - 8. Horizontal Cabling:
 - a. Data jacks in horizontally oriented faceplates shall occupy rightmost position(s).
 - b. Voice jacks shall occupy the top position(s) on the faceplate. Voice jacks in horizontally oriented faceplates shall occupy the left-most position(s).
- C. Horizontal Cross Connect:
 - 1. Cables shall be dressed and terminated in accordance with ANSI/TIA-568, Manufacturer's recommendations, and best industry practices.
 - 2. Pair untwist at termination shall not exceed 0.125 inch (3.175 mm).
 - a. Bend radius of cable in termination area shall not be less than 4 times outside diameter of cable.
 - 3. Cables shall be neatly bundled and dressed to their respective panels or blocks.
 - a. Each panel or block shall be fed by individual bundle separated and dressed back to point of cable entrance into rack or frame.
 - b. Cables shall be bundled using Velcro straps at least 0.25 inch (6.35 mm) wide. Use of plastic wire ties or zip ties is not allowed on project.
 - 4. Cable jacket shall be maintained as close as possible to termination point.
 - 5. Each cable shall be clearly labeled on cable jacket behind patch panel at location that can be viewed without removing bundle support ties.
 - a. Cables labeled within bundle, where label is obscured from view shall not be acceptable.
 - 6. Horizontal Cabling:
 - a. A pull cord (nylon; 1/8 inch (3 mm) minimum) shall be co-installed with all cable installed in any conduit.

- b. Cable raceways shall not be filled greater than required by TIA-569 maximum fill for particular raceway type.
 - c. Cables shall be installed in continuous lengths from origin to destination (no splices) except for transition points, or consolidation points.
 - d. Where transition points or consolidation points are allowed, they shall be located in accessible locations and housed in enclosure intended and suitable for purpose.
 - e. Cable's minimum bend radius and maximum pulling tension shall not be exceeded.
 - f. If J-hook or trapeze system is used to support cable bundles, all horizontal cables shall be supported at 48 inch (1 200 mm) to 60 inches (1 500 mm) maximum intervals. At no point shall cable(s) rest on acoustic ceiling grids or panels.
 - g. Horizontal distribution cables shall be bundled in groups of no more than 25 cables. Cable bundle quantities in excess of 25 cables may cause deformation of bottom cables within bundle and degrade cable performance.
 - h. Cables shall be bundled using Velcro straps at least 0.25 inch (6.35 mm) wide. Use of plastic wire ties or zip ties is not allowed on project.
 - i. Cable shall be installed above fire-sprinkler systems and shall not be attached to system or any ancillary equipment or hardware. Cable system and support hardware shall be installed so that it does not obscure any valves, fire alarm conduit, boxes, or other control devices.
 - j. Cables shall not be attached to ceiling grid or lighting fixture wires. Where support for horizontal cable is required, install appropriate carriers to support cabling.
 - k. Cables shall be identified by self-adhesive label and meet requirements of TIA-606. Cable label shall be applied to cable behind faceplate on section of cable that can be accessed by removing cover plate.
 - l. Unshielded twisted pair cable shall be installed so that there are no bends smaller than four times the cable outside diameter at any point in run and at termination field.
 - m. Pulling tension on 4-pair UTP cables shall not exceed 25 lbf (111 N) for a four-pair UTP cable.
- D. Vertical Outlet Pole And Surface Raceway:
- 1. Horizontal Cabling:
 - a. General:
 - 1) Vertical outlet poles and Surface Raceway refers to surface raceway system used for branch circuit wiring and/or data network, voice, video and other low-voltage cabling. Surface raceway shall be used in solid wall applications or for applications where moves, additions and changes are very typical to workflow.
 - b. Raceway system shall consist of raceway, appropriate fittings and accessories to complete installation per electrical Contract Documents. Non-metallic surface raceway is to be utilized in dry interior locations only as covered in Article 352, part B of the NEC, as adopted by the NFPA and as approved by the ANSI.
- E. Copper Termination Hardware:
- 1. Cables shall be dressed and terminated in accordance with TIA-568, Manufacturer's recommendations, and best industry practices.
 - 2. Pair untwist at termination shall not exceed 0.125 inch (3.175 mm).
 - a. Bend radius of cable in termination area shall not be less than 4 times outside diameter of cable.
 - 3. Cables shall be neatly bundled and dressed to their respective panels or blocks.
 - a. Each panel or block shall be fed by individual bundle separated and dressed back to point of cable entrance into rack or frame.
 - b. Cables shall be bundled using Velcro straps at least 0.25 inch (6.35 mm) wide. Use of plastic wire ties or zip ties is not allowed on project.
 - 4. Cable jacket shall be maintained as close as possible to termination point.
 - 5. Each cable shall be clearly labeled on cable jacket behind patch panel at location that can be viewed without removing bundle Velcro support straps.

- a. Cables labeled within bundle, where label is obscured from view shall not be acceptable.
- F. Grounding System:
 - 1. Where required, Telecommunications Bonding Backbone shall be designed and/or approved by qualified Installer.
 - 2. Follow requirements of TIA-607.
- G. Seismic Bracing:
 - 1. Comply with IBC and local seismic requirements for all equipment and conduit pathways.
- H. Identification and Labeling:
 - 1. Apply machine generated approved labeling for racks, cables, panels and outlets:
 - a. Designate cables origin and destination and unique identifier for cable by room name and/or number and port count.
 - b. Racks and patch panels shall be labeled to identify location within cable system infrastructure.
 - 2. Place labeling within view at termination point on each end.
 - 3. Outlet, patch panel and wiring block labels shall be installed on, or in, space provided on device.
 - 4. See Contract Drawings for labeling scheme.
 - 5. Conform to IP addressing assignments as listed in Attachment 'FACILITIES ZONE IP ADDRESS ASSIGNMENT TABLE'.
 - a. See Attachment 'FACILITIES ZONE IP ADDRESS ASSIGNMENT TABLE' for 'IP Address Assignments.

3.02 FIELD QUALITY CONTROL

- A. Field Tests:
 - 1. Provide testing upon completion of installation.
 - a. General:
 - 1) Testing to be in accordance with ANSI/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)
 - d. UTP Cables and Links testing:
 - 1) UTP cabling channel must be tested at swept frequencies up to 500 MHz for internal channel performance parameters as defined in IEEE 802.3 and ANSI/TIA-568. Certifications shall include following parameters for each pair of each cable installed:
 - (a) Wire map (pin to pin connectivity).
 - (b) Length (in feet or millimeters).
 - (c) Near End Crosstalk (NEXT).
 - (d) Far End Crosstalk (FEXT).

- (e) ELFEXT.
 - (f) Attenuation/Crosstalk Ration (ACR).
 - (g) Return Loss.
 - (h) Propagation Delay.
 - (i) Delay Skew.
 - (j) Test equipment shall provide electronic and printed record of these tests.
- 2) Test each pair of cable for opens, shorts, grounds, and pair reversal.
 - (a) Correct short or grounded and reversed pairs.
 - (b) Examine open and shorted pairs to determine if problem is caused by improper termination.
 - (c) If termination is proper, tag bad pairs at both ends and note on termination sheets.
 - (d) If horizontal cable contains bad conductors, remove and replace cable.
- e. Testing Equipment:
 - 1) Comply with requirements of TIA-568.
 - (a) Appropriate level III tester shall be used to verify Category 6 cabling systems.
 - 2) UTP Cables and Links test equipment:
 - (a) Category Four Approved Testing Equipment. See Section 01 6200 for definitions of Categories:
 - (b) Fluke Networks DTX2-8000 or DTX2-5000 with latest firmware version.
 - (c) Viava Certifier 10G or Certifier 40G w/ latest firmware.
 - (d)
 - (e)
 - (f) Equipment shall be calibrated in accordance with manufacture requirements, ANSI/TIA standards and warranty requirements.
- f. Re-Testing:
 - 1) Consulting Engineer may request ten (10) percent random field re-test to be conducted on cable system, at no additional cost to Owner, to verify documented findings.
 - (a) Tests shall be repeat of those defined above.
 - (b) If findings contradict documentation submitted, additional testing can be requested to extent determined necessary by Consulting Engineer, including one hundred (100) percent re-test at no additional cost to Owner.
- g. Tests And Evaluation Reports:
 - 1) Printouts generated for each cable by wire test instrument shall be submitted as part of documentation package. Installer may furnish this information in electronic form.
 - (a) Media shall contain electronic equivalent of test results as defined by the Section along with software necessary to view and evaluate test reports.
 - 2) Submit documentation within ten (10) working days of completion of each testing phase. This is inclusive of all test results and record drawings.
 - 3) Draft drawings may include annotations done by hand. Final copies of all drawings shall be submitted within thirty (30) working days of completion of each testing phase.
 - 4) If requested by Consulting Engineer, provide copies of original test results.
- h. Test Documentation:
 - 1) Provide electronic format documentation within three (3) weeks after completion of project.
 - 2) Documentation shall be clearly marked on outside front cover with following:
 - (a) "Project Test Documentation".
 - (b) Project name.
 - (c) Date of completion (month and year).
 - 3) Test results shall include following:

- (a) Record of test frequencies.
 - (b) Cable type.
 - (c) Conductor pair and cable (or outlet) I.D.
 - (d) Measurement direction.
 - (e) Reference setup.
 - (f) Crew member name(s).
 - (g) Test equipment name, manufacturer, model number, serial number, software version.
 - (h) Last calibration date:
 - (i) Unless Manufacturer specifies more frequent calibration cycle, annual calibration cycle is required on all test equipment used on project.
 - (j) Document shall detail test method used and specific settings of equipment during test as well as software version being used in field test equipment.
- B. Non-Conforming Work: Non-conforming work as covered in General Conditions applies, but is not limited to following:
 - 1. Any cable damaged or exceeding recommended installation parameters during installation shall be replaced at no additional cost to Owner.
 - 2. Any defect in cabling system installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks shall be repaired or replaced in order to ensure one hundred (100) percent useable conductors in all cables installed at no additional cost to Owner.
 - 3. Correct deviation and repeat applicable testing at no additional cost to Owner.
 - 4. Correct any work found defective or not complying with Association Publications and TDMM requirements at no additional cost to Owner.
 - a. Document all problems found and corrective action taken.
 - b. Include both failed and passed test data.

END OF SECTION 27 1501

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**SECTION 27 4117
AUDIO SYSTEMS****PART 1 GENERAL****1.01 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install complete and operational sound system as described in Contract Documents including:
 - a. Complete systems for amplifying sound signals from microphones and media source equipment and distributing them to loudspeakers at various locations.
 - 2. Assist Audiovisual Consultant with final inspection and equalization of system and provide necessary test equipment for audio system and partition noise isolation tests if applicable. Correct problems found at time of final inspection of system.
- B. Audiovisual Consultant will perform final inspection, system balance, equalization, and instruct local leaders in operation of system.
- C. Products Installed But Not Furnished Under This Section:
 - 1. Webcast/Streaming Capable Device.

1.02 RELATED REQUIREMENTS

- A. Section 27 1116 – Structured Cabling: Communications Cabinets, Rack, Frames and Enclosures
- B. Section 27 1501 – Communication Cabling
- C. Section 27 4118 - Video Systems.

1.03 REFERENCE STANDARDS

- A. ANSI/AVIXA 10 - Audiovisual Systems Performance Verification 2013.
- B. ANSI/Infocomm 2M - Standard Guide for Audiovisual Systems Design and Coordination Processes 2010.
- C. ANSI/Infocomm 10 - Audiovisual Systems Performance Verification 2013.
- D. AVIXA RP-C303.01 - Recommended Practices for Security in Networked Audiovisual Systems 2018.
- E. BICSI ITSIMM - Information Technology Systems Installation Methods Manual (ITSIMM), 8th Edition 2022.
- F. BICSI N1 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure, 1st Edition 2019.
- G. BICSI TDMM - Telecommunications Distribution Methods Manual, 14th Edition 2020.
- H. ANSI/AVIXA 4:2 , 'Audiovisual Systems Energy Management'(2012 Edition)..
- I. IEEE 1100 - IEEE Recommended Practice for Powering and Grounding Electronic Equipment 2005.
- J. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- K. NFPA 72 - National Fire Alarm and Signaling Code Most Recent Edition Cited by Referring Code or Reference Standard.
- L. TIA-568-C.2 - Balanced Twisted-Pair Telecommunications Cabling and Components Standards 2009, with Addendum (2016).
- M. TIA-569 - Telecommunications Pathways and Spaces 2019e.
- N. TIA-606 - Administration Standard for Telecommunications Infrastructure 2021d.
- O. TIA-607 - Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises 2019d.

P. TIA-758, 'Customer-Owned Outside Plant Telecommunication Infrastructure Standard' (Revision B, 2012).

Q. UL 486A-486B - Wire Connectors Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate final inspection schedule of both audio and video systems before Audiovisual Consultant's final inspection.

B. Schedule:

1. After completion of audio system installation of this section, Installer to perform Field Testing before Audiovisual Consultant Final Inspection of audio system.
2. Notify Audiovisual Consultant two (2) weeks minimum before Audiovisual Consultant's final inspection as specified in Field Quality Control in Part 3 of this specification.
3. Deliver metal speaker grilles, which are to be painted to match ceiling, before attachment to speakers and before installation of audio system.

1.05 SUBMITTALS

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

B. Informational Submittals:

1. Special Procedure Submittals:
 - a. Provide itemized list of equipment to be supplied.
 - b. Provide proposed labeling for system components.
2. Qualification Statement:
 - a. Installer:
 - 1) Provide Qualification documentation as requested by Engineer/Architect including:
 - (a) List of Projects requested.
 - (b) List of certified technician(s) with dates of training courses completed.
 - (c) Other items outlined section 1.06 b.

C. Closeout Submittals:

1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Operations and Maintenance Data:
 - 1) Equipment Manufacture's manual:
 - (a) Audio system operation and maintenance instructions.
 - (b) List of equipment provided, including portable equipment, showing make, model, and serial number.
 - b. Warranty Documentation:
 - 1) Include copy of final, executed warranty.
 - c. Record Documentation:
 - 1) Software and Programming: Copies of all manufacturers' software used for programming various components and functions of the system shall be furnished to the Owner:
 - (a) Original audio processor program files, source codes and compiled codes used for system control, audio setup and any other computerized functions of system including screen layout generation, configuration and layouts and any other related computer files shall also be furnished to Owner.
 - (b) In each and every case, all programming, code generation, configuration files, layout files and any other software and/or code written and generated of setup and operation of this system are property of Owner of system and not of Audiovisual Consultant, Contractor or Integrator.

1.06 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:

1. System shall be installed in accordance with applicable standards, requirements, and recommendations of International Building Code, National Electrical Code and all local authorities having jurisdiction.
- B. Qualifications:
 1. Installer. Requirements of Section 01 4000 applies, but not limited to following:
 - a. Approved Installers:
 - 1) Installers are to furnish and install components of audio system and meet qualification requirements.
 - 2) Approval subject to agreement process for Pre-Approval Installers.
 - b. Alternate Installer(s):
 - 1) Firm specializing in performing work of this section:
 - (a) Minimum three (3) years of successful installation experience of AV system projects of comparable size, and complexity required for this project. Audio systems must have included complete installation and setup work and must have been completed by factory trained and certified technician.
 - (b) Firm successfully completed minimum of three (3) projects in past two (2) years before bidding. including at least one (1) project designed by an audio consultant.
 - (c) Firm shall own sufficient hand tools, vehicles, scaffolding, power tools, and so forth to install the system in a timely and proper manner.
 - (d) Firm shall be a factory authorized dealer for the majority of equipment to be furnished, and able to execute manufacturers warranties for installed equipment.
 - (e) Firm must employ personnel which have:
 - (1) At-least 5 years recent experience in sound reinforcement, who will be assigned to the project.
 - (2) Satisfactorily completed formal industry technical training including Syn-Aud-Con: Course 50, AVIXA: CTS-I, or CTS-D, and manufacturers training for equipment installed under this section including Q-sys: Level 1 and 2.
 - (f) Firm Shall be active in industry professional societies such as NSCA, AES, AVIXA, etc.
 - (g) Firm shall own appropriate test equipment for audio and network equipment installed under this section, including but not limited to notebook computer, test and measurement microphone(s), SPL Meter, Level II Cable Certifier, etc.
 - (h) Firm shall be directly responsible for the completion of the work, and shall not sub-contract it to another contractor who would not otherwise meet these qualification requirements.
 - (i) Firm shall have sufficient staff, physical plan, and inventory to provide timely warranty and post-warranty service as required by the specifications.
 - (j) Comply with specifications and Contract Documents.
 - 2) Submit documentation of compliance of qualifications before bid to Architect or Owner's Representative.
 - c. Same Approved Installer shall furnish and install components of Section
 - d. Same Approved Installer shall furnish and install components of Section 27 1000 - Structured Cabling and 27 4118 - Video Systems.
 - e. Same Approved Installer shall furnish and install components of Section 27 1000 - Structured Cabling.
 - f. Same Approved Installer shall furnish and install components of Section 27 4118 - Video Systems.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:

1. Materials shall be delivered in original, unopened packages with labels intact.
- B. Storage And Handling Requirements:
 1. Provide secure location protected from weather in cool, dry location, out of direct sunlight in compliance with Manufacturer's instructions and recommendations.
 2. Keep materials free from dirt and foreign matter.

1.08 WARRANTY

- A. Special Warranty:
 1. Provide complete warranty repair or replacement for one (1) year at no cost to Owner, except in case of obvious abuse.
 2. If failure causes audio system to be inoperative or unusable for its intended purpose, Installer, when notified of problem shall repair system within five (5) days so it will be operational and usable. If defective components cannot be repaired in time, furnish and install temporary loaner equipment as required.
 3. If failure causes Chapel or Cultural Center audio system to be inoperative or unusable for its intended purpose, Installer, when notified of problem before Wednesday, shall repair system so it will be operational and usable by following Sunday. If defective components cannot be repaired in time, furnish and install temporary loaner equipment as required.
 4. Honor component warranties for term established by Manufacturer, if greater than one (1) year.

PART 2 PRODUCTS

2.01 OWNER-FURNISHED PRODUCTS

- A. Approved Products. See Section 01 6000:
 1. Network Streaming Equipment as specified on contract drawings. Drawings as shown in Contract Documents. including projectors and video monitors.
 2. Steaming Equipment, as shown on contract drawings.
 3. Coordinate installation of all Owner Furnished Network Streaming Equipment with Div 27 4133 Installer.

2.02 SYSTEM

- A. Shall Consist of components, as specified on Project Drawings. See Section 01 6000.
- B. Performance:
 1. Capabilities:
 - a. Installations with audio DSP shall meet following performance parameters:
 - 1) From 100 Hz to 2 kHz, flat within plus or minus 2 dB.
 - 2) Above 2 kHz, slope down along an approximate 3 dB per octave slope to 8 kHz.
 - b. No noise, hum, RFI pickup or distortion shall be audible under normal operating conditions.
 - c. Audio systems shall reproduce program material at level of 80 to 85 dBA without audible distortion.
 - d. All input levels shall be pre-set so system may be operated without going into feedback under normal conditions.
 - e. Seat-to-seat variations in the 4kHz octave band shall not exceed plus or minus 2 dB in the Chapel or Cultural Center.
 - f. Sound masking system:
 - 1) Sound masking system shall provide adequate speech privacy in Corridor when set between 42 dBA and 46 dBA at ear-height under speaker so conversation in Office at slightly raised voice levels cannot be understood in Corridor.
 - 2) Speakers and masking generator, as specified on Technology drawings.
- C. System Requirements:
 1. General:

- a. Provide complete and fully functional audio systems using materials and equipment of types, sizes, ratings, and performances as indicated in equipment list in accompanying drawings:
 - 1) Use materials and equipment that comply with referenced standards and manufacturers' standard design and construction in accordance with published product information.
 - 2) Coordinate features of materials and equipment so they form integrated system with components and interconnections matched for optimum performance of specified functions.
2. Provide all wire, cable, and connectors as required to complete installation of all systems as designed and specified.
- D. Equipment And Materials:
 1. Provide equipment selected from equipment list on drawings, or as substituted following proscribed substitution process, using all solid-state components fully rated for continuous duty at ratings indicated or specified.
 2. Select equipment for normal operation on input power supplied at 105 130 V, 60 Hz.
- E. Operation
 1. Summary: Set up and program the system so room combining, and signal routing is automatically executed based on control commands issued by system switches and partition infra-red sensors.
 2. Program system using owner provided template files. Make modifications to files as indicated on project drawings to provide turn-key system.

PART 3 EXECUTION

3.01 INSTALLERS

- A. Approved Installers. See Section 01 6000:
 1. Qualifications:
 - a. Meet qualification requirements as specified in Quality Assurance in Part 1 of this specification.
 2. DSI Systems: 1-844-660-8402
 3. Marshall Industries: (801) 266-2428.
 4. Poll Sound: (801) 261-2500.
 5. Professional Systems Technology: (801) 649-6696.
 6. IES Communications (Bluffdale Office): 540-537-9977
 7. Alternate Installer(s):
 - a.

3.02 EXAMINATION

- A. Verification Of Conditions:
 1. Verify compliance with following items before beginning work of this Section:
 - a. No cables spliced.
 - b. Isolated ground run back to electrical panel from all equipment cabinets.
 - c. Specified conduit, cables, speaker enclosures and equipment cabinets are properly installed.
 - d. Location and angle of speaker cabinets.
 2. Ensure that no solid structural or decorative member impedes sound propagation from speakers and that no member with cross section greater than 3/4 inch (19 mm) is placed in front of speakers.
 3. Verify installation of fiberglass insulation in field-fabricated speaker enclosures.
 4. Verify proper functionality for all system components being reused or remaining untouched.

3.03 INSTALLATION

- A. General:

1. Install system in accordance with NFPA 70, NFPA 72, and other applicable codes. Install equipment in accordance with manufacturer's written instructions.
- B. Mounting And Securing Equipment:
 1. Equipment shall be firmly secured in place unless requirements of portability dictate otherwise.
 2. Fastenings and supports shall be adequate to support their loads with safety factor of at least three (3) times weight of equipment being installed.
 3. Any structural mounting that is not able to meet this requirement due to specific nature of equipment, manufacturer's requirements, or limitations of facility, shall not be installed without prior approval of Engineer.
 4. Install all boxes, equipment, hardware, and other materials plumb, level, and square.
- C. Millwork:
 1. Install technology equipment and support equipment in millwork in neat and cosmetically dressed out manner.
 2. Install technology equipment and support equipment in podium and other millwork in neat and cosmetically dressed out manner.
 3. Saw cuts, holes and recesses into laminates and woodwork shall be straight.
 4. Radius and circular cuts shall be consistent, and all uneven surfaces shall be corrected. This shall include use of moldings, grommets, bushings, laminates, and wood products as required to dress out installation of equipment.
 5. Install equipment and panels in technology racks using matching screws, hardware, and grommets.
 6. Install equipment and panels in technology racks and podiums using matching screws, hardware, and grommets.
- D. Speakers:
 1. Maintain uniform polarity in speakers and wiring.
 2. Employ no positive stop in rotation of speaker volume controls. Controls shall be capable of continuous rotations in either direction.
 3. Mount transformers with screws securely to speaker brackets or enclosures. Adjust torsion springs as necessary to securely support speaker assembly.
 4. Neatly mount speaker grilles, panels, connector plates, control panels, etc., tight, plumb, and square unless indicated otherwise on drawings.
 5. Provide brackets, screws, adapters, springs, rack mounting kits, etc, recommended by manufacturer for correct assembly and installation of speaker assemblies and electronic components.
 6. Line factory-fabricated speaker back boxes with one inch (25 mm) minimum fiberglass if not done by Back box Manufacturer.
 7. Speaker Back Boxes shall be secured to structure using 12 ga (2.7 mm) minimum seismic safety cables.
- E. Technology:
 1. Provide sufficient ventilation for adequate cooling of equipment.
 2. Install vent rack panels in unused spaces. Install vent panels at top and bottom and above each power amplifier.
 3. Securely fasten equipment plumb and square in place. Where equipment is installed in rack cabinets, utilize all fastening holes and cove open spaces with perforated panels.
 4. Securely fasten relays and small components. Do not use sticky-back tape for fasteners.
 5. Install balancing transformer on each unbalanced input or output that connects to devices outside equipment cabinet, or that connects to balanced input or output within equipment cabinet.
 6. Connect powered components to 120 VAC outlets on transient voltage surge suppressors. Do not connect to outlets on other components.
 7. Leave sufficient service loops to uniform length on cables to allow operation of system with chassis outside cabinet.

8. Equipment shall be held firmly in place with proper types of mounting hardware as recommended and/or supplied by manufacturer:
 - a. Mounting hardware provided with equipment shall be used when practical. This shall include, but not be limited to, front and rear rack rails, angle brackets and rack mount kits.
 - b. Equipment shall be installed so as to provide reasonable safety to operator.
- F. Cables, Wires, And Connectors:
 1. Cables:
 - a. Cable and wire shall be new and unspliced.
 - b. Splicing:
 - 1) Splicing of cables and conductors is expressly prohibited in any location other than equipment racks.
 - 2) Splicing of control and speaker level conductors shall be accomplished via punch block or terminal strip connections only.
 - c. Additional cable length shall be provided at all connector locations. Duplex box, junction box, and floor box locations shall be installed with sufficient cable length behind cover plates to permit wiring maintenance and connector replacement in the future.
 - d. When cable runs utilize vertical cable raceways located within walls, acoustic integrity of walls shall be maintained:
 - 1) Cables that pass-through cover plates of junction boxes and raceways, through slab-to-slab walls, and through conduit lines shall be properly gasketed and sealed. Acoustic material shall be restored or replaced.
 - e. Separation between system cables and other services shall be maximized to prevent and/or minimize potential for electro-magnetic interference (EMI):
 - 1) Provide at least 12 inches (305 mm) separation from electrical lines whenever feasible.
 - 2) Where separation is unavoidable, distribution cables shall cross other services at right angles whenever practical to minimize EMI.
 - f. Do not install signal cables on top of light fixtures, ceiling speakers, projection screens, HVAC controls or sensing devices, fire safety and sprinkler system detection technology, or any other technology or mechanical equipment.
 - g. Do not lay cables directly on top of T-bar grid ceiling tiles:
 - 1) Support cables installed outside of conduit at 4 feet (1.20 m) maximum intervals from building structure.
 - 2) Do not utilize support wires from other trades or systems.
 - h. Install system cables shall not block access to other equipment or services, across removable service panels and/or in any other manner to prohibit routine maintenance of HVAC systems, fire safety equipment and building mechanical control systems.
 - i. Inter-rack cabling:
 - 1) Inter-rack cabling shall be neatly laced, dressed, strain relieved and adequately supported.
 - 2) Inter-rack cables shall be grouped according to signals being carried to reduce signal contamination. Separate groups shall be formed for following:
 - (a) Power.
 - (b) Control.
 - (c) Video.
 - (d) Audio cables carrying signals less than -20 dBm.
 - (e) Audio cables carrying signals between -20 dBm and +20 dBm.
 - (f) Audio cables carrying signals over +20 dBm.
 - j. Power cables, control cables, and high-level cables shall be run on left side of equipment racks as viewed from rear. All other cables shall be run on right side of all equipment racks as viewed from rear.

- k. Cables, except video cables which must be cut to electrical length, shall be cut to length dictated by cable run.
 - l. Terminal blocks, boards, strips or connectors, shall be furnished by installer for all cables which interface with racks, cabinets, consoles, or equipment modules. Affix terminal blocks, boards, strips or connectors to equipment racks using screws only. Double sided tape will not be accepted.
 - m. Shields for audio cables shall be grounded at input end only of various equipment items on system to prevent potential for ground loops.
 - n. Shields for microphone cables shall be grounded at both ends to allow Phantom Power to pass.
 - o. Where AV cable is installed in areas that are exposed to view of end users, install AV cable and associated power cables inside nylon braided sleeving (wire loom):
 - 1) Examples of such areas include but are not limited to cables installed to projectors and monitors, and cables installed to devices in/on lecterns such as touch panels and document cameras.
 - 2) Where security cables are specified for physical security to such devices, install the specified security cables inside nylon braided sleeving along with AV cables.
2. Wiring and Cabling:
- a. Comply with industry standard circuit polarity and loudspeaker wiring polarity. No cables shall be terminated with polarity reversal between connectors at either end.
 - b. System wire, after being cut and stripped, shall have wire strands twisted back to their original lay and be terminated by approved soldered or mechanical means. No bare wire ends shall be accepted.
 - c. Do not place any wires and cables for this system in any conduit, raceway, wire way or cable tray that is used for mechanical systems of building.
 - d. Route all cable and wiring within equipment racks, cabinets, and millwork according to function, separating wires of different signal levels (microphone, line level, amplifier output, AV, control, etc.) by as much distance as possible. Neatly arrange, harness and bundle all cable with Velcro straps.
 - e. After completion of wiring and cable installation, all trough and box covers shall be notched out and grommited for clearance of various cable bundles, (i.e., separate audio, video, and control). Panel covers shall be screwed back in place and all gaskets shall be restored or replaced.
3. Connectors:
- a. Provide connectors of type and quality as detailed in Contract Drawings and/or as required to meet minimum bandwidth requirements of equipment to which connectors are terminated. Overall quantity of connectors shall not be limited by quantities indicated in Contract Drawings and shall be provided as required.
 - b. No connectors shall be installed in non-accessible locations or used for splicing cables. Connectors shall be new.
 - c. Connectors shall incorporate strain relief mechanisms which firmly grip the jacket of connected cables.
 - d. Connectors shall be properly polarized to prevent improper seating.
 - e. Connectors shall provide appropriate electrical characteristics for circuitry to which they are attached.
 - f. Exposed conductors inside of equipment racks shall be dressed with heavy duty neoprene heat-shrink tubing.
 - g. Heat-shrink type tubing shall be used to insulate, and dress ends of all wire and cables including separate tube for ground or drain wire.
 - h. Solder connections shall be made with rosin-core solder. Temperature controlled soldering irons rated at least 60 watts shall be used for all soldering work. No soldering guns, gas or butane, or temperature unregulated irons shall be used on job site.
 - i. Mechanical connections shall be made with approved crimp lugs of correct size and type for connection. Wire nuts shall not be permitted except inside speaker

enclosures. Each connector shall be attached with proper size controlled-duty-cycle ratcheting crimp tool approved by manufacturer.

- j. Conventional non-ratcheting type crimping tools are unacceptable and shall not be used on job site. Presence of such tools on job site shall constitute evidence of mechanical connections made with unauthorized tools and shall provide sufficient grounds for rejection of all mechanical connections in system and will be considered non-conforming work.

G. Equipment Cabinet:

1. Install vent panels at top and bottom of equipment cabinets and between components where possible for maximum ventilation. Locate amplifiers at top of cabinet. Locate equalizers below amplifiers, separated by several vent panels.
2. Securely fasten equipment plumb and square in place. Utilize all fastening holes in front of cabinet.
3. Securely fasten in place equipment that is not rack mounted, including relays and other small components. Do not use sticky-back tape.
4. Install balancing / isolation transformer when balanced and unbalanced components are connected.
5. Wire XLR-type connections with pin 2 hot, pin 1 shield.
6. Connect powered components to 120 VAC outlets on voltage suppressor power bars. Do not connect to outlets on other components.
7. Identification:
 - a. Legibly identify user-operated system controls and system input / output jacks using engraved, permanently attached laminated plastic plates or imprinted Lexan labels. Label equipment and controls within equipment cabinets using similar labels or printed labels from a label maker or laser printer.
 - b. Affix label to rack panel inside cabinet listing name and telephone number of installer. Appropriate warranty instructions may be included.

H. Identification And Labeling:

1. Cables, regardless of length, shall be identified with machine-printed wrap-around labeling system at both ends:
 - a. These labels shall be self-laminating to ensure durability.
 - b. Label format used shall be equal, or better than, system detailed.
2. There shall be no unmarked cables any place in system.
3. Marking codes used on cables shall correspond to codes provided with submittals, and/or written documentation of 'Record Drawings'.
4. Connectors, controls, equipment components, terminal blocks and equipment racks are to be permanently labeled in format approved during submittal process.
5. Equipment labels are to be permanently engraved in metal. Alternative method shall be approved during submittal process only.
6. Clearly and permanently label all jacks, controls, connections, and so forth. Embossed or printed label tape shall not be used and is considered unacceptable for this system. Attach labels with double stick tape as required.
7. Labeling shall be completed prior to acceptance of final system.

I. Grounding:

1. Provide equipment grounding connections for audio system as indicated. Tighten connections to comply with tightening torques specified in UL 486A-486B to assure permanent and effective grounds.
2. Ground equipment, conductor, and cable shields to eliminate shock hazard and to eliminate ground loops, common mode returns, noise pickup, cross talk, and other impairments. Provide 5 ohm ground at main equipment location. Measure, record, and report ground resistance.
3. Provide grounding conductor with green insulation between as indicated on Contract Drawings. Comply with IEEE and TIA standards.

- J. Pulpit:
 - 1. Install pulpit microphone pre-amplifier to be accessible below lectern. Do not alter factory supplied microphone cable and connectors.
 - 2. Install pulpit microphone so tip of microphone head is 2 inches (50 mm) inside edge of lectern when microphone is tilted down to maximum extent.
- K. Seismic Bracing:
 - 1. Comply with IBC and local seismic requirements for all equipment and conduit pathways.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Field Tests:
 - 1. Installer Testing:
 - a. After completion of installation but before inspection by Audiovisual Consultant, perform following:
 - 1) Conduct system tests and make necessary corrections for proper system operation including, but not limited to, following:
 - (a) Output level uniformity.
 - (b) Polarity.
 - (c) Shock, strain excited hum, and oscillation.
 - (d) Clipping, hum, noise, and RFI in all system configurations.
 - (e) Speaker line impedances.
 - (f) Loose parts and poor workmanship or soldering.
 - 2) Sweep speaker systems with high-level sine wave or 1/3 octave pink noise source. Correct causes of buzzes or rattles related to speakers or enclosures. Notify Contractor and Audiovisual Consultant of external causes of buzzes or rattles.
 - 3) Rough Balance: Balance system well enough that it can be used for meetings before final inspection.
 - b. Complete documentation required by Audiovisual Consultant and submit to consultant within five (5) days of Substantial Completion.
- C. Field Inspections:
 - 1. Audiovisual Consultant Inspection And Equalization:
 - a. Coordinate final inspection schedule with Audiovisual Consultant two (2) weeks minimum before Consultant's final inspection.
 - b. Have copy of Installer redlined documents sent to Audiovisual Consultant two (2) weeks minimum to before field inspection.
 - c. Have loose equipment (microphones, cables, etc.) available at time of inspection.
 - d. Assist Audiovisual Consultant in final inspection of completed system.
 - e. Assist Audiovisual Consultant in noise isolation testing of folding partitions and office doors.
 - f. Provide following test equipment in good working order:
 - 1) Laptop computer:
 - (a) capable of running current DSP configuration software
 - (b) with active commercially available anti-virus software
 - 2) 1/3 octave real-time audio spectrum analyzer with SPL meter, and precision microphone.
 - 3) Digitally generated random pink noise generator, 20Hz-20KHz, minimum two (2) hour repetition rate or ten (10) minutes minimum of equivalent signal recorded on compact disc.
 - 4) Direct reading audio impedance meter, minimum three (3) frequencies, and ten (10) percent accuracy.
 - 5) Digital Volt-Ohmmeter.
 - 6) Audio oscillator, variable frequency, 20Hz-20KHz.

- 7) MP3 player with pre-recorded speech and music program material.
 - 8) Necessary chargers, cables, test leads, adapters, and other accessories for test equipment.
 - 9) Tools and spare parts for making adjustments and corrections to system.
 - 10) Level II Cable certifier, or cable certifier report.
 - g. Correct minor items so Audiovisual Consultant may certify satisfactory completion during his visit.
- D. Non-Conforming Work:
1. Correct any work found defective or not complying with contract document requirements at no additional cost to the Owner.
 - a. Provide all materials requested by consultant to document rededication of punch list items not remedied during system commissioning.
- E. Manufacturer Services:
1. Provide services of factory authorized service representative to supervise field assembly and connection of components and pretesting, testing, and adjustment of system.

3.05 CLEANING

- A. Waste Management:
1. All work areas are to be kept clean, clear, and free of debris at all times.
 2. Disposal of rubbish, debris, and packaging materials to Contractor provided Dumpster.
 3. Disposal of rubbish, debris, and packaging materials in proper manner.

PART 4 MEETINGHOUSE SOUND SYSTEM FUNCTIONALITY

4.01 EACH OF THE SOUND SYSTEM(S) SHOULD FUNCTION AS INDICATED.

4.02 SOUND MASKING SYSTEM

- A. Sound masking speakers located outside of offices, should be tapped at 1W, and be calibrated to produce 42-46dB SPL when measured at 5'10" AFF. Masking speakers located in offices, shall be tapped at ½ W. SPL is determined by calibration of public area sound masking speakers.

4.03 CHAPEL SYSTEM

- A. 'CP' shall consist of touch panel installed in Bishop's Pedestal and shall function as follows:
- B. When in the Off state, the touch panel shall contain a single On/Off button. Chapel inputs shall be muted, and power to the amplifier shall be off. Pressing the On/Off Button shall cause the system to turn on.
1. Power to the amplifier shall be engaged. While the amplifier is booting, Touch panel shall display a message indicating the system is powering on, and system chapel outputs shall remain muted.
- C. When the amplifier is fully powered on, Chapel outputs shall be unmuted, and the Touchpanel shall display standard "System On" Page. This page shall consist of:
1. Momentary Pulpit Up and Down Buttons, which shall raise and lower the pulpit respectively when pressed.
 2. Chapel Volume Slider, which shall start at center position, and allow the user to raise or lower the room volume by 5 dB.
 3. Power On/Off Button, which when pressed shall return the system to its original off state.
 4. In systems with video systems, a Program Audio Button, which when pressed shall unmute audio the program audio feed to the room and add a second slider to the panel for controlling the program audio level.
 - a. Pressing the program audio button again, shall mute the program audio, remove the program audio slider from the panel display, and return the program audio slider to its pre-set level.

- b. Program audio level shall allow adjustment of up to 60dB, and when at its lowest position, shall mute the program output.
 - 5. "Video Control" Button, which when pressed, shall overlay the video controls page on the touch panel, and consist of:
 - a. Video Mute/Unmute Button – which when pressed shall cause the video switch to show the 'LOGO' image.
 - b. Video selection buttons, one for each input with a connected video input as shown on the project video riser.
 - 1) When pressed, shall cause the video switch to route the selected output to all video inputs.
 - 2) The Camera input button shall additionally, cause the camera presets to appear, and be labeled inputs 1 through 8. When pressed, these inputs shall cause the camera to recall the indicated preset and move to that position.
 - (a) Neither direction and focus, nor Camera Preset storage shall not be possible from the touch panel.
- D. Each time the system is turned on, the system will shall:
 - 1. Restore the system to its default settings, and,
 - 2. return chapel volume slider to middle sound level, which corresponds to its default sound level.
 - 3. After the system is fully ready, the touch panel shall display the main operations screen
 - 4. Shall not cause an audible pop to be heard over the sound system
- E. Volume Level Control
- F. Default Configuration
 - 1. The default sound level for the system is 4Db below the feedback level.
 - 2. The number of open Mics (NOM) shall be 3.
 - 3. The pulpit, and sacrament microphones shall be set to always open.
 - 4. Auxiliary feeds from both the video system, and the audio system shall not be included in the NOM calculation.

4.04 CULTURAL HALL SYSTEM

- A. The cultural hall system consists of multiple sections. From the available sections, the section closest to the chapel shall be equipped with a 'CC' or main controller and shall be referred to as the main section. The next largest available section may be equipped with a 'CC2' or secondary controller and shall be referred to as the secondary. Each section shall be electronically separated, or combined via an Infrared sensor, which shall be mounted such that it reliably detects whether the operable partition doors are open or closed.
- B. The Cultural Hall 'CC' device shall consist of a touch panel installed on the wall and shall function as follows:
 - 1. When Cultural Hall system (CC) is off, and the associated section is separated (separating door(s) are closed) from the chapel, or it is connected to the Chapel (door(s) are open) and the chapel is off, CC shall display the "CC System Off" page.
 - 2. When associated section is connected to chapel (door(s) are open) and Chapel system is on or starting, CC shall display a message indicating "CC is connected to Chapel. To use system, turn off chapel system or close one or more doors separating the rooms.
 - 3. The CC System Off pages shall consist of a single "System On" Button. When pressed, the system shall engage power to the amplifier, unmute the cultural hall audio outputs, and display the "CC Auto Mode Page".
 - 4. The CC Auto Mode Page shall consist of a "Power Off" button, and a "CC Manual" Button.
 - a. Pressing the "Power Off" button shall return the CC panel and its associated room to their off states.
 - b. Pressing the "CC Manual" button shall display the CC Manual page.
 - 5. The "CC Manual Mode" page shall consist of the same System On/Off Buttons available on the "Auto Mode" page, and volume sliders for each audio inputs in the associated

cultural hall section, or any of its combined sections (door(s) open between them). This excludes the chapel, which inputs are never broken out for individual control. Since the number of available inputs will vary depending on which other sections are combined, the number of sliders will vary. Multiple "CC Manual Mode" pages may be necessary.

- a. Each slider shall allow for 40dB of gain adjustment, ranging from -30dB to +10dB from teach inputs nominal level. When the slider is set to -30dB, the system shall fully mute the associated input.
6. Pressing the "CC Auto" Button shall return the panel to the "CC Auto Mode" page. return system to Auto mode operation and reset all manual volume sliders to nominal levels and positions.
7. Pressing "CC Off" Button from this screen shall immediately return associated cultural all sections to their off state, display the "CC System Off" page, and return all manual volume sliders to their nominal volume levels and positions.
- C. When included in a system, CC2 shall function in the same manner as the "CC" control panel.
 1. When cultural hall sections containing CC and CC2 are combined, both panels shall show the same pages, and information at the same time.
 2. When separated (one or more partition doors between them are closed) each panel shall operate independently of the other, enabling only control of the audio inputs and outputs in their respective sections.
- D. If at any time, the chapel system is turned on while connected to the one or more of the cultural hall sections containing a CC or CC2 control. Connected controls shall immediately display the "CC connected to Chapel" page, mute their inputs, and route chapel audio to any cultural hall sections connected to the chapel.
 1. Any systems which were operation in Manual Mode, shall additionally return sliders to their nominal positions, and levels.
- E. Room Combining
 1. Cultural hall sections and the chapel shall be combinable, by opening the folding partition doors, and triggering the IR sensors. Combinable sections are assigned a priority, when a lower priority section is combined with a higher priority section, controls in the lower priority section shall be disabled, and the sound mix from the higher priority section shall be routed to the lower priority section.

4.05 ASSISTIVE LISTENING SYSTEM (ALS)

- A. The assistive listening system uses the building network and Wi-Fi network to broadcast the ALS streams. In buildings which host a recognized language unit (group, ward or branch) the ALS system shall additionally include broadcast channels for language translation. Servers shall be ordered from the factory, pre-configured with the owner's configuration.
- B. Users shall be able to select the desired stream by connecting to the owner's Wi-Fi Network to their phone or other device, opening the manufacturer's ALS app, then selecting the available stream.
 1. Channels shall be available for each channel shown on the project drawings, including large meeting spaces and interpretation channels.
 - a. Where multiple languages are required simultaneously, each shall have its own translation channel on the app.

4.06 INDEPENDENT ROOM SYSTEMS

- A. Rooms with independent systems include one or mic or auxiliary input jacks, and a wall controller consisting of an audio switch, and volume control.
 1. Switch shall select which audio signal is heard in the room. Available signals are Local sound, or overflow.

4.07 PERIMETER ROOM SYSTEMS, AND THE PERIMETER FEED

- A. The perimeter room systems shall include a speaker and volume control knob, in each meetinghouse foyer area, serving area, as well as other selected rooms. These systems shall be connected to the perimeter feed.

- B. When active, the perimeter feed shall transmit sound to the connected systems and rooms. Connected systems shall include independent room systems, Assistive Listening Systems, and Foyer systems, the perimeter feed shall default to the chapel sound whenever the chapel system is on. If the cultural hall system is on, when the chapel system is off, the perimeter feed shall transmit the cultural hall system. When both systems are off, the perimeter feed shall transmit no sound signals.

4.08 STREAMING AUDIO

- A. Stake Centers shall be equipped with XLR inputs and outputs for the purpose of allowing users to alter the default webcast audio feed. The AV rack shall include connections for 2 Choir microphones, an Organ Output, a Chapel Mix output, and a Webcast Input. The chapel organ sound shall be routed from the chapel organ to the chapel organ output. The sound heard through the overflow speakers in the chapel shall be routed to the Chapel Mix Output. The Choir Microphone outputs shall be cabled directly to the Choir microphone inputs on the rostrum.
- B. The system shall include a webcast output connected directly from the DSP processor to the Webcast device. By Default, the system shall route the Chapel Mix to webcast device. If signal is detected on the Webcast In, the system shall automatically route that signal to the webcast device instead of the default chapel mix. Users shall be able to connect a manual mixer to the provided connections on CP1, and automatically route a custom mix to the webcast device.
 - 1. Webcast output (3,5mm plug type connection) shall be set to provide a line level (commercial). adjusted for a typical talker at the pulpit, while chapel slider is in its default position.

END OF SECTION

SECTION 27 4124 TELEVISION WALL MOUNTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Furnish and install TV wall mount as described in Contract Documents.

1.02 RELATED REQUIREMENTS

- A. Section 01 3000 - Administrative Requirements: Submittal procedures, project meetings, progress schedules and documentation, reports, coordination.
- B. Section 06 1000 - Rough Carpentry for wall blocking and installation of television wall mounts.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Action Submittals:
 - 1. Product Data:
 - a. Provide Manufacturer's written installation instructions.

PART 2 PRODUCTS

2.01 MANUFACTURED UNITS

- A. TV Wall Mounts:
 - 1. Description:
 - a. Large Flat Panel TV Swing Arm Wall Display Mount allowing for perfect display placement and ideal viewing from any angle and remains low-profile in home position.
 - 2. Design Criteria:
 - a. Adjustable tilt mechanism.
 - b. Mounting system secures flat panel to mount.
 - c. Typical Screen Sizes: 65 inch (1 067 mm to 71 inch (1 803 mm).
 - d. UL Listed.
 - e. Weight Capacity: 200 lbs (90 kg).
 - 3. General:
 - a. Lateral shift: 9 inch (230 mm).
 - b. Manual Height Adjustment: 1 inch (25 mm).
 - c. Maximum Extension: 37 inch (940 mm) extension.
 - d. Minimum Depth: 3.4 inch (86.4 mm).
 - e. Mounting Pattern Compatibility (Universal Versions): 200 x 200mm - 862 x 517mm.
 - f. Orientation: landscape and portrait.
 - g. Overall Dimensions 22 inches (559 mm) high x 39.5 inches (940 mm) wide x 3.4 inches (86 mm) deep.
 - h. Tilt: +5 deg, -16 deg.
 - 4. Color: Black.
 - 5. Acceptable Products:
 - a. PDRUB / PDR Series Large Flat Panel Swing Arm Wall Display Mount - 37 inch extension by Chief (Division of Milestone AV Technologies), Eden Prairie, Minnesota www.milestone.com.
 - b. Equals as approved by Architect before bidding. See Section 01 6200.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions:
 - 1. Verify wall blocking in stud wall is in correct location for mounting TV Wall Mount before beginning installation.

3.02 INSTALLATION

- A. Installing TV Wall Mount to Wall:
 - 1. Follow Manufacturer's written installation instructions for anchoring to wall.
 - 2. Install Mount so that top of TV is 3 inch (76 mm) minimum from ceiling.
 - 3. Install at locations shown on Contract Drawings.

END OF SECTION

SECTION 28 3101**FIRE DETECTION AND ALARM SYSTEM****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install fire alarm and detection system as described in Contract Documents.
 - 2. Furnish and install raceway, cable and conductors, boxes, and miscellaneous items necessary for complete system.
- B. Products Furnished But Not Installed Under This Section:
 - 1. Door Plates for door hold / release devices.
- C. Related Requirements:
 - 1. Division 26: Quality of and installation standards for wiring, raceway, conduit, and boxes.

1.2 REFERENCES

- A. Reference Standards:
 - 1. National Fire Protection Association:
 - a. NFPA 72, 'National Fire Alarm and Signaling Code' (2019 or most recent edition adopted by AHJ).
 - 2. Underwriters Laboratories:
 - a. UL 268, 'Smoke Detectors for Fire Alarm Systems'.
 - b. UL 464, 'Audible Signal Appliances'.
 - c. UL 521, 'Heat Detectors for Fire Protective Signaling Systems'.
 - d. UL 864, 'Control Units and Accessories for Fire Alarm Systems'.
 - e. UL 1480, 'Speakers for Fire Alarm, Emergency, and Commercial and Professional'.
 - f. UL 1481, 'Power Supplies for Fire-Protective Signaling Systems'.
 - g. UL 1971, 'Standard for Signaling Devices for the Hearing Impaired'.

1.3 SUBMITTALS

- A. Action Submittals:
 - 1. Shop Drawings:
 - a. Prepared by authorized factory representative and including:
 - 1) Single line diagram of actual system. Typical riser diagrams are not acceptable.
 - 2) Complete wiring diagrams.
 - 3) Manufacturer's original catalog data and descriptive information on each piece of equipment to be used.
- B. Informational Submittals:
 - 1. Certificates:
 - a. Certificate of completion, from Manufacturer's Representative, in accordance with NFPA 72 requirements.
 - 2. Qualification Statement:
 - a. Installer:
 - 1) Provide NICET Certification documentation.
- C. Closeout Submittals:
 - 1. Include following information in Operations And Maintenance Manual specified in Section 01 7800:

- a. Operations and Maintenance Data:
 - 1) Provide operating and maintenance instructions for each item of equipment submitted under Product Data.
 - 2) Provide instruction manual from Manufacturer that explains what is to be done in event of various indications.
- b. Record Documentation:
 - 1) Include copy of approved shop drawings.

1.4 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. System shall meet approval of authority having jurisdiction (AHJ). NEC and local ordinances and regulations shall govern unless more stringent requirements are specified.
 - 2. Equipment, devices, and cable shall be UL or Factory Mutual listed for use in fire alarm systems.
- B. Qualifications:
 - 1. Installer:
 - a. Project Forman or Person in Charge at all times to be NICET Level III Certified for work performed by this Section.
 - b. Provide Certificate documentation before installation.

PART 2 - PRODUCTS

2.1 SYSTEMS

- A. Manufacturers:
 - 1. Type One Acceptable Manufacturers:
 - a. Fire-Lite Alarms, Northford, CT www.firelite.com.
- B. Performance:
 - 1. Design Criteria:
 - a. Automatic fire alarm system consisting of control panel, power supplies, alarm initiating devices, notification appliances, and off-site communicating devices. System shall be non-coded and addressable, and monitored for integrity of conductors.
 - b. Class B initiating device circuits and Class B notification appliance circuits including end-of-line devices.
 - c. Equipment and accessories furnished under this Specification shall be standard products of single manufacturer, or include written statement by Control Panel Manufacturer confirming compatibility of components and inclusion of these components under system warranty.
- C. Operation:
 - 1. Operation Sequences:
 - a. Operation of manual station or automatic activation of any smoke detector, heat detector, or sprinkler flow device shall:
 - 1) Cause system notification appliances to operate.
 - 2) Indicate zone in alarm on control panel.
 - 3) Initiate off-site alarm notification system.
 - b. System shall return to normal when operated device is returned to normal and control panel is manually reset, except alarms may be silenced as specified below.
 - c. Alarm may be silenced by switch in control panel.
 - 1) Ring Back Feature: When silenced, this shall not prevent the resounding of subsequent alarms if another zone should alarm.
 - d. When alarms are silenced, zone indicating red LEDs on control panel and remote annunciator shall remain indicated until operated device is returned to normal and control panel is manually reset.

- e. Green pilot LED, or other visual annunciation, shall normally be on indicating that system is receiving normal power. In addition, failure of normal power shall be annunciated.
 - f. Trouble alarm and annunciation, operating together, shall signal trouble condition. Following conditions shall signal trouble condition:
 - 1) Failure of normal power.
 - 2) Opens or short circuits on indicating circuits.
 - 3) Disarrangements in system wiring.
 - 4) Control panel circuit board removal.
 - 5) Ground faults.
 - 6) Trouble silencing switch shall silence trouble alarm, but visual annunciation shall remain on until system is restored to normal. As ring-back feature, trouble alarm shall resound as reminder to return silencing switch to normal position.
 - g. Supervisory LED, separate from trouble LED, and alarm, operating together, shall signal operation of supervisory device, such as control valve tamper, low air pressure, and low temperature switches. Alarm silence switch shall operate in same manner as trouble alarm.
- D. Components:
- 1. Control Panel:
 - a. Control panel is existing.
 - b. Audible Horn Alarm Annunciation:
 - 1) Provide separate and distinct alarm signals for alarm and trouble conditions.
 - 2) Alarm signal shall also operate strobe lights, if specified.
 - 3) Provide alarm silence switches at control panel.
 - 4) Trouble alarm shall be horn integral to control panel.
 - 5) Supervisory alarm may be same audible alarm as trouble alarm, but with separate visual annunciation.
 - 2. Off-Site Alarm Notification System:
 - a. Provide one (1) analog telephone lines to fire alarm control panel.
 - b. Install, program and connect cellular communication device furnished by Owner. Coordinate with Owner at least four (4) weeks in advance for equipment delivery.
 - c. Provide dialer system equipment and programming compatible with Owner selected monitoring service (refer to alarm.ldschurch.org for details).
 - d. Owner will arrange for monitoring connection contract.
 - e. Communicator device shall transmit all zone identification, device identification alarm identification, and all other signals available at panel to Owner's Central Station using standard contact ID codes.
 - f. Phone Dialer device shall be of same manufacturer as Fire Alarm Panel or shall be supplied, approved and tested by Fire Alarm Panel Manufacturer.
 - 3. Alarm Initiating Devices:
 - a. Smoke Detectors:
 - 1) Photoelectric type.
 - 2) Listed under UL Standard 268.
 - 3) Provide visual indication of alarm on unit.
 - b. Heat Detectors:
 - 1) Non-settable 135 deg F (57 deg C) fixed temperature.
 - 2) Provide visible indication that device has operated.
 - 3) Listed under UL Standard 521.
 - c. Carbon monoxide (CO) Detection:
 - 1) Carbon monoxide detectors shall meet UL 217, UL 2075 and UL 2034.
 - 2) Detectors shall be addressable
 - 3) Combination heat/CO sensors are acceptable
 - 4) Combination smoke/CO sensors are acceptable
 - 5) Provide devices compatible with the control unit.
 - 6) Device shall be provided with a from C relay.
 - d. Strobe Only:
 - 1) Wall or ceiling mounted flush or semi-flush.
 - 2) Integrally mounted flashing light unit with block letters 'FIRE.' Adjustable light intensity of 15-110 candela and flash rate between one and three Hertz.
 - 3) Listed under UL Standard 1971.
 - e. Combination Horn / Strobe:

- 1) Wall or ceiling mounted flush or semi-flush.
 - 2) Non-coded audible output of 90 dB minimum at 10 feet (3 meters).
 - 3) Integrally mounted flashing light unit with block letters 'FIRE.' Minimum light intensity of 15 candela and flash rate between one and three Hertz.
 - 4) Listed under UL Standard 464 and UL Standard 1971.
4. Cables And Wiring:
- a. Comply with NEC Article 760.
 - b. Jacket and insulation color shall be red.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install fire alarm and detection systems as indicated, in accordance with Equipment Manufacturer's written instructions, and complying with applicable portions of NEC, NFPA, and NECA's 'Standard of Installation'.
1. Mounting Heights:
 - a. Unless otherwise indicated, mount center of outlets or boxes at following heights above finish floor:
 - 1) Control Panel: 72 inches (1 800 mm) to top.
 - 2) Wall-Mounted Horn / Strobe: 80 inches (2 1032 mm). 6 inches (150 mm) below ceiling, whenever ceiling is below 80 inches (2 1032 mm).
 - 3) Wall-Mounted Strobe: 80 inches (2 1032 mm). 6 inches (150 mm) below ceiling, whenever ceiling is below 80 inches (2 1032 mm).
 - 4) Manual pull stations: 48 inches (1 200 mm).
 - 5) Remote annunciator panel: 60 inches (1 500 mm).
 2. Locate fire alarm manual stations 24 inches (600 mm) minimum away from any light switch.
- B. Identification:
1. Label zone indicators on control unit indicating location and type of initiating device, i.e., CORRIDOR SMOKE, VALVE TAMPER, AIR SYSTEM SMOKE, etc. Labels shall be engraved plastic laminate, or other permanent labeling system as supplied by Control Unit Manufacturer.
 2. Post copy of wire identification list inside fire alarm panel door or other area accessible to fire alarm service personnel.
 3. Print location of circuit disconnecting means inside panel.
- C. Conductors:
1. Install conductors in conduit per NEC requirements.
 2. Fire alarm system conductors from different zones may be combined in common conduit. Make certain that raceway size and wire quantity, size, and type is suitable for equipment supplied and is within NEC standards. Label pull and junction boxes 'FIRE ALARM.'
 3. Loop wires through each device on zone for proper supervision. Tee-taps not permitted.
 4. Minimum conductor size shall be 14 AWG unless otherwise specified.
- D. Do not install ceiling mounted detectors within 36 inches (900 mm) of air discharge grilles. Do not install manual fire alarm boxes within 24 inches (610 mm) of light switches. Coordinate with other trades as required.

3.2 FIELD QUALITY CONTROL

- A. Field Tests:
1. Provide factory-trained representative to perform complete system testing in presence of Owner's representative and local fire department personnel upon completion of installation.
 - a. Test each initiating and annunciating device for proper operation, except fixed temperature heat detectors.
 - b. Test operation of trouble annunciation on each circuit.

- c. Perform complete testing of control panel functions including off-site monitoring.

3.3 CLOSEOUT ACTIVITIES

- A. Instruction Of Owner:
 - 1. Instruct Owner's Representative in proper operation and maintenance procedures.

3.4 PROTECTION

- A. Provide dust protection for installed smoke detectors until finish work is completed and building is ready for occupancy.
- B. Protect conductors from cuts, abrasion and other damage during construction.

END OF SECTION

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**SECTION 31 2316
EXCAVATION AND TRENCHING**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Excavating for new underground utilities within the building.

1.02 RELATED REQUIREMENTS

- A. Section 31 0500 - Common Earthwork Requirements.
- B. Section 31 2323 - Fill and Aggregate Base: Fill materials, backfilling, and compacting.
- C. Performance of excavating inside of building required for electrical and mechanical work is responsibility of respective Section doing work unless arranged differently by Contractor.

PART 2 PRODUCTS - NOT USED**PART 3 EXECUTION****3.01 EXAMINATION**

- A. Verification Of Conditions:
 - 1. Carefully examine site and available information to determine type soil to be encountered.
 - 2. Discuss problems with Architect before proceeding with work.

3.02 PREPARATION

- A. Locate, identify, and protect utilities that remain and protect from damage.
- B. Contact Architect immediately upon discovery of undocumented utilities.

3.03 PERFORMANCE

- A. Interface With Other Work:
 - 1. See Section 31 2323 for subgrade preparation at general excavations.
- B. Excavate to accommodate new structures and construction operations.
 - 1. Excavate to the specified elevations.
 - 2. Excavate to the length and width required to safely install, adjust, and remove any forms, bracing, or supports necessary for the installation of the work.
 - 3. Cut utility trenches wide enough to allow inspection of installed utilities.
 - 4. Hand trim excavations. Remove loose matter.
- C. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
- D. Provide temporary means and methods, as required, to remove all water from excavations until directed by Architect. Remove and replace soils deemed suitable by classification and which are excessively moist due to lack of dewatering or surface water control.
- E. Utility Trenches:
 - 1. Unless otherwise indicated, excavation shall be open cut. Short sections of trench may be tunneled if pipe or duct can be safely and properly installed and backfill can be properly tamped in tunnel sections and if approved by Architect.
 - 2. Excavate to proper alignment, depth, and grade. Excavate to sufficient width to allow adequate space for proper installation and inspection of utility piping.
 - 3. If trenches are excavated deeper than required, backfill until trench bottom is proper depth with properly compacted native material.
 - 4. Pipe 4 inches in Diameter or Larger:
 - a. Grade bottom of trenches to provide uniform bearing and support for each section of pipe on undisturbed soil at every point along its length.
 - b. Except where rock is encountered, take care not to excavate below depths indicated.
 - 1) Where rock excavations are required, excavate rock with minimum over-depth of 4 inches below required trench depths.

- 2) Backfill over-depths in rock excavation and unauthorized over-depths with loose, granular, moist earth, thoroughly compacted.
- c. Whenever wet or unstable soil incapable of properly supporting pipe, as determined by Architect, occurs in bottom of trench, remove soil to depth required and backfill trench to proper grade with coarse sand, fine gravel, or other suitable material acceptable to Architect.

3.04 REPAIR

- A. Repair damage to other portions of the Work resulting from work of this Section at no additional cost to Owner. Arrange for damage to be repaired by original installer.
- B. Correct areas that are over-excavated and load-bearing surfaces that are disturbed; see Section 31 2323.

3.05 CLEANING

- A. Stockpile excavated material to be re-used in area designated on site in accordance with Section 31 2200.
- B. Remove excavated material that is unsuitable for re-use from site.
- C. Remove excess excavated material from site.

END OF SECTION

**SECTION 31 2323
FILL AND AGGREGATE BASE**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Filling, backfilling, and compacting for new utilities within the building.
- B. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.
- C. Lightweight (Flowable) concrete fill (option for backfilling of piping systems and other utilities)
- D. Aggregate Base

1.02 RELATED REQUIREMENTS

- A. Section 31 2316 - Excavation and Trenching: Removal and handling of soil to be re-used.

1.03 REFERENCE STANDARDS

- A. ASTM C150/C150M - Standard Specification for Portland Cement 2022.
- B. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete 2018.
- C. ASTM C796/C796M - Standard Test Method for Foaming Agents for Use in Producing Cellular Concrete Using Preformed Foam 2019.
- D. ASTM D1883 - Standard Test Method for California Bearing Ratio (CBR) of Laboratory-Compacted Soils 2016.
- E. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System) 2017, with Editorial Revision (2020).
- F. ASTM D6817/D6817M - Standard Specification for Rigid Cellular Polystyrene Geofoam 2017 (Reapproved 2021).
- G. ASTM D7557/D7557M - Standard Practice for Sampling of Expanded Polystyrene Geofoam Specimens 2009 (Reapproved 2021).
- H. ASTM E1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs 2018a.

1.04 DEFINITIONS

- A. Lightweight (Flowable) Concrete Fill:
 - 1. Self-leveling and self-compacting, cementitious material.
 - 2. Unconfined compressive strength of less than 150 psi.
 - 3. Cementitious slurry consisting of mixture of fine aggregate of filler, water and cementitious materials, which is used as fill or backfill in lieu of compacted earth. This material is capable of filling all voids in irregular excavations and hard to reach places (such as under undercuts of existing slabs), is self-leveling, and hardens in a matter of a few hours without need for compacting in layers. Lightweight (Flowable) concrete fill is sometimes referred to as excavatable flowable fill, controlled density fill, controlled low strength material, lean concrete slurry, and unshrinkable fill. Flowable fill is not concrete nor used to replace concrete. It is intended to contain low cementitious content for reduced strength development.
- B. Reclaimed Asphalt Pavement (RAP): Existing asphalt mixture that has been pulverized, usually by milling, and is used like an aggregate in recycling of asphalt pavements.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Mix design for Lightweight (Flowable) Concrete Fill.
- C. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used, including manufactured fill.

- D. Compaction Density Test Reports.
- E. Lightweight (Flowable) Concrete Fill Test Reports.
- F. Testing Agency Qualification Statement.

1.06 ADMINISTRATIVE REQUIREMENTS

- A. Participate in pre-installation meeting as specified in Section 31 0500.

1.07 QUALITY ASSURANCE

- A. Testing and Inspection:
 - 1. Owner will provide Testing and Inspection for fill and aggregate base:
 - a. Owner is responsible for Quality Assurance. Quality assurance performed by Owner will be used to validate Quality Control performed by Contractor.
 - 2. Owner will employ testing agencies to perform testing and inspection for aggregate base as specified in Field Quality Control in Part 3 of this specification.
 - a. Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform the Work in strict accordance with requirements of Contract Documents and perform contractor testing and inspection.
- B. Designer Qualifications: Perform design of structural fill under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
- C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.
- D. Scheduling:
 - 1. Allow special inspector to review all subgrades and excavations to determine if site has been prepared in accordance with geotechnical evaluation report prior to placing any fill or aggregate base (or concrete).
 - 2. Notify Testing Agency and Architect seventy-two (72) hours minimum before installation of fill or aggregate base to perform proctor and plasticity index tests on proposed fill, aggregate base or subgrade.
 - 3. Notify Testing Agency and Architect twenty-four (24) hours minimum before installation of fill or aggregate base to allow inspection.
 - 4. Allow Inspection and Testing Agency to inspect and test subgrades and each fill and aggregate base layer. Proceed with subsequent earthwork only after inspections and test results for prior compacted work comply with requirements.
 - 5. Interior slab-on-grade concrete:
 - a. Notify Architect twenty-four (24) hours minimum before installation of concrete to allow inspection of vapor retarder installation.
 - b. Notify Testing Agency and Architect twenty-four (24) hours minimum before installation of interior concrete slabs to allow inspection of aggregate base.
 - c. Allow special inspector to review all subgrades and excavations to determine if building pad has been prepared in accordance with geotechnical report prior to placing any aggregate base.
 - 6. Notify Testing Agency and Architect twenty-four (24) hours minimum before placing concrete for exterior site work concrete (sidewalks, curbs, gutters), footings, foundation walls, and building slabs to allow inspection of aggregate base.
 - 7. Paving:
 - a. Notify Testing Agency and Architect twenty-four (24) hours minimum before placing aggregate base to allow inspection of aggregate base.

PART 2 PRODUCTS

2.01 FILL MATERIALS

- A. General Fill: Subsoil excavated on-site.
 - 1. Graded.

2. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.
 3. Complying with ASTM D2487 Group Symbol CL.
- B. Fill:
1. Well graded material conforming to ASTM D2487 free from debris, organic material, frozen materials, brick, lime, concrete, and other material which would prevent adequate performance of backfill.
 - a. Under Building Footprint And Paved Areas: Fill shall comply with soil classification groups GW, CL, GP, GM, SW, SP, or SM. Fill may not contain stones over 6 inches diameter and ninety-five (95) percent minimum of fill shall be smaller than 1-1/2 inch in any direction.
 - b. Under Landscaped Areas:
 - 1) Fill more than 36 inches below finish grade shall comply with soil classification groups GW, CL, GP, GM, SW, SP, or SM. Fill may not contain stones over 6 inches (150 mm) diameter and ninety (90) percent minimum of fill shall be smaller than 1-1/2 inch in any direction.
 - 2) Fill less than 36 inches below finish grade shall comply with soil classification groups SW, SP, SM, or SC. Fill may not contain stones larger than 1-1/2 inches in any direction and ninety (90) percent minimum of fill shall be smaller than 3/8 inch in any direction.
- C. Engineered Fill:
1. Structural Fill: Subsoil excavated on-site.
 - a. Graded.
 - b. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.
 - c. Complying with ASTM D2487 Group Symbol CL.
- D. Lightweight (Flowable) Concrete Fill:
1. Finished Properties, Class II Engineered Fill:
 - a. Cast Density, Maximum: 30 pounds per cubic foot.
 - b. Compressive Strength, Minimum: 41 pounds per square inch.
 2. Materials:
 - a. Cement: ASTM C150/C150M.
 - b. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.
 - c. Admixtures: As recommended by lightweight (flowable) concrete fill manufacturer.
 - d. Expansion Material: Manufacturer's recommended expansion material.
 - e. Mix Design: By manufacturer.
- E. Aggregate Base:
1. Under Interior Concrete Slab-On-Grade:
 - a. New Aggregate Base:
 - 1) Gravel: 3/4 inch minimum to one inch maximum well-graded, clean gravel or crushed rock.
 - 2) Base type gravel or crushed rock, graded by weight (three-quarter to one-inch clean gap-graded gravel); road Base type gravel or crushed stone (slag not allowed). Conform to the following gradation:

(a)	Sieve	Percent of Weight Passing
(1)	2 inch (50.0 mm)	100
(2)	1 1/2 inch (38.0 mm)	85 - 100
(3)	1 inch (25.4 mm)	100
(4)	3/4 inch (19.0 mm)	80 - 90
(5)	1/2 inch (12.7 mm)	20 - 40
(6)	3/8 inch (9.5 mm)	5 - 10
(7)	No. 4 (4.750 mm)	0 - 12
- F. Source Quality Control

1. See Section 01 4000 - Quality Requirements, for general requirements for testing and analysis of soil material.
2. Where fill materials are specified by reference to a specific standard, test and analyze samples for compliance before delivery to site.
3. If tests indicate materials do not meet specified requirements, change material and retest.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Identify required lines, levels, contours, and datum locations.
- B. Verify areas to be filled are not compromised with surface or ground water.

3.02 PREPARATION

- A. Before placing fill, aggregate base, or finish work, prepare existing subgrade as follows:
 1. Under Building Slab, Equipment Pad, Under Driveways, Parking, Under Miscellaneous Concrete Site Elements And Outside Face of Foundation Wall Areas:
 - a. Do not place fill or aggregate base over frozen subgrade.
 - b. Moisture condition to uniform moisture content of between optimum and four (4) percent over optimum, and mechanically compact 6 inches deep to ninety-five (95) percent minimum of relative compaction.
 - c. Finish grade to grades required by Contract Documents.
- B. Aggregate Base:
 1. Do not perform work during unfavorable conditions as specified below:
 - a. Presence of free surface water.
 - b. Over-saturated sub base materials.
- C. Vapor Retarder under Interior Concrete Slab-on-Grade:
 1. Unacceptable conditions for installation include presence of high winds which would tear or damage vapor retarder.
- D. Compact subgrade to density equal to or greater than requirements for subsequent fill material.
- E. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

3.03 PERFORMANCE

- A. Interface With Other Work:
 1. Section 31 2200 - Grading for rough grading and preparation of natural soil subgrades below fill and aggregate base materials.
 2. Section 31 2200 - Grading for grading of subgrade below aggregate base and topsoil.
 3. Do not place fill or aggregate base material when subgrade is frozen or unstable.
 4. Remove all standing water before placing fill or aggregate base material.
- B. Fill:
 1. General:
 - a. Before backfilling, show utility and service lines being covered on record set of Drawings. Do not backfill until utilities involved have been tested and approved by Architect and until instructed by Architect.
 - b. Around Buildings And Structures: Slope grade away from building as specified unless noted otherwise in Contract Drawings. Hand backfill when close to building or where damage to building might result.
 - c. Do not use puddling or jetting to consolidate fill areas.
- C. Compacting:
 1. Fill And Aggregate Base:
 - a. Under Interior Concrete Slabs on Grade:
 - 1) Fill:
 - (a) Place in 8 inch maximum uncompacted layers, moisture condition to plus or minus two (2) percent of optimum moisture content and mechanically

- compact to ninety-five (95) percent minimum of maximum laboratory density as established by ASTM D1157.
- 2) Aggregate Base:
 - (a) Place 4 inches minimum of aggregate base under vapor retarder, level, and mechanically compact to ninety-five (95) percent minimum of maximum laboratory density as established by ASTM D1157.
 - 3) Vapor Retarder:
 - (a) Install vapor retarder in accordance with ASTM E1643 except where Contract Documents indicate otherwise and following instructions:
 - (1) Install vapor retarder over aggregate base over compacted subgrade so entire area under slab is covered.
 - (2) Install vapor retarder in accordance with ASTM E1643 at interior stem walls.
 - (b) Lap joints 6 inches (150 mm) minimum and seal with specified seam tape.
 - (1) Seal vapor retarder around pipes, conduits, and other utility items that penetrate vapor retarder using factory-fabricated boot installed as recommended by Manufacturer.
 - (2) Except for punctures required for reinforcing and anchor bolts at top of stem walls, seal tears and punctures.
2. Utility Trenches:
- a. Under Miscellaneous Slabs:
 - 1) Fill:
 - (a) Place in 6 inch maximum uncompacted layers, moisture condition to plus or minus two (2) percent of optimum moisture content, and compact to ninety-five (95) percent minimum relative compaction to within 4 inches of finish grade.
 - 2) Aggregate Base:
 - (a) Place 4 inches minimum of aggregate base, level, and compact. as specified in Part 3.
 3. Other Backfills: Place other fills in 12 inch maximum uncompacted layers and compact to ninety-five (95) percent relative compaction.
 4. Loose material from compacted subgrade surface shall be immediately removed before placing compacted fill or aggregate base course.
- D. Fill to contours and elevations indicated using unfrozen materials.
- E. Employ a placement method that does not disturb or damage other work.
- F. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
- G. Maintain optimum moisture content of fill materials to attain required compaction density.
- H. Maintain temporary means and methods, as required, to remove all water while fill is being placed as required, or until directed by the Architect. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.

3.04 LIGHTWEIGHT (FLOWABLE) CONCRETE FILL

- A. Install lightweight concrete fill according to manufacturer's written instructions.
- B. Use batching, mixing, and placing equipment approved by the manufacturer.
- C. Prevent segregation of material.
- D. Tolerance: Finished surface within 2 inches of elevation indicated on drawings.

3.05 FILL AT SPECIFIC LOCATIONS

- A. Use general fill unless otherwise specified or indicated.
- B. Over Subdrainage Piping at Foundation Perimeter and Under Slabs:

1. Cover drainage fill with general fill.
2. Fill up to subgrade elevation.
3. Compact to 95 percent of maximum dry density.

3.06 TOLERANCES

- A. Top Surface of General Filling: Plus or minus 1 inch from required elevations.
- B. Paving Areas:
 1. Survey and stake parking surfaces to show grading required by Contract Drawings.
 2. Subgrade (soil below aggregate base):
 - a. Prepare natural soil subgrade or fill.
 3. Aggregate Base:
 - a. Finish grade parking surface are to grades as required by Contract Drawings.
 - 1) 0.00 inches high and no more than 1/2 inch low.
 - b. Measure using string line from curb to curb, gutter, flat drainage structure, or grade break.
 - c. Finished aggregate base course shall be true to line and grade within plus or minus 1/4 inch in 10 feet.
 - d. Maximum variation from required grades shall be 1/10 of one foot.

3.07 REPAIR / RESTORATION

- A. Repair damage to other portions of the Work resulting from work of this Section at no additional cost to Owner. On new work, arrange for damage to be repaired by original installer.

3.08 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection and testing.
- B. Field Tests and Inspections:
 1. Field tests and inspections and laboratory testing are provided by Owner's independent Testing Agency as specified in Section 01 4523.
 - a. Quality Control is sole responsibility of Contractor:
 - 1) Owner's employment of an independent Testing Agency does no relieve Contractor of Contractor's obligation to perform testing and inspection as part of his Quality Control:
 - (a) Testing and inspections, if performed by Contractor, will be responsibility of Contractor to be performed by an independent entity.
 2. Fill/Engineered Fill:
 - a. Testing Agency shall provide testing and inspection for fill.
 - b. Number of tests may vary at discretion of Architect.
 - c. Testing Agency is to provide one (1) moisture-maximum density relationship test for each type of fill material.
 - d. Prior to placement of engineered fill, inspector shall determine that site has been prepared in accordance with geotechnical evaluation report.
 - e. Footing sugrade: At footing subgrades, inspector is to verify that soils confor to geotechnical evaluation report.
 - f. Testing Agency will test compaction of soils according to ASTM D1556/D1556M, ASTM D2167, and ASTM D6938 as applicable. Lift thicknesses shall comply with geotechnical evaluation report. Inspector shall determine that in-place dry density of engineered fill material complies with geotechnical evaluation report. Tests will be performed at following locations and frequencies:
 - 1) Paved Areas: At each compacted fill and backfill layer, at least one (1) test for every 10,000 sq. ft. or less of paved areas but in no case less than three (3) tests.

- 2) Building Slab Areas: At each compacted fill and backfill layer, at least one (1) test for every 2,500 sq. ft. or less of building slab area but in no case less than three (3) tests.
 - 3) Trench Backfill: At each 12 inch compacted lift for each 100 linear feet or less of trench length but no fewer than two (2) tests.
 3. Aggregate Base:
 - a. Interior slab-on-grade concrete areas:
 - 1) Testing Agency shall provide testing and inspection for interior aggregate base.
 - 2) Number of tests may vary at discretion of Architect.
 - 3) Testing Agency will test compaction of base in place according to ASTM D1556/D1556M, ASTM D2167, and ASTM D6938, as applicable. Tests will be performed at following frequency:
 - (a) Building Slab Areas: One test for every 2,500 sq. ft. (232 sq. m) or less of building slab area but no fewer than three tests.
 - C. Lightweight (Flowable) Concrete Fill:
 1. Sampling: During initial placement, take four 3 inch by 6 inch3 inch by 6 inch test specimens per 303 cubic yards of material placed or for each four hours of placement work.
 2. Testing: Provide third-party testing of samples in accordance with ASTM C796/C796M except do not oven-dry load-test specimens.

3.09 PROTECTION

- A. Interior Slab-On-Grade Concrete:
 1. Vapor Retarder:
 - a. Do not allow water onto vapor retarder or aggregate base before placing concrete.
 - b. Protect membrane from possible punctures caused by reinforcing bar supports before placing concrete.

3.10 CLEANING

- A. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.
- B. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

END OF SECTION

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