

project manual

THE CHURCH OF
JESUS CHRIST
OF LATTER-DAY SAINTS

Harrisville DI Welfare DI Utah North

435 North Wall Ave. - Harrisville, UT

Project Number: 500021624010101



bradley gygi architect & associates, pllc

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mechanical engineer

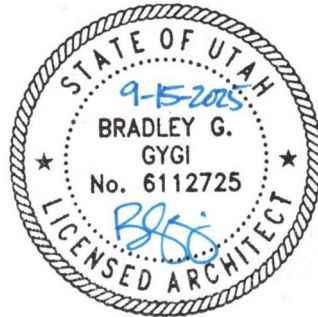
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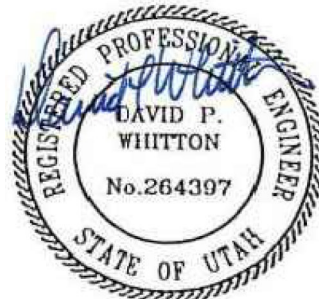
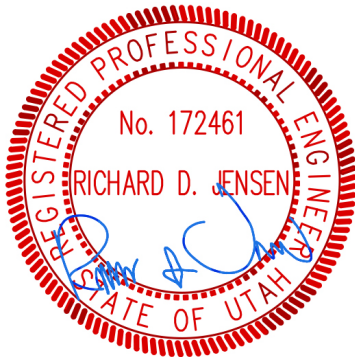
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INTRODUCTORY INFORMATION

B L A N K P A G E

TABLE of CONTENTS

PROCUREMENT AND CONTRACTING REQUIREMENTS GROUP

INTRODUCTORY INFORMATION

PROJECT TITLE PAGE
SEALS PAGE
TABLE OF CONTENTS

DIVISION 00: PROCUREMENT AND CONTRACTING REQUIREMENTS

PROCUREMENT REQUIREMENTS SUBGROUP

00 1000 SOLICITATION

INVITATION TO BID

00 2000 INSTRUCTIONS FOR PROCUREMENT

INSTRUCTIONS TO BIDDERS

00 3000 AVAILABLE INFORMATION

INFORMATION AVAILABLE TO BIDDERS
GEOTECHNICAL DATA
ASBESTOS-CONTAINING MATERIAL

00 4000 PROCUREMENT FORMS AND SUPPLEMENTS

BID FORM

00 4500 REPRESENTATIONS AND CERTIFICATIONS

CONSTRUCTION MATERIAL ASBESTOS REPRESENTATION

CONTRACTING REQUIREMENTS SUBGROUP

00 5000 CONTRACTING FORMS AND SUPPLEMENTST

SAMPLE SMALL PROJECT AGREEMENT BETWEEN OWNER AND CONTRACTOR (US)

00 7000 CONDITIONS OF THE CONTRACT

SUPPLEMENTARY CONDITIONS FOR SMALL PROJECT AGREEMENT BETWEEN OWNER AND CONTRACTOR (US)

SPECIFICATIONS GROUP

GENERAL REQUIREMENTS SUBGROUP

DIVISION 01: GENERAL REQUIREMENTS

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

FACILITY CONSTRUCTION SUBGROUP

DIVISION 02: NOT USED

DIVISION 03: CONCRETE

03 1000 CONCRETE FORMING AND ACCESSORIES

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

03 2000 CONCRETE REINFORCING

03 2100 REINFORCEMENT BARS

03 3000 CAST-IN-PLACE CONCRETE

03 3111 CAST-IN-PLACE STRUCTURAL CONCRETE
03 3543 POLISHED CONCRETE FINISHING
03 3923 MEMBRANE CONCRETE CURING

03 6000 GROUTING

03 6213 NON-METALLIC NON-SHRINK GROUT

DIVISION 04: MASONRY

04 0500 COMMON WORK RESULTS FOR MASONRY

04 0501 COMMON MASONRY REQUIREMENTS
04 0513 CEMENT AND LIME MASONRY MORTARING
04 0516 MASONRY GROUTING
04 0519 MASONRY ANCHORS AND INSERTS
04 0520 MASONRY REINFORCING

04 2000 UNIT MASONRY

04 2223 ARCHITECTURAL CONCRETE UNIT MASONRY

DIVISION 05: METALS

05 0500 COMMON WORK RESULTS OF METALS

05 0503 SHOP-APPLIED METAL COATINGS

05 0523 METAL FASTENINGS

05 1000 STRUCTURAL METAL FRAMING

05 1223 STRUCTURAL STEEL FOR BUILDINGS

05 3000 METAL DECKING

05 3123 STEEL ROOF DECKING

05 4000 COLD-FORMED METAL FRAMING

05 4010 COLD-FORMED LOAD-BEARING METAL FRAMING

DIVISION 06: WOOD, PLASTICS, AND COMPOSITES

06 1000 ROUGH CARPENTRY

06 1011 WOOD FASTENINGS

06 1100 WOOD FRAMING

06 2000 FINISH CARPENTRY

06 2001 COMMON FINISH CARPENTRY REQUIREMENTS

06 2024 DOOR, FRAME, AND FINISH HARDWARE INSTALLATION

06 2210 MISCELLANEOUS WOOD TRIM

06 4000 ARCHITECTURAL WOODWORK

06 4001 COMMON ARCHITECTURAL WOODWORK REQUIREMENTS

06 4512 ARCHITECTURAL WOODWORK WOOD TRIM INSTALLATION

DIVISION 07: THERMAL AND MOISTURE PROTECTION

07 2000 THERMAL PROTECTION

07 2116 BLANKET INSULATION

07 2616 BELOW-GRADE VAPOR RETARDERS

07 5000 MEMBRANE ROOFING

07 5419 POLYVINYL-CHLORIDE ROOFING: PVC

07 9000 JOINT PROTECTION

07 9213 ELASTOMERIC JOINT SEALANTS

07 9219 ACOUSTICAL JOINT SEALANTS

DIVISION 08: OPENINGS

08 0100 OPERATION AND MAINTENANCE OF OPENINGS

08 0601 HARDWARE GROUP AND KEYING SCHEDULES

08 1000 DOORS AND FRAMES

08 1213 HOLLOW METAL FRAMES

08 1313 HOLLOW METAL DOORS

08 1429 FLUSH WOOD DOORS: FACTORY-FINISHED, CLEAR

08 3000 SPECIALTY DOORS AND FRAMES

08 3323 OVERHEAD COILING DOORS

08 3819 RIGID TRAFFIC DOORS

08 7000 HARDWARE

08 7101 COMMON FINISH HARDWARE REQUIREMENTS

08 7102 HANGING DEVICES

08 7103 SECURING DEVICES

08 7106 CLOSING DEVICES

08 7107 PROTECTIVE PLATES AND TRIM

08 7108 STOPS AND HOLDERS

08 7109 ACCESSORIES

DIVISION 09: FINISHES

09 0500 COMMON WORK RESULTS FOR FINISHES

09 0503 FLOORING SUBSTRATE PREPARATION

09 2000 PLASTER AND GYPSUM BOARD

09 2216 NON-STRUCTURAL METAL FRAMING

09 2226 METAL SUSPENSION SYSTEM: GYPSUM BOARD

09 2900 GYPSUM BOARD

09 3000 TILING

09 3013 CERAMIC TILING

09 5000 CEILINGS

09 5113 ACOUSTICAL PANEL CEILINGS

09 5323 METAL ACOUSTICAL SUSPENSION ASSEMBLIES

09 6000 FLOORING

09 6513 RESILIENT BASE AND ACCESSORIES

09 6519 RESILIENT TILE FLOORING

09 6723 RESINOUS FLOORING SYSTEM

09 6816 SHEET CARPET: BACK CUSHION, DIRECT GLUE

09 7000 WALL FINISHES

09 7720 DECORATIVE FIBERGLASS REINFORCED WALL PANELS

09 9000 PAINTS AND COATINGS

09 9001 COMMON PAINTING AND COATING REQUIREMENTS
09 9112 EXTERIOR PAINTED FERROUS METAL
09 9113 EXTERIOR PAINTED GALVANIZED METAL
09 9114 EXTERIOR PAINTED CMU, CONCRETE, STUCCO
09 9122 INTERIOR PAINTED CMU
09 9123 INTERIOR PAINTED GYPSUM BOARD, PLASTER
09 9124 INTERIOR PAINTED METAL
09 9125 INTERIOR PAINTED WOOD
09 9324 INTERIOR CLEAR-FINISHED HARDWOOD
09 9413 INTERIOR TEXTURED FINISHING

DIVISION 10: SPECIALTIES**10 1000 INFORMATION SPECIALTIES**

10 1116 FIXED MARKERBOARDS
10 1495 MISCELLANEOUS INTERIOR SIGNAGE

10 2000 INTERIOR SPECIALTIES

10 2113 METAL TOILET COMPARTMENTS
10 2118 DRESSING COMPARTMENTS: FITTING ROOMS
10 2613 CORNER GUARDS
10 2616 BUMPER GUARDS
10 2813 COMMERCIAL TOILET ACCESSORIES
10 2814 BABY-CHANGING STATION

DIVISIONS 11 THROUGH 19: NOT USED**FACILITY SERVICES SUBGROUP****DIVISION 20: NOT USED****DIVISION 21: FIRE SUPPRESSION****21 1000 WATER-BASED FIRE SUPPRESSION SYSTEMS**

21 1313 WET-PIPE SPRINKLER SYSTEMS

DIVISION 22: PLUMBING**22 0500 COMMON WORK RESULTS FOR PLUMBING**

22 0501 COMMON PLUMBING REQUIREMENTS
22 0529 HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT
22 0553 IDENTIFICATION FOR PLUMBING PIPES AND EQUIPMENT
22 0719 PLUMBING PIPING INSULATION

22 1000 PLUMBING PIPES AND PUMPS

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

22 4000 PLUMBING FIXTURES

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

DIVISION 23: HEATING, VENTILATING, AND AIR-CONDITIONING

23 0500 COMMON WORK RESULTS FOR HVAC

- 23 0501 COMMON HVAC REQUIREMENTS
- 23 0529 HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT
- 23 0713 DUCT INSULATION
- 23 0933 ELECTRIC AND ELECTRONIC CONTROL SYSTEM FOR HVAC

23 3000 HVAC AIR DISTRIBUTION

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

DIVISION 24 & 25: NOT USED

DIVISION 26: ELECTRICAL

26 0500 COMMON WORK RESULTS FOR ELECTRICAL

- 26 0501 COMMON ELECTRICAL REQUIREMENTS
- 26 0519 LINE-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
- 26 0526 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
- 26 0533 RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS
- 26 0613 ELECTRICAL EQUIPMENT MOUNTING HEIGHT SCHEDULE

26 2000 LOW-VOLTAGE ELECTRICAL TRANSMISSION

- 26 2726 WIRING DEVICES

26 5000 LIGHTING

- 26 5100 INTERIOR LIGHTING
- 26 5121 INTERIOR LIGHTING: LED DIMMING DRIVERS
- 26 5200 EMERGENCY LIGHTING

DIVISION 27: NOT USED

DIVISION 28: ELECTRONIC SAFETY AND SECURITY

28 3000 ELECTRONIC DETECTION AND ALARM

- 28 3101 FIRE DETECTION AND ALARM SYSTEM

DIVISION 29: NOT USED

SITE AND INFRASTRUCTURE SUBGROUP

DIVISIONS 30 THROUGH 31: NOT USED

DIVISION 32: EXTERIOR IMPROVEMENTS

32 1000 BASES, BALLASTS, AND PAVING

- 32 1723 PAVEMENT MARKINGS

32 3000 SITE IMPROVEMENTS

- 32 3113 CHAIN LINK FENCES AND GATES

DIVISIONS 33 THROUGH 39: NOT USED

PROCESS EQUIPMENT SUBGROUP

DIVISIONS 40 THROUGH 49: NOT USED

END OF TABLE OF CONTENTS

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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 DI
Welfare DI Utah North
Project Number: 500021624010101

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, Utah North PM Office
435 North Wall St., Ste. D
Ogden, UT 84484

5. CONSULTANT:

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

6. DESCRIPTION OF PROJECT:

- A. Interior remodeling, including sales floor, restrooms, custodian, and conference room, and new lighting and controls throughout the building.
- 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.

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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 DI
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:	500021624010101
Completion Date:	

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

Project Consultant and Principal in Charge (signature)	Date
Company Name	

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

General Contractor (signature)	Date
Company Name	

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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 One Hundred Fifty dollars (\$150.00) 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.

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DIVISION 01

SECTION 01 0000

GENERAL REQUIREMENTS: R&I PROJECT

01 1000 SUMMARY

01 1200 MULTIPLE CONTRACT SUMMARY

01 1400 WORK RESTRICTIONS

01 3000 ADMINISTRATIVE REQUIREMENTS

01 3100 PROJECT MANAGEMENT AND COORDINATION

01 3300 SUBMITTAL PROCEDURES

01 3500 SPECIAL PROCEDURES

01 4000 QUALITY REQUIREMENTS

01 4301 QUALITY ASSURANCE – QUALIFICATIONS

01 4523 TESTING AND INSPECTING SERVICES

01 5000 TEMPORARY FACILITIES AND CONTROLS

01 6100 COMMON PRODUCT REQUIREMENTS

01 6200 PRODUCT OPTIONS

01 6400 OWNER-FURNISHED PRODUCTS

01 6600 DELIVERY, STORAGE, AND HANDLING REQUIREMENTS

01 7000 EXECUTION REQUIREMENTS

01 7400 CLEANING AND WASTE MANAGEMENT

01 7700 CLOSEOUT PROCEDURES

01 7800 CLOSEOUT SUBMITTALS

SECTION 01 1000 SUMMARY

A. Work Covered By Contract Documents:

1. Provisions contained in Division 01 apply to all other sections and divisions of Specifications. All instructions contained in Specifications are directed to Contractor. Unless specifically provided otherwise, all obligations set forth in Specifications are obligations of Contractor.
2. Comply with applicable laws and regulations.

B. Work By Owner:

1. Owner will furnish and install some portions of the Work with its own forces. Complete the Work necessary to accommodate the Work to be performed by Owner before scheduled date for performance of such Work.
2. Owner may provide furnishings and/or equipment for Project. Contractor will receive, store, and protect such items on site until the date Owner accepts Project.

SECTION 01 1200 MULTIPLE CONTRACT SUMMARY

A. Separate Contracts:

1. Contracts may be issued by Owner for performance of certain construction operations at Project site.
2. Contractor will afford other contractors reasonable opportunity to place and store their materials and equipment on site and to perform their work and will properly connect and coordinate its work with theirs where applicable:

SECTION 01 1400 WORK RESTRICTIONS

A. Project Conditions:

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

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

SECTION 01 3000 ADMINISTRATIVE REQUIREMENTS

A. Administrative Requirements:

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

SECTION 01 3100 PROJECT MANAGEMENT AND COORDINATION

A. Multiple Contract Coordination:

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

B. Project Meetings And Conferences:

1. Attend preconstruction conference and organizational meeting scheduled by Architect or Owner Representative at Project site or other convenient location.
2. Be prepared to discuss items of significance that could affect progress, including such topics as:
 - a. Construction schedule, equipment deliveries, general inspection of tests, preparation of record documents and O&M manuals, project cleanup, security, shop drawings, samples, use of premises, work restrictions, and working hours.
2. Pre-Installation Conferences.
 - a. Attend pre-installation conferences specified in Contract Document.

SECTION 01 3300 SUBMITTAL PROCEDURES

A. Submittal Procedure:

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

General:

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

- b. All submittals shall include Contractor's certification that information complies with Contract Document requirements, or, on form or separate sheet, record deviations from Contract Document requirements, including minor variations and limitations.
- c. Submittals received from sources (both electronic and physical sources) other than Contractor or not marked with Contractor's approval will be returned without action.

Electronic Submittals:

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

Physical Submittals:

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

B. Action Submittals:

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

C. Informational Submittals:

- 1. Informational submittals are design data, test reports, certificates, manufacturer's instructions, manufacturer's field reports, and other documentary data affirming quality of products and installations.
 - a. Return copies or PDF files marked with action taken and with corrections or modifications required.

D. Closeout Submittals:

- 1. Submittals that occur during project closeout.

SECTION 01 3500 SPECIAL PROCEDURES

A. Quality Assurance:

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

SECTION 01 4000 QUALITY REQUIREMENTS

A. Administrative Requirements:

- 1. Conflicting Requirements:
 - a. If compliance with two or more standards is specified and standards establish different or conflicting requirements for minimum quantities or quality levels, comply with most stringent requirement.
- 2. Minimum Quantity or Quality Levels:

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

SECTION 01 4301 QUALITY ASSURANCE - QUALIFICATIONS

- A. Qualifications: Qualifications in this Section establish minimum qualification levels required; individual Specification Sections specify additional requirements:
1. Fabricator / Supplier / Installer Qualifications:
 - a. Firm experienced in producing products similar to those indicated for this Project and with record of successful in-service performance, as well as sufficient production capacity to produce required units:
 - 1) Where heading '*VMR (Value Managed Relationship) Suppliers / Installers*' is used to identify list of specified suppliers or installers, Owner has established relationships that extend beyond requirements of this Project. No other suppliers / installers will be acceptable. Follow specified procedures to preserve relationships between Owner and specified suppliers / installers and advantages that accrue to Owner from those relationships.
 - 2) Where heading '*Acceptable or Approved Suppliers / Installers / Fabricators*' is used to identify list of specified suppliers / installers / fabricators, use only one of listed suppliers / installers / fabricators. No others will be acceptable.
 2. Factory-Authorized Service Representative Qualifications:

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

SECTION 01 4523 TESTING AND INSPECTION SERVICES

- A. Submittals:
 1. Certificates: Testing Agency will submit certified written report of each inspection, test, or similar service.
 2. Tests and Evaluation Reports:
 - a. Testing Agency or Agencies will prepare logs, test reports, and certificates applicable to specific tests and inspections and deliver copies to Owner's Representative and to each of following if involved on project: Architect, Consulting Engineers (Engineer of Record), General Contractor, Authorities Having Jurisdiction (if required).
 3. Testing Agency:
 - a. Qualifications of Testing Agency management, personnel, inspector and technicians designated to project.
 - b. Provide procedures for non-destructive testing, equipment calibration records, personnel training records, welding inspection, bolting inspection, shear connector stud inspection, and seismic connection inspections.
- B. Quality Assurance:
 1. Owner or Owner's designated representative(s) will perform quality assurance. Owner's quality assurance procedures may include observations, inspections, testing, verification, monitoring and any other procedures deemed necessary by Owner to verify compliance with Contract Documents.

2. Owner will employ independent Testing Agencies to perform certain specified testing, as Owner deems necessary.
 3. Certification:
 - a. Product producers and associations, which have instituted approved systems of quality control and which have been approved by document approval agencies, are not required to have further testing.
 - b. Concrete mixing plants, plants producing fabricated concrete and wood or plywood products certified by agency, lumber, plywood grade marked by approved associates, and materials or equipment bearing underwriters' laboratory labels require no further testing and inspection.
 4. Written Practice for Quality Assurance:
 - a. Testing Agency will maintain written practice for selection and administration of inspection personnel, describing training, experience, and examination requirements for qualification and certification of inspection personnel.
 - b. Written practice will describe testing agency procedures for determining acceptability of structure in accordance with applicable codes, standards, and specifications.
 - c. Written practice will describe Testing Agency inspection procedures, including general inspection, material controls, visual welding inspection, and bolting inspection.
- C. Quality Control:
1. Quality Control will be sole responsibility of Contractor. Contractor will be responsible for testing, coordination, start-up, operational checkout, and commissioning of all items of the Work included in Project. All costs for these services will be included in Contractor's cost of the Work.
 2. Notify results of all Testing and Inspection performed by Contractor's independent Testing Agencies to Architect and/or Owner's Representative within 24 hours of test or inspection having been performed:
 - a. Testing and Inspection Reports will be distributed as follows:
 - 1) 1 copy to Owner's Representative.
 - 2) 1 copy to Architect.
 - 3) 1 copy to Consulting Engineer(s) (Engineer of Record).
 - 4) 1 copy to Authorities Having Jurisdiction (if required).
 3. Contractor's Responsibility:
 - a. Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform the Work in strict accordance with requirements of Contract Documents.
 - b. Tests and inspections that are not explicitly assigned to Owner are responsibility of Contractor.
 - c. Cooperate with Testing Agency(s) performing required inspections, tests, and similar services and provide reasonable auxiliary services as requested. Notify Testing Agency before operations to allow assignment of personnel. Auxiliary services required include but are not limited to:
 - 1) Providing access to the Work and furnishing incidental labor, equipment, and facilities deemed necessary by Testing Agency to facilitate inspections and tests at no additional cost to Owner.
 - 2) Taking adequate quantities of representative samples of materials that require testing or helping Testing Agency in taking samples.
 - 3) Providing facilities for storage and curing of test samples, and delivery of samples to testing laboratories.
 - 4) Providing Testing Agency with preliminary design mix proposed for use for materials mixes that require control by Testing Agency.
 - d. For any requested inspection, Contractor will complete prior inspections to ensure that items are ready for inspection.
 - e. All Work is subject to testing and inspection and verification of correct operation.
 - f. Comply:
 - 1) Upon completion of Testing Agency's inspection, testing, sample-taking, and similar services, repair damaged construction and restore substrates and finishes to eliminate deficiencies, including deficiencies in visual qualities of exposed finishes.
 - 2) Comply with Contract Documents in making such repairs.
 - g. Data:
 - 1) Furnish records, drawings, certificates, and similar data as may be required by testing and inspection personnel to assure compliance with Contract Documents.
 - h. Defective Work (Non-Conforming Work): Non-conforming Work as covered in General Conditions applies, but is not limited to following requirements Protection:
 - 1) Where results of inspections, tests, or similar services show that the Work does not comply with Contract Document requirements, correct deficiencies in the Work promptly to avoid work delays.
 - 2) Where testing personnel take cores or cut-outs to verify compliance, repair prior to acceptance.

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

- c. Testing Agency will have full authority to see that the Work is performed in strict accordance with requirements of Contract Documents and directions of Owner's Representative and/or Architect.
- d. Testing Agency will not provide additional testing and inspection services beyond scope of the Work without prior approval of Owner's Representative and/or Architect.
- 3. Testing Agency Duties:
 - a. Independent Testing Agency engaged to perform inspections, sampling, and testing of materials and construction specified in individual specification Sections will cooperate with Architect or Owner Representative and Contractor in performance of its duties and will provide qualified personnel to perform required inspections and tests.
 - b. Testing Agency will test or obtain certificates of tests of materials and methods of construction, as described herein or elsewhere in technical specification.
 - c. Testing Agency will provide management, personnel, equipment, and services necessary to perform testing functions as outlined in this section.
 - d. Testing Agency must have experience and capability to conduct testing and inspecting indicated by ASTM standards and that specializes in types of tests and inspections to be performed.
 - e. Testing Agency will comply with requirements of ASTM E329, ASTM E543, ASTM C1021, ASTM C1077, ASTM C1093, ASTM D3666, ASTM D3740, and other relevant ASTM standards.
 - f. Testing Agency must calibrate all testing equipment at reasonable intervals (minimum yearly) with accuracy traceable to either National Bureau of Standards or accepted values of natural physical constants.
 - g. Welding Procedure Review: Testing Agency will provide review and approval or rejection of all welding procedures to be used and verify compliance with all reference standard requirements.
- 4. Testing and Inspection Reports:
 - a. Conduct and interpret tests and inspections and state in each report whether tested and inspected Work complies with or deviates from requirements.
 - b. Laboratory Reports: Testing Agency will furnish reports of materials and construction as required, including:
 - 1) Description of method of test.
 - 2) Identification of sample and portion of the Work tested:
 - (a) Description of location in the Work of sample.
 - (b) Time and date when sample was obtained.
 - (c) Weather and climatic conditions at time when sample was obtained.
 - 3) Evaluation of results of tests including recommendations for action.
 - c. Inspection Reports:
 - 1) Testing Agency will furnish "Inspection at Site" reports for each site visit documenting activities, observations, and inspections.
 - 2) Include notation of weather and climatic conditions, time and date conditions and status of the Work, actions taken, and recommendations or evaluation of the Work.
 - d. Reporting Testing and Inspection (Conforming Work):
 - 1) Submit testing and inspection reports as required within twenty four (24) hours of test or inspection having been performed.
 - e. Reporting Testing and Inspection Defective Work (Non-Conforming Work):
 - 1) Testing Agency, upon determination of irregularities, deficiencies observed or test failure(s) observed in the Work during performance of its services of test or inspection having been performed, will:
 - (a) Verbally notify results to Architect, Contractor, and Owner's Representative within one hour of test or inspection having been performed (if Defective Work (Non-Conforming Work) is incorporated into project).
 - (b) Submit written inspection report and test results as required within twenty four (24) hours of test or inspection having been performed.
 - f. Final Report:
 - 1) Submit final report of tests and inspections at Substantial Completion, which identify unresolved deficiencies.

F. Architect's Responsibility:

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

G. Field Quality Control:

- 1. Field Tests And Inspections:

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

SECTION 01 4546 DUCT TESTING, ADJUSTING, AND BALANCING

A. 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.

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.

C. Submittals:

1. Informational Submittals:
 - a. Test and Evaluation Reports:
 - b. Preliminary Report(s): Four copies to be given to Owner's Representative.
 - c. Final Report: Four copies to be given to Owner's Representative.
2. Closeout Submittals:
 - a. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - 1) 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.

D. 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.

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

SECTION 01 5000 TEMPORARY FACILITIES AND CONTROLS

A. Administrative Requirements:

1. Contractor is responsible for security of materials, tools, and equipment. Do not permit others to use building keys provided by Owner. Safeguard building and contents while the Work is being performed and secure building when the Work is finished for day.
 2. Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and reduce possibility that air, waterways, and subsoil might be contaminated or polluted, or that other undesirable effects might result:
 - a. Avoid use of tools and equipment that produce harmful noise.
 - b. Restrict use of noisemaking tools and equipment to hours that will minimize complaints from persons or firms near site.
 - c. Protect the Work, materials, apparatus, and fixtures from injury due to weather, theft, and vandalism.
 3. Existing restroom facilities may be used by Contractor. Clean restrooms and portions of existing building used in accessing restrooms daily. If existing facilities are not usable, provide and maintain temporary sanitary toilet.
- B. Temporary Barriers And Enclosures:
1. Protect existing trees and plants. Remove and replace vegetation that dies or is damaged beyond repair due to construction activities.
 2. Erect adequate barricades, warning signs, and lights necessary to protect persons from injury or harm.
 3. Provide temporary enclosures at exterior building openings for security and protection from weather, theft, and vandalism. Erect and maintain dust-proof partitions and enclosures as required to prevent spread of dust and fumes to occupied portions of building.
 4. Proprietary Camera Services: In its absolute discretion, and with or without notice to Contractor, Owner may provide from time to time, but is not obligated to provide, one or more cameras on or about Project site and/or signage or notices of the same:
 - a. If provided by Owner, such camera(s) and/or signage and notices are solely for Owner's benefit and convenience and shall not be for benefit of Contractor, Subcontractor(s) or for any third person.
 - b. Owner shall have no liability, obligation, or responsibility to Contractor, Subcontractors, or any third person relative to such camera(s), signage, or notices, or absence of camera(s), signage, or notices, including without limitation, installation, maintenance, operation, repair, testing, functionality, capacity, recording, monitoring, posting, etc., of the same (hereafter 'Proprietary Camera Services').
 - c. Contractor, with Owner's prior consent (which shall not be unreasonably withheld), may relocate such camera(s), signage, or notices as necessary to not unreasonably, materially and physically interfere with work at Project Site.
 - d. Contractor's obligations under Contract Documents, including but not limited to, Contractor's obligation for security of Project Site, are not modified by Owner's opportunity to provide, actually providing, or not providing Proprietary Camera Services and/or signage or notices regarding the same.
 - e. This Specification Section does not preclude Contractor from providing its own camera(s), signage, or notices pursuant to terms and conditions of this Agreement. Neither does this Section reduce, expand or modify any other right or obligation of Owner pursuant to terms of this Agreement.
- C. Utilities:
1. Electrical Power: Owner will provide electric power for construction activities within limits available at existing facility.
 2. Fire Protection: Exercise caution to avoid fire damage: Do not build fires on site.
 3. Heating, Cooling, And Ventilation:
 - a. Permanent mechanical system may be operated upon following conditions:
 - 1) Do not interfere with normal set-back temperature patterns except as approved by Project Manager.
 - 2) Do not operate system when the Work causing airborne dust is occurring or when dust caused by such Work is present without first installing temporary filtering system.
 4. Lighting: Existing lighting system may be used by Contractor.
 5. Water Service: Contractor will use existing water supply for construction purposes to extent of existing facilities.

SECTION 01 6100 COMMON PRODUCT REQUIREMENTS

A. Administrative Requirements:

1. Provide products that comply with Contract Documents, are undamaged, and, unless otherwise indicated, are new and unused at time of installation. Provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for complete installation and for intended use and effect.

SECTION 01 6200 PRODUCT OPTIONS

- A. Product selection is governed by Contract Documents and governing regulations, not by previous Project experience. Procedures governing product selection include:
1. Substitutions And Equal Products:
 - a. Generally speaking, substitutions for specified products and systems, as defined in Uniform Commercial Code, are not acceptable. However, equal products may be approved upon compliance with Contract Document requirements.
 - b. Approved Products / Manufacturers / Suppliers / Installers:
 - 1) Category One:
 - (a) Owner has established 'Value Managed Relationships' that extend beyond requirements of this Project. No substitutions or equal products will be allowed on this Project.
 - (b) Follow specified procedures to preserve relationships between Owner and specified manufacturers / suppliers and advantages that accrue to Owner from those relationships.
 - 2) Category Two:
 - (a) Owner has established National Contracts that contain provisions extending beyond requirements of this Project. No substitutions or equal products will be allowed on this Project.
 - (b) Follow specified procedures to preserve relationships between Owner and specified manufacturers / suppliers and advantages that accrue to Owner from those relationships.
 - 3) Category Three:
 - (a) Specified products are provided to Church Projects under a National Account Program. Use these products to preserve advantages that accrue to Owner from those programs. No substitutions or equal products will be allowed on this Project.
 - 4) Category Four:
 - (a) Provide only specified products available from manufacturers listed. No substitutions, private-labeled, or equal products, or mixing of manufacturers' products is allowed on this Project.
 - (b) In Sections where lists recapitulating Manufacturers previously mentioned in Section are included under heading '*Manufacturers*' or '*Approved Manufacturers*', this is intended as convenience to Contractor as listing of contact information only. It is not intended that all manufacturers in list may provide products where specific products and manufacturers are listed elsewhere in Section.
 - c. Acceptable Products / Manufacturers / Suppliers / Installers:
 - 1) Type One: Use specified products / manufacturers unless approval to use other products / manufacturers has been obtained from Architect or Owner Representative by Addendum.
 - 2) Type Two: Use specified products / manufacturers unless approval to use other products and manufacturers has been obtained from Architect or Owner Representative in writing before installing or applying unlisted or private-labeled products.
 - 3) Use 'Equal Product Approval Request Form' to request approval of equal products, manufacturers, or suppliers before bidding or before installation, as noted in individual Sections.
 - d. Quality / Performance Standard Products / Manufacturers:
 - 1) Class One: Use specified product / manufacturer or equal product from specified manufacturers only.
 - 2) Class Two: Use specified product / manufacturer or equal product from any manufacturer.
 - 3) Products / manufacturers used will conform to Contract Document requirements.

SECTION 01 6400 OWNER-FURNISHED PRODUCTS

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

SECTION 01 6600 DELIVERY, STORAGE, AND HANDLING REQUIREMENTS

- A. Administrative Requirements:
 - 1. Deliver, store, and handle products according to manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft.
- B. Delivery, Storage, and Handling:
 - 1. Delivery and Acceptable Requirements:
 - a. Deliver, store, and handle products according to manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft.
 - b. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 - c. Deliver products to site in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 - d. Inspect products upon delivery to ensure compliance with Contract Documents, and to ensure that products are undamaged and properly protected.
 - 2. Storage and Handling Requirements:
 - a. Store products at site in manner that will simplify inspection and measurement of quantity or counting of units.
 - b. Store heavy materials away from Project structure so supporting construction will not be endangered.
 - c. Store products subject to damage by elements above ground, under cover in weather tight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

SECTION 01 7000 EXECUTION REQUIREMENTS

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

SECTION 01 7400 CLEANING AND WASTE MANAGEMENT

- A. Disposal Of Waste:
 - 1. Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in landfill or incinerator acceptable to authorities having jurisdiction:

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

SECTION 01 7700 CLOSEOUT PROCEDURES

- A. General:
1. Closeout process consists of three specific project closeout inspections. Contractor shall plan sufficient time in construction schedule to allow for required inspections before expiration of Contract Time.
 2. Contractor shall conduct his own inspections of The Work and shall not request closeout inspections until The Work of the contract is reasonably complete and correction of obvious defects or omissions are complete or imminent.
 3. Date of Substantial Completion shall not occur until completion of construction work, unless agreed to by Architect / Owner's Representative and included on Certificate of Substantial Completion.
- B. Preliminary Closeout Review:
1. When Architect, Owner and Contractor agree that project is ready for closeout, Pre-Substantial Inspection shall be scheduled. Preparation of floor substrate to receive carpeting and any work which could conceivably damage or stain carpet must be completed, as carpet installation will be scheduled immediately following this inspection.
 2. Prior to this inspection, completed test and evaluation reports for HVAC system and font, where one occurs, are to be provided to Project Manager, Architect, and applicable consultants.
 3. Architect, Owner and Contractor review completion of punch list items. When Owner and Architect confirm that Contractor has achieved Substantial Completion of The Work, Owner, Architect and Contractor will execute Certificate of Substantial Completion that contains:
 - a. Punch list of items requiring completion and correction will be created.
 - b. Time frame for completion of punch list items will be established, and date for Substantial Completion Inspection shall be set.
- C. Substantial Completion Inspection:
1. When Architect, Owner and Contractor agree that project is ready for Substantial Completion, an inspection is held. Punch list created at Pre-Substantial Inspection is to be substantially complete.
 2. Prior to this inspection, Contractor shall discontinue or change over and remove temporary facilities from the site, along with construction tools, mock-ups and similar elements.
 3. Architect, Owner and Contractor review completion of punch list items. When Owner and Architect confirm that Contractor has achieved Substantial Completion of The Work, Owner, Architect and Contractor will execute Certificate of Substantial Completion that contains:
 - a. Date of Substantial Completion.
 - b. Punch List Work not yet completed, including seasonal and long lead items.
 - c. Amount to be withheld for completion of Punch List Work.
 - d. Time period for completion of Punch List Work.

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

SECTION 01 7800 CLOSEOUT SUBMITTALS

- A. Administrative Requirements:
- 1. Project Record Documents:
 - a. Do not use record documents for construction purposes:
 - 1) Protect from deterioration and loss in secure, fire-resistive location.
 - 2) Provide access to record documents for reference during normal Working hours.
 - b. Maintain clean, undamaged set of Drawings. Mark set to show actual installation where installation varies from the Work as originally shown. Give particular attention to concealed elements that would be difficult to measure and record at later date:
 - 1) Mark record sets with red erasable pencil. Use other colors to distinguish between variations in separate categories of the Work.
 - 2) Mark new information that is important to Owner, but was not shown on Contract Drawings.
 - 3) Note related Change Order numbers where applicable.
 - 2. As Built Record Drawings:
 - a. Provide two full-size sets of prints and PDF file of As Built Record Drawings to Facilities Management Office, printed from the updated AutoCAD drawing files or updated Revit model files, as specified by Owner, that have been modified to show actual dimensions and location of equipment, material, utility lines, and other work as actually constructed, based upon information provided by Contractor. Architect will submit updated As Built Record Drawings in PDF (ISO32000 format) to Owner. In addition, Architect will submit to Owner updated AutoCAD as built record drawing files with associated plot style tables or the Revit as built record model files, as specified by Owner.
- B. Operations And Maintenance Manual:
- 1. General:
 - a. Include closeout submittal documentation as required by Contract Documentation. Include only closeout submittals as defined in individual specification section.
 - b. Submittal Format: Digital copies unless otherwise noted, required for each individual specification section that include 'Closeout Submittals'.
 - 2. Project Manual:
 - c. Copy of complete Project Manual including Addenda, Modifications as defined in General Conditions, and other interpretations issued during construction:
 - (1) Mark these documents to show variations in actual Work performed in comparison with text of specifications and Modifications.
 - (2) Show substitutions, selection of options, and similar information, particularly on elements that are concealed or cannot otherwise be readily discerned later by direct observation.
 - 3. Maintenance Contracts: (digital format only).
 - 4. Operations and Maintenance Data (digital format only):

- a. Operations and maintenance submittals includes cleaning instructions, maintenance instructions, operations instructions, equipment list, and parts lists.
 5. Warranty Documentation: Digital format of final, executed warranties.
 6. Record Documentation:
 - a. Documentation includes Certifications, color and pattern selections, Design Date, Geotechnical Evaluation Reports (soils reports), Manufacture Reports, Literature or cut sheets, Shop Drawings, Source Quality Control, Special Procedures, and Testing and Inspection Reports.
 7. Software: Audio and Video System software, programming and set-files.
 8. Irrigation Plan: Laminated and un-laminated reduced sized hard copies.
 9. Landscape Management Plan (LMP):
 - a. Irrigation Section:
 - (1) Documentation required by Sections under 32 8000 Heading: Irrigation.
 - b. Landscaping Section:
 - (1) Documentation required by Sections under 32 8000 Heading: Irrigation.
- C. Warranties:
1. When written guarantees beyond one (1) year after substantial completion are required by Contract Documents, secure such guarantees and warranties properly addressed and signed in favor of Owner. Include these documents in Operations & Maintenance Manual(s) specified above.
 2. Delivery of guarantees and warranties will not relieve Contractor from obligations assumed under other provisions of Contract Documents.

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DIVISION 03: CONCRETE

03 1000 CONCRETE FORMING AND ACCESSORIES

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

03 2000 CONCRETE REINFORCING

03 2100 REINFORCEMENT BARS

03 3000 CAST-IN-PLACE CONCRETE

03 3111 CAST-IN-PLACE STRUCTURAL CONCRETE
03 3543 POLISHED CONCRETE FINISHING
03 3923 MEMBRANE CONCRETE CURING

03 6000 GROUTING

03 6213 NON-METALLIC NON-SHRINK GROUT

END OF TABLE OF CONTENTS

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

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

1.2 REFERENCES

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

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference:
 - 1. Participate in pre-installation conference as specified in Section 03 3111.
 - 2. In addition to agenda items specified in Section 01 3100 and 31 3111, review following:
 - a. Review Section 01 4523 for Testing and Inspection administrative requirements and responsibilities and Field Quality Control tests and inspections required of this section.
 - 1) Review requirements and frequency of testing and inspections.
- B. Scheduling:
 - 1. Notify Testing Agency and Architect as directed in Section 03 3111.

1.4 SUBMITTALS

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

PART 2 - PRODUCTS**2.1 COMPONENTS**

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

2.2 ACCESSORIES

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

PART 3 - EXECUTION

3.1 INSTALLATION

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

3.2 FIELD QUALITY CONTROL

- A. Field Tests And Inspections:
 - 1. Concrete Formwork:

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

END OF SECTION

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

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

1.2 REFERENCES

- A. Reference Standards:
 - 1. American Concrete Institute:
 - a. ACI 355.4-11, 'Qualification of Post-Installed Adhesive Anchors in Concrete and Commentary'.
 - b. ACI 548.12-12, 'Specification for Bonding Hardened Concrete and Steel to Hardened Concrete with an Epoxy Adhesive'.
 - 2. American National Standards Institute / American Welding Society (Following are specifically referenced for Structural Steel testing):
 - a. ANSI/AWS D1.1/D1.1M:2015, 'Structural Welding Code - Steel'.
 - 3. ASTM International:
 - a. ASTM A108-18, 'Standard Specification for Steel Bar, Carbon and Alloy, Cold Finished'.
 - b. ASTM A307-14, 'Standard Specification for Carbon Steel Bolts and Studs, 60 000 psi Tensile Strength'.
 - c. ASTM A563-15, 'Standard Specification for Carbon and Alloy Steel Nuts'.
 - d. ASTM A706/A706M-16, 'Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement'.
 - e. ASTM A1064/A1064M-18a, 'Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete'.
 - f. ASTM F1554-18, 'Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength'.
 - g. ASTM F3125/F3125-15a, 'Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions'.
 - 4. International Code Council (IBC) (2018 or most recent edition adopted by AHJ):
 - a. IBC Chapter 17, 'Structural Tests and Special Inspections'.

1.3 ADMINISTRATIVE REQUIREMENTS

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

1.4 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Manufacturer's product literature for each item.
- B. Informational Submittals:
 - 1. Certificates:
 - a. Adhesive Anchors:
 - 1) Installer to provide current ACI/CRSI certification to Architect prior to installation of anchors.
 - 2. Test And Evaluation Reports:
 - a. Provide ESR for products used indicating conformance with current applicable ESR Acceptance Criteria.
 - 3. Manufacturer's Instructions:
 - a. Manufacturer's published installation recommendations for each item.
 - 4. Qualification Statements:
 - a. All concrete anchors except Adhesive Anchors:
 - 1) Installer to provide record of installer installation training showing dates and those trained for all installed products when required when by Architect.
- C. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Record Documentation:
 - 1) Testing and Inspection Reports:
 - a) Testing Agency inspection reports of all inspected anchors.

1.5 QUALITY ASSURANCE

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

1. Owner is responsible for Quality Assurance. Quality assurance performed by Owner will be used to validate Quality Control performed by Contractor.
2. Owner will provide Inspection for post-installed concrete anchors:
 - a. Owner will employ testing agency to perform inspection for post-installed concrete anchors as specified in Field Quality Control in Part 3 of this specification:
 - 1) Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform the Work in strict accordance with requirements of Contract Documents and perform contractor testing and inspection.
 - 2) See Section 01 1200: 'Multiple Contract Summary'.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
 1. Materials shall be delivered in original, unopened packages with labels intact.
- B. Storage And Handling Requirements:
 1. Store materials protected from exposure to harmful weather conditions and as directed by Manufacturer.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Concrete Anchors:
 1. General:
 - a. Use hot-dipped galvanized or stainless steel with matching nuts and washers in exterior and moist interior applications unless indicated otherwise on Contract Drawings.
 - b. Install hot-dipped or stainless steel anchor bolts to attach wood sill plates to foundation with **1/4 inch (6.4 mm)** by **3 inch (76 mm)** x **3 inch (76 mm)** minimum adjustable plate washers and standard cut washers between wood sill plates and nuts.
 - c. Nut: Conform to requirements of ASTM A563, Grade A, Hex.
 - d. Conform to requirements of ASTM F3125/F3125 for chemical, physical and mechanical requirements for quenched and tempered bolts manufactured from steel and alloy steel.
 2. Threaded rod for adhesive anchors and cast-in anchors:
 - a. Conform to requirements of ASTM A307, Grade A or ASTM F1554 Grade 36 unless indicated otherwise on Contract Drawings.
 3. Cast-In-Place Anchor Bolts:
 - a. J-Bolts:
 - 1) Non-headed type threaded **2 inches (50 mm)** minimum conforming to requirements of ASTM F1554, Grade A.
 - 2) Anchor hook to project **2 inches (50 mm)** minimum including bolt diameter.
 - b. Headed Bolts:
 - 1) Headed type threaded **2 inches (50 mm)** minimum conforming to requirements of ASTM F1554, Grade A.
 4. Headed Concrete Anchor Studs:
 - a. Composed of low carbon steel meeting requirements of ASTM A108.
 - b. Tensile Strength: **61,000 psi (420 MPa)** minimum.
 - c. Yield Strength: **49,000 psi (340 MPa)** minimum.
 5. Deformed Bar Anchors:
 - a. Manufactured in accordance with requirements of ASTM A1064/A1064M.
 - b. Tensile Strength: **80,000 psi (552 MPa)** minimum.
 - c. Yield Strength: **70,000 psi (485 MPa)** minimum.
 6. Reinforcing Bars:
 - a. Composed of deformed carbon steel meeting requirements of ASTM A615/A615M, Grade 60.

7. Adhesive Anchors:
 - a. Products shall have current ESR conforming to current ICC Acceptance Criteria AC308 for concrete.
 - b. Rod diameter and embedment length as indicated on Contract Drawings.
 - c. Type Two Acceptable Products:
 - 1) HIT-RE 500V3 with SafeSet Epoxy Adhesive by Hilti Fastening Systems, Tulsa, OK www.us.hilti.com.
 - 2) Pure 110+ by Powers Fasteners Inc., Brewster NY www.powers.com.
 - 3) SET-XP Epoxy by Simpson Strong-Tie Co., Pleasanton, CA www.simpsonanchors.com.
 - 4) Equal as approved by Architect before installation. See Section 01 6200.
8. Expansion Anchors:
 - a. Products shall have current ESR conforming to current ICC Acceptance Criteria AC193 for concrete.
 - b. Type Two Acceptable Products:
 - 1) KWIK Bolt TZ Expansion Anchor by Hilti Fastening Systems, Tulsa, OK www.us.hilti.com.
 - 2) Power-Stud +SD2 by Powers Fasteners Inc., Brewster NY www.powers.com.
 - 3) Strong-Bolt by Simpson Strong-Tie Co., Pleasanton, CA www.simpsonanchors.com.
 - 4) Equal as approved by Architect before installation. See Section 01 6200.
9. Screw Anchors:
 - a. Provide anchors with length identification markings conforming to ICC Acceptance Criteria AC 193 for concrete.
 - b. Type Two Acceptable Products:
 - 1) KWIK HUS-EZ by Hilti Fastening Systems, Tulsa, OK www.us.hilti.com.
 - 2) Wedge-Bolt+ by Powers Fasteners Inc., Brewster NY www.powers.com.
 - 3) Titen HD by Simpson Strong Tie Co, Pleasanton, CA www.simpsonanchors.com.
 - 4) Equals as approved by Architect through shop drawing submittal before installation. See Section 01 6200.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification Of Conditions:
 1. Embedded Items:
 - a. Identify position of reinforcing steel and other embedded items before drilling holes for anchors:
 - 1) Exercise care in coring or drilling to avoid damaging existing reinforcing or embedded items.
 - 2) Take precautions as necessary to avoid damaging pre-stressing tendons, electrical and telecommunications conduit, and gas lines.
 - b. Notify Engineer if reinforcing steel or other embedded items are encountered during drilling.
 2. Base Material Strength:
 - a. Unless otherwise specified, do not drill holes in concrete until:
 - 1) Concrete has minimum age of 21 days at time of anchor installation.
 - 2) Concrete has achieved full design strength for load achievement.

3.2 PREPARATION

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

3.3 INSTALLATION

A. Post-Installed Anchors:

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

3.4 FIELD QUALITY CONTROL

A. Field And Inspections:

1. Civil and structural field inspections are provided by Owner's independent Testing Agency as specified in Section 01 4523 'Testing And Inspection Services':
 - a. Quality Control is sole responsibility of Contractor.
 - 1) Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform testing and inspection as part of his Quality Control:
 - a) Testing and inspections, if performed by Contractor, will be responsibility of Contractor to be performed by an independent entity.
2. Expansion Anchors / Adhesive Anchors / Screw Anchors:
 - a. Certified Inspector from Testing Agency shall verify procedures used for installation of all concrete anchors and monitor their installation for compliance with Manufacturer's requirements.
 - b. Inspections:
 - 1) Inspections shall include required verification and inspection of anchors as referenced in IBC Table 1704.4 and in accordance with most current version of ACI 318 or ACI 318M and applicable ASTM material standards that:
 - a) The correct rod/anchor is used; size and type.
 - b) The correct hole size is used and prepared per Manufacturer's instructions.

- c) That climactic conditions, and concrete temperature, allow for the anchors' installation and use.
- d) Proper hole cleaning equipment, per Manufacturer's instructions, is used.
- e) Torque applied to anchors does not exceed Manufacturer's allowable limits.
- f) Torque applied to anchors is per Manufacturer's instructions.

B. Non-Conforming Work:

- 1. Contractor is to immediately notify Architect of incorrectly placed, misplaced or malfunctioning anchors and request instructions for corrective actions.

3.5 CLEANING

A. Waste Management:

- 1. Disposal of rubbish, debris, and packaging materials.

3.6 PROTECTION

A. General:

- 1. Protect installed products from damage during construction.

END OF SECTION

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

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

1.2 REFERENCES

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

1.3 ADMINISTRATIVE REQUIREMENTS

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

1.4 SUBMITTALS

- A. Action Submittals:

1. Shop Drawings:
 - a. Reinforcing placement drawings.
- B. Informational Submittals:
 1. Certificates:
 - a. Mill certificates for mill tests for reinforcing in accordance with ASTM A615/A615M.
- C. Closeout Submittals:
 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Record Documentation:
 - 1) Testing and Inspection Reports:
 - a) Testing Agency Inspection Reports of reinforcement bars.

1.5 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 1. Comply with provisions of following codes and standards except where more stringent requirements are shown or specified:
 - a. American Concrete Institute:
 - 1) ACI 318, 'Building Code Requirements for Structural Concrete and Commentary'.
 - b. Concrete Reinforcing Steel Institute:
 - 1) CRSI, 'Manual of Standard Practice'.
- B. Qualifications:
 1. Throughout progress of the work of this section, provide at least one (1) person who shall be thoroughly familiar with Construction Documents and other applicable specified requirements, completely trained and experienced in necessary skills, and who shall be present at site and shall direct all work performed under this Section:
 - a. In actual installation of the work of this Section, use adequate numbers of skilled workmen to ensure installation in strict accordance with approved design.
 - b. In acceptance or rejection of work performed under this Section, no allowance will be made for lack of skill on part of workmen.
- C. Testing And Inspection:
 1. Owner is responsible for Quality Assurance. Quality assurance performed by Owner will be used to validate Quality Control performed by Contractor.
 2. Owner will provide Testing and Inspection for inspection of reinforcement bars:
 - a. Owner will employ testing agencies to perform testing and inspection for inspection of reinforcement bars as specified in Field Quality Control in Part 3 of this specification:
 - 1) Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform the Work in strict accordance with requirements of Contract Documents and perform contractor testing and inspection.
 - 2) See Section 01 1200: 'Multiple Contract Summary'.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
 1. Deliver bars separated by size and tagged with manufacturer's heat or test identification number.
 2. Reinforcement bars shall be free of heavy rust scales and flakes, or other coating at time of delivery and placing.
- B. Storage And Handling Requirements:
 1. Properly protect rebar on site after delivery.

PART 2 - PRODUCTS

2.1 MATERIAL

A. Reinforcement Bars:

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

2.2 ACCESSORIES

A. Bar Supports:

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

2.3 FABRICATION

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

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Avoid cutting or puncturing vapor retarder during reinforcement placement and concrete operations.
2. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete.
3. Blowtorch shall not be used to facilitate field cutting or bending or any other reinforcing work.
4. Reinforcement shall not be bent after partially embedded in hardened concrete.

B. Placing Reinforcement:

1. Comply with Concrete Reinforcing Steel Institute CRSI 'Manual of Standard Practice' recommended practice for 'Placing Reinforcing Bars' for details and methods of reinforcement placement and supports. and as herein specified.
2. Accurately position, support, and secure reinforcement against displacement by formwork, construction, or concrete placement operations:
 - a. Locate and support reinforcing by chairs, runners, bolsters, bar supports, spacers, or hangers, as required as recommended by 'ACI Detailing Manual, except slab on grade work.
 - b. Support bars in slabs on grade and footings with specified bar supports around perimeter and at 4-1/2 feet on center each way maximum to maintain specified concrete cover.
 - c. Install bar supports at bar intersections.
3. Bend bars cold.

4. Dowel vertical reinforcement for formed concrete columns or walls out of footing or structure below with rebar of same size and spacing required above.
 5. Securely anchor and tie reinforcement bars and dowels before placing concrete. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- C. Splices:
1. Non-Concrete Structural System:
 - a. Avoid splices of reinforcement bars at points of maximum stress. Lap bars 60 bar diameters minimum unless dimensioned otherwise on Drawings. Run reinforcement bars continuous through cold joints.
- D. Tolerances:
1. Provide following minimum concrete cover for reinforcement as per ACI 318 or ACI 318M. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations:
 - a. Concrete cast against and permanently exposed to earth:
 - 1) Interior Slabs on Grade: **1 inches (25 mm)**. clear from top of slab at **4 inches (100 mm)** slabs, **2 inches (50 mm)** clear at **6 inches (150 mm)** slabs.
 - 2) Sections other than Slabs: **3 inches (75 mm)**.
 - b. Concrete Exposed to Earth or Weather:
 - 1) No. 6 and Larger Bars: **2 inches (50 mm)**.
 - 2) No. 5 and Smaller Bars, W31 and D31 Wire: **1-1/2 inches (38 mm)**.

3.2 FIELD QUALITY CONTROL

- A. Field Tests And Inspections:
1. Civil and structural field tests, laboratory testing, and inspections are provided by Owner's independent Testing Agency as specified in Section 01 4523 'Testing And Inspection Services':
 - a. Quality Control is sole responsibility of Contractor.
 - 1) Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform testing and inspection as part of his Quality Control:
 - a) Testing and inspections, if performed by Contractor, will be responsibility of Contractor to be performed by an independent entity.
 2. Reinforcement Bars:
 - a. Testing Agency shall provide inspection for Reinforcement Bars. See Section 03 3111 for Testing and Inspection requirements.

END OF SECTION

SECTION 03 3111**CAST-IN-PLACE STRUCTURAL CONCRETE****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install concrete work as described in Contract Documents including:
 - a. Quality of concrete used on Project but furnished under other Sections.
 - b. Concrete mix information and use of admixtures.
 - c. Field Quality Control Testing and Inspection requirements for concrete.
 - d. Pre-installation conference held jointly with other concrete related sections.
 - e. Sealants and curing compounds used with concrete.
 - f. Compact aggregate base for miscellaneous cast-in-place concrete.
 - g. Miscellaneous cast-in-place concrete and equipment pads.
- B. Products Installed But Not Furnished Under This Section:
 - 1. Membrane Concrete Curing.
- C. Related Requirements:
 - 1. Section 01 1200: 'Multiple Contract Summary' for Owner Furnished Testing and Inspecting Services.
 - 2. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
 - 3. Section 03 1113: 'Structural Cast-In-Place Concrete Forming'.
 - 4. Section 03 1511: 'Concrete Anchors and Inserts'.
 - 5. Section 03 2100: 'Reinforcement Bars'.
 - 6. Section 03 3923: 'Membrane Concrete Curing' for application.
 - 7. Section 07 9213: 'Elastomeric Joint Sealant' for quality of sealants.
 - 8. Furnishing of items to be embedded in concrete specified in Section involved.
 - 9. Owner will provide concrete leveling compounds and patching compounds required for carpet installation.

1.2 REFERENCES

- A. Association Publications:
 - 1. American Concrete Institute, Farmington Hills, MI www.concrete.org. Abstracts of ACI Periodicals and Publications.
 - a. Certifications:
 - 1) ACI CP-1(16), *'Technical Workbook for ACI Certification of Concrete Field Testing Technician-Grade 1'*.
 - 2) ACI CP-10(10), *'Craftsman Workbook for ACI Certification of Concrete Flatwork Technician/Finisher'*.
 - 3) ACI CP-19(16), *'Technical Workbook for ACI Certification of Concrete Strength Testing Technician'*.
- B. Definitions:
 - 1. Cold Weather, as referred to in this Section, is four (4) hours with ambient temperature below **40 deg F (4.4 deg C)** in twenty-four (24) hour period.
 - 2. Floor Flatness (F_F): Rate of change in elevation of floor over **12 inches (305 mm)** section.
 - 3. Floor Levelness (F_L): Measures difference in elevation between two points which are **10 feet (3.05 m)** apart.

4. Hot Weather, as referred to in this Section, is ambient air temperature above 100 deg F (38 deg C) or ambient air temperature above 90 deg F (32 deg C) with wind velocity 8 mph (12.9 kph) or greater.

C. Reference Standards:

1. American Association of State and Highway Transportation Officials:
 - a. AASHTO M 153-06 (2016), 'Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction'.
2. American Concrete Institute
 - a. ACI 117-10 (R2015): 'Specifications for Tolerances for Concrete Construction and Materials and Commentary'.
 - b. ACI 305.1-14, 'Specification for Hot Weather Concreting'.
 - c. ACI 306.1-90 (R2002), 'Standard Specification for Cold Weather Concreting'.
 - d. ACI 318-14, 'Building Code Requirements for Structural Concrete' (ACI 318) and 'Commentary on Building Code Requirements for Structural Concrete' (ACI 318R).
3. ASTM International:
 - a. ASTM C31/C31M-15, 'Standard Practice for Making and Curing Concrete Test Specimens in the Field'.
 - b. ASTM C33/C33M-16, 'Standard Specification for Concrete Aggregates'.
 - c. ASTM C39/C39M-15a, 'Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens'.
 - d. ASTM C94/C94M-16, 'Standard Specification for Ready-Mixed Concrete'.
 - e. ASTM C140/C140M-16, 'Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units'.
 - f. ASTM C143/C143M-15, 'Standard Test Method for Slump of Hydraulic-Cement Concrete'.
 - g. ASTM C150/C150M-16, 'Standard Specification for Portland Cement'.
 - h. ASTM C172/C172M-14a, 'Standard Practice for Sampling Freshly Mixed Concrete'.
 - i. ASTM C173/C173M-16, 'Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method'.
 - j. ASTM C192/C192M-16a, 'Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory'.
 - k. ASTM C231/C231M-14, 'Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method'.
 - l. ASTM C260/C260M-10a, 'Standard Specification for Air-Entraining Admixtures for Concrete'.
 - m. ASTM C330/C330M-14, 'Standard Specification for Lightweight Aggregates for Structural Concrete'.
 - n. ASTM C494/C494M-15a, 'Standard Specification for Chemical Admixtures for Concrete'.
 - o. ASTM C496/C496M-11, 'Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens'.
 - p. ASTM C567/C567M-14, 'Standard Test Method for Determining Density of Structural Lightweight Concrete'.
 - q. ASTM C595/C595M-16, 'Standard Specification for Blended Hydraulic Cements'.
 - r. ASTM C618-15, 'Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete'.
 - s. ASTM C1077-16, 'Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation'.
 - t. ASTM C1157/C1157M-11, 'Standard Performance Specification for Hydraulic Cement'.
 - u. ASTM D1751-04(2013), 'Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)'.
 - v. ASTM E329-14a: 'Standard Specification for Agencies Engaged in Construction Inspection and/or Testing'.
 - w. ASTM E1155-14, 'Standard Test Method for Determining F_F Floor Flatness and F_L Floor Levelness Numbers'.
4. International Code Council (IBC) (2015 or latest approved edition):
 - a. IBC Chapter 17, 'Special Inspections And Tests'.
 - 1) Section 1704, 'Special Inspections And Tests, Contractor Responsibility And Structural Observations'.
 - 2) Section 1705, 'Required Special Inspection And Tests'.

a) Section 1705.2, 'Steel Construction'.

1.3 ADMINISTRATIVE REQUIREMENTS**A. Pre-Installation Conference:**

1. Participate in MANDATORY pre-installation conference as specified in Section 01 3100 and held jointly with following sections:
 - a. Section 03 1113: 'Structural Cast-In-Place Concrete Forming'.
 - b. Section 03 2100: 'Reinforcement Bars'.
 - c. Section 22 1116: 'Domestic Water Piping'.
 - d. Section 26 0526: 'Grounding And Bonding For Electrical Systems'.
2. Schedule pre-installation conference prior to placing of footings, installation of foundation forms and reinforcing steel, and installation of anchors, dowels, inserts, and block outs in foundation walls and slabs.
3. In addition to agenda items specified in Section 01 3100, review following:
 - a. Set up concrete placement pour card system and verify that all relevant trades have signed off prior to concrete placement.
 - b. Obtaining trade sign-offs on each pour card will be responsibility of General Contactor's foreman or whoever is in charge of ordering concrete.
 - c. Pour cards will be turned in to Quality Assurance representative after the work has been completed so that they can be reviewed and filed.
 - d. Review installation scheduling, coordination, placement of building concrete, and placement of items installed in and under concrete.
 - e. Review installation scheduling, coordination and placement of site concrete and of items installed in concrete.
 - f. Review 'Verification of Conditions' requirements.
 - g. Review requirements for preparation of subgrade and aggregate base requirements.
 - h. Review formwork requirements.
 - i. Review approved mix design requirements, mix designs and use of admixtures.
 - j. Review reinforcing bar submittals.
 - k. Review installation schedule and placement of reinforcing bars.
 - l. Review placement, finishing, and curing of concrete, including cold and hot weather requirements.
 - m. Review smooth rubbed concrete finish procedures and requirements (applied immediately after removing concrete formwork while concrete is 'green').
 - n. Review concrete slab tolerances and corrective measures if tolerances not met.
 - o. Review safety issues.
 - p. Review Section 01 4523 for Testing and Inspection administrative requirements and responsibilities and Field Quality Control tests and inspections required of this section.
 - 1) Review requirements and frequency of testing and inspections.

B. Scheduling:

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

1.4 SUBMITTALS**A. Action Submittals:**

1. Joint layout plan for control and expansion joints for sidewalks, curbs, and gutters for written approval before starting work on this Section.
2. Shop Drawings:
 - a. Show dimensioned locations of anchor bolts for hold-down anchors and columns.
 - b. Show reinforcement and all necessary bending diagrams and reinforcing steel list, and construction joint locations.
 - c. Provide bar schedules and bending details.
 - d. Reinforced concrete walls shall be shown in scale elevation (scale at least one quarter inch to one foot). Details shall be in accordance with ACI rules.
 - e. Show all formwork for concrete surfaces which are to remain exposed in the finished work.

B. Informational Submittals:

1. Certificates:
 - a. Installers:
 - 1) Certification for National Ready Mixed Concrete Association (NRMCA).
 - 2) Certification for ACI-certified Flatwork Finishers and Technicians.
2. Design Data:
 - a. Mix Design:
 - 1) Furnish proposed mix design to Architect for review prior to commencement of Work.
 - a) Include density (unit weight) and void content determined per ASTM C1688/C1688M for fresh mixed properties and per ASTM C140/C140M for hardened concrete properties.
 - b) Mix design shall show proposed admixture, amount, usage instructions, and justification for proposed use.
 - b. Ready-Mix Supplier:
 - 1) Require mix plant to furnish delivery ticket for each batch of concrete. Keep delivery tickets at job-site for use of Owner or his representatives. Tickets shall show following:
 - a) Name of ready-mix batch plant.
 - b) Serial number of ticket.
 - c) Date and truck number.
 - d) Name of Contractor.
 - e) Name and location of Project.
 - f) Specific class or designation of concrete conforming to that used in Contract Documents.
 - g) Amount of concrete.
 - h) Amount and type of cement.
 - i) Total water content allowed by mix design.
 - j) Amount of water added at plant.
 - k) Sizes and weights of sand and aggregate.
 - l) Time loaded.
 - m) Type, name, manufacturer, and amount of admixtures used.
 - n) Design Data.
 - 2) Provide certificates with supporting testing reports verifying compliance with Contract Document requirements and that materials provided are from single source for following:
 - a) Cement.
 - b) Aggregate.
 - c) Fly Ash.
3. Manufacturer's Instructions:
 - a. Provide Manufacturer's installation for following:
 - 1) Floor and slab treatments.
4. Source Quality Control Submittals:
 - a. Concrete mix design: Submit mix designs to meet following requirements:
 - 1) Mix Type B:
 - a) Unexposed interior concrete slabs on grade.
 - b) 3500 psi (24.13 MPa) minimum at twenty-eight (28) days.
 - c) Water / Cementitious Material: 0.45 maximum by weight.
 - 2) Air Entrainment: Six (6) percent, plus or minus 1-1/2 percent for exterior concrete and foundation walls exposed to freeze/thaw cycles.
 - 3) Do not add water any time during mixing cycle above amount required to meet specified water / cement ratio. No reduction in amount of cementitious material is allowed.
 - b. Slump:
 - 1) 4 inch (100 mm) slump maximum before addition of high range water reducer.
 - 2) 8 inch (200 mm) slump maximum with use of high range water reducer.
 - 3) Slump not required for Mix Type G.
 - c. Admixtures:
 - 1) Mix design shall show proposed admixture, amount, usage instructions, and justification for proposed use. Do not use any admixture without Architect's written approval.
 - 2) Fly ash: Amount of specified Class F (or Class C where Class F is not available) fly ash not to exceed twenty-five (25) percent of weight of cementations materials may used.

- 3) Chemical: Specified accelerator or retarder may be used if necessary to meet environmental conditions.
- 4) Chemical: Special additives to promote rapid drying concrete may be used in interior concrete slabs on grade if necessary to meet construction schedules.
5. Manufacturer's Reports:
 - a. Provide Manufacturer's performance and testing data for following:
 - 1) Each admixture used.
- C. Closeout Submittals:
 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Record Documentation:
 - 1) Pour Reports:
 - a) Provide report that records following information:
 - b) Date and time of start of pour, Date and time of end of pour, and Date and time of end of finishing procedures.
 - c) Temperature at start of pour, Temperature at end of Pour, and Maximum temperature during performance of finishing procedures.
 - d) Wind speed at start of pour, Wind speed at end of pour, and Maximum wind speed during performance of finishing procedures.
 - e) Humidity at start of pour, Humidity at end of pour, and High and low humidity during performance of finishing procedures.
 - f) Cloud cover at start of pour, Cloud cover at end of pour, and High and low cloud cover during performance of finishing procedures.
 - g) Screeding method and equipment used.
 - h) Saw cut method and equipment used.
 - 2) Testing and Inspection Reports:
 - a) Testing Agency Testing and Inspecting Reports of concrete.

1.5 QUALITY ASSURANCE

- A. Qualifications: Requirements of Section 01 4301 applies, but is not limited to following:
 1. Installers and Installation Supervisor:
 - a. ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
 2. Ready-Mix Supplier:
 - a. Comply with ASTM C94/C94M requirements and be certified according to NRMCA's 'Certification of Ready Mixed Concrete Production Facilities'.
 3. Testing Agencies:
 - a. Independent agency qualified according to ASTM C1077 and ASTM E329.
 - 1) Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technicians, Grade I according to ACI CP-1 or equivalent certification program.
 - 2) Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be ACI-certified Concrete Laboratory Testing Technician - Grade II.
- B. Testing And Inspection:
 1. Owner is responsible for Quality Assurance. Quality assurance performed by Owner will be used to validate Quality Control performed by Contractor.
 2. Owner will provide Testing and Inspection on concrete:
 - a. Owner will employ testing agencies to perform testing and inspection on concrete as specified in Field Quality Control in Part 3 of this specification:
 - 1) Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform the Work in strict accordance with requirements of Contract Documents and perform contractor testing and inspection.
 - 2) See Section 01 1200: 'Multiple Contract Summary'.

1.6 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 SYSTEM

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Aridus Admixture by US Concrete, Euless, TX www.us-concrete.com/aridus/.
 - b. BASF (Construction Chemicals Division), Cleveland, OH www.master-builders-solutions.basf.us/en-us.
 - c. Bonsal American, Charlotte, NC www.bonsal.com.
 - d. Concure Systems Admixture by Concure Systems, Phoenix, AZ www.ConcureSystems.com.
 - e. Dayton Superior Specialty Chemicals, Kansas City, KS www.daytonsuperiorchemical.com.
 - f. Euclid Chemical Company, Cleveland, OH www.euclidchemical.com.
 - g. Fritz-Pak Concrete Admixtures, Dallas, TX www.fritzpak.com.
 - h. GCP Applied Technologies, Cambridge, MA www.gcpat.com/construction/en-us.
 - i. L & M Construction Chemicals, Omaha, NE www.lmcc.com.
 - j. Larsen Weldcrete by Larsen Products Corp, Rockville, MD www.larsenproducts.com.
 - k. Sika Corporation, Lyndhurst, NJ www.sikaconstruction.com and Sika Canada, Pointe Claire, QC www.sika.ca.
 - l. Unitex, Kansas City, MO www.unitex-chemicals.com.
 - m. U S Mix Products Co, Denver, CO www.usspec.com.
 - n. W R Meadows, Hampshire, IL www.wrmeadows.com.
- B. Performance:
 - 1. Design Criteria: Conform to requirements of ASTM C94/C94M unless specified otherwise:
 - 2. Capacities:
 - a. For testing purposes, following concrete strengths are required:
 - 1) At 7 days: 70 percent minimum of 28 day strengths.
 - 2) At 28 days: 100 percent minimum of 28 day strengths.
- C. Materials:
 - 1. Hydraulic Cement: Meet requirements of ASTM C150/C150M, Type <Insert Type>.
 - a. Meet requirements of ASTM C595/C595M, Type <Insert Type>.
 - b. Meet requirements of ASTM C1157/C1157M, Type <Insert Type>.
 - 2. Aggregates:
 - a. General:
 - 1) Submit a letter on quarry's letterhead that certifies all aggregate for concrete complies with the requirements of this section. Material certificates which are submitted shall be signed by both the materials producer and the contractor, certifying that materials comply with or exceed requirements specified herein to the Architect, Civil and Structural Engineering Consultant and the Independent Testing Laboratory for review and approval.
 - 2) Aggregates for all concrete shall come from a quarry that is DOT approved and meets or exceeds durability Class I aggregate. The quarry shall submit a letter to Engineer

- that certifies that all aggregate complies with DOT requirements for durability.
Aggregate not meeting DOT durability requirements shall not be used.
- b. Coarse:
 - 1) Meet requirements of ASTM C33/C33M or nonconforming aggregate that by test or actual service produces concrete of required strength and conforms to local governing codes.
 - 2) Aggregate shall be uniformly graded by weight.
 - c. Fine:
 - 1) Meet requirements of ASTM C33/C33M.
 - 2) Aggregate shall be uniformly graded by weight.
 3. Water: Clear, apparently clean, and potable.
 4. Admixtures And Miscellaneous:
 - a. Fly Ash:
 - 1) Meet requirements of ASTM C618, Class F (or Class C where Class F is not available) and with loss on ignition (LOI) of three (3) percent maximum.
 - b. Chemical:
 - 1) No admixture shall contain calcium chloride nor shall calcium chloride be used as an admixture. All chemical admixtures used shall be from same manufacturer and compatible with each other.
 - 2) Air Entraining Admixture:
 - a) Meet requirements of ASTM C260/C260M.
 - b) Type Two Acceptable Products:
 - (1) Equal as approved by Architect before use. See Section 01 6200.
 - 3) Water Reducing Admixture:
 - a) Meet requirements of ASTM C494/C494M, Type A and containing not more than 0.05 percent chloride ions.
 - b) Type Two Acceptable Products:
 - (1) Equal as approved by Architect before use. See Section 01 6200.
 - 4) Water Reducing, Retarding Admixture:
 - a) Meet requirements of ASTM C494/C494M, Type D and contain not more than 0.05 percent chloride ions.
 - b) Type Two Acceptable Products:
 - (1) Equal as approved by Architect before use. See Section 01 6200.
 - 5) High Range Water Reducing Admixture (Superplasticizer):
 - a) Meet requirements of ASTM C494/C494M, Type F or G and containing not more than 0.05 percent chloride ions.
 - b) Type Two Acceptable Products:
 - (1) Equal as approved by Architect before use. See Section 01 6200.
 - 6) Non-Chloride, Non-Corrosive Accelerating Admixture:
 - a) Meet requirements of ASTM C494/C494M, Type C or E and containing not more than 0.05 percent chloride ions.
 - b) Type Two Acceptable Products:
 - (1) Equal as approved by Architect before use. See Section 01 6200.
 - 7) Corrosion Inhibiting Admixture:
 - a) Liquid admixture to inhibit corrosion of steel reinforcement in concrete by introducing proper amount of anodic inhibitor. Admixture shall contain thirty (30) percent calcium nitrite solution and shall be used where called for in specifications or on drawings.
 - b) Type Two Acceptable Products:
 - (1) Eucon CIA by Euclid.
 - (2) DCI or DCI-S by GCP Applied Technologies.
 - (3) Equal as approved by Architect before use. See Section 01 6200.
 - 8) Alkali-Silica Reactivity Inhibiting Admixture:
 - a) Specially formulated lithium nitrate admixture for prevention of alkali-silica reactivity (ASR) in concrete. Admixture must have test data indicating conformance to ASTM C1293.
 - b) Type Two Acceptable Products:
 - (1) Eucon Integral ARC by Euclid.
 - (2) RASIR by W R Grace.
 - (3) Equal as approved by Architect before use. See Section 01 6200.

- 9) Viscosity Modifying Admixture (VMA):
 - a) Liquid admixture used to optimize viscosity of Self-Consolidating Concrete (SCC). Subject to compliance with requirements, provide following at dosage rates per manufacturer's recommendation.
 - b) Type Two Acceptable Products:
 - (1) Equal as approved by Architect before use. See Section 01 6200.
- 10) Shrinkage Reducing Admixture (SRA):
 - a) Liquid admixture specifically designed to reduce drying shrinkage and potential for cracking.
 - b) Type Two Acceptable Products:
 - (1) Equal as approved by Architect before use. See Section 01 6200.
- 11) Rapid Drying Admixture in Interior Concrete Slabs on Grade:
 - a) Admixture specifically designed to promote rapid drying of concrete.
 - b) Type Two Acceptable Products:
 - (1) Equal as approved by Architect before use. See Section 01 6200.

2.2 ACCESSORIES

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

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification Of Conditions:
 1. Concrete Forms:
 - a. Verify dimensions and spot elevations for locations of forms for concrete footings, stem walls, building slabs, curbs, gutters, walkways, and drainage systems are correct before concrete is placed.
 - 1) Notify Architect of incorrect dimensions or spot elevations in writing.

- 2) Do not place concrete until corrections are made and verified.

3.2 PREPARATION

A. Concrete Mixing:

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

B. Surface Preparation:

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

C. Removal:

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

3.3 INSTALLATION

A. Placing Concrete:

1. General:
 - a. Place as soon after mixing as possible.
 - b. Deposit as nearly as possible in final position.
 - c. No concrete shall be deposited in water.
 - d. Placing of concrete shall be continuous until panel or section is complete.
 - e. Compact concrete in forms by vibrating and other means where required.
 - 1) Thoroughly consolidate concrete around reinforcing bars (Consolidation not required in concrete around reinforcing bars with Mix Type G).
 - 2) Use and type of vibrators shall conform to ACI 309.
 - f. Form vertical surfaces full depth. Do not allow concrete to flow out from under forms in any degree into landscaped areas.
 - g. Consolidate concrete thoroughly.
 - h. Do not embed aluminum in concrete.
 - i. Do not use contaminated, deteriorated, or re-tempered concrete.
 - j. Avoid accumulation of hardened concrete.
 - k. Dusting with cement not permitted.
2. Interior Slabs:
 - a. For continuous placing and where shown on Drawings, saw cut **one inch (25 mm)** deep control joints before shrinkage occurs (**2 inches at 6 inch slabs**) (**50 mm at 150 mm slabs**).
 - 1) Do not install control joints where Drawings indicate they are not to be installed.
3. Bonding Fresh And Hardened Concrete:
 - a. Re-tighten forms.
 - b. Roughen surfaces.
 - c. Clean off foreign matter and laitance.
 - d. Wet but do not saturate.
 - e. Slush with neat cement grout or apply bonding agent.
 - f. Proceed with placing new concrete.
4. Anchor Bolts:
 - a. Place anchor bolts not tied to reinforcing steel immediately following leveling of concrete. Reconsolidate concrete around bolt immediately after placing bolt.
 - b. Do not disturb bolts during finishing process.

B. Finishing:

1. Interior Concrete Flatwork:
 - a. Screed Concrete.
 - b. Float Finish:
 - 1) Float as soon after screeding as possible.
 - 2) Consolidate surface with power-driven floats with exception of areas inaccessible to power-driven floats, which may be hand-floated.
 - 3) Re-straighten, cutting down high spots and filling low spots.
 - 4) Repeat float passes and re-straightening until surface has uniform, smooth, granular texture.
 - c. Rough:
 - 1) Top of building slab to receive setting bed for ceramic or paver tile.
 - d. Trowel Finish:
 - 1) Steel trowel slab after concrete has set enough to avoid bringing water and fines to surface.
 - 2) Perform troweling with power-driven trowels with exception of areas inaccessible to power-driven trowels, which may be hand-troweled.
 - 3) Continue troweling passes and re-straightening with **10 foot (3 meter)** highway straightedge until surface is free of trowel marks and uniform in texture and appearance.
 - 4) Apply burnished, burned-out trowel finish.

C. Curing:

1. Membrane Concrete Curing:

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

D. Tolerances:

1. General:

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

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

2. Local Flatness / Levelness of Interior Slabs:

a. Carpet and Tile Areas:

- 1) Specified Overall Value of F_{F25} / F_{L20} and Minimum Local Value of F_{F15} / F_{L13} when tested in accordance with ASTM E1155.
- 2) Specified Overall Value of F_{F30} / F_{L20} and Minimum Local Value of F_{F18} / F_{L13} when tested in accordance with ASTM E1155 in ceramic, resilient or vinyl tiled areas.
- 3) Used on building slabs to be covered by carpet and tile as shown on Contract Drawings. Verify and coordinate with Finish Schedule.
- 4) Remedy For Out-of-Tolerance Building Slabs:
 - a) Sections of building slabs which do not meet specified tolerances but are within ten (10) percent of specified tolerances, may be corrected by grinding or filling, at Owner's option.
 - b) Remove and replace sections of slabs measuring outside specified correctable tolerances.
 - c) Carpet areas: If floor leveling compounds or concrete patching compounds are required to bring floor into specified tolerances, they will be provided by Owner in conjunction with carpet installation and back-charged to Contractor.

3.4 FIELD QUALITY CONTROL

A. Field Tests And Inspections:

1. Civil and structural field tests, laboratory testing, and inspections are provided by Owner's independent Testing Agency as specified in Section 01 4523 'Testing And Inspection Services':
 - a. Quality Control is sole responsibility of Contractor:
 - 1) Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform testing and inspection as part of his Quality Control:
 - a) Testing and inspections, if performed by Contractor, will be responsibility of Contractor to be performed by an independent entity.
2. Reinforcement Bars and Bolts:
 - a. Testing Agency shall provide inspections will include following:
 - 1) Bolts:
 - a) Inspection of bolts to be installed in concrete prior to and during placement of concrete.
 - b) Periodic inspection of anchors installed in hardened concrete.
 - 2) Reinforcement Bars:
 - a) Periodic inspection of reinforcement bars and placement prior to concrete placement to verify grade, size, cover, spacing, and position of reinforcing.
 - b) Inspect that all reinforcement bars are be positively identified as to heat number and mill analysis.
 - c) Confirm surface of reinforcing bars is free of form release oil or other deleterious substances.
3. Concrete:
 - a. Testing Agency shall provide testing and inspection for concrete as per ASTM C1077.
 - b. Testing and inspections, if performed, will include following:
 - 1) Periodic inspection verifying use of required design mix.
 - 2) Inspection of reinforcing bars and anchor bolts before placement of concrete for proper installation.
 - 3) Inspection at time fresh concrete is sampled to fabricate specimens for strength tests, perform slump and air content tests, and determine temperature of concrete.
 - 4) Inspection of concrete placement for proper application techniques.
 - a) Steel tools are not to be used on exterior concrete.
 - 5) Periodic inspection for maintenance of specified curing temperature and techniques:
 - a) Steel tools are not to be used on exterior concrete. Bull floating and finish floating is to be performed with magnesium or wood floats.
 - 6) Periodic inspect of formwork for shape, location and dimensions of concrete member being formed:
 - a) Certified Inspector shall inspect forms for general location, configuration, camber, shoring, sealing of form joints, correct forming material, concrete accessories, and form tie locations.
 - 7) Periodic inspection of concrete finishing operations for proper finishing techniques.
 - 8) Periodic inspection for placement of specified curing compounds.
 - c. Testing Agency will sample and test during placement of concrete as directed by Architect and may include following:
 - 1) Sampling Fresh Concrete: ASTM C172/C172M, except modified for slump to comply with ASTM C94/C94M:
 - a) Slump: ASTM C143/C143M, test each time set of compressive specimens are made.
 - b) Air Content: ASTM C173/C173M, volumetric method for lightweight or normal weight concrete: ASTM C231/C231M, pressure method for normal weight concrete each time set of compression test specimens are made.
 - c) Concrete Temperature: Test each time set of compressive specimens are made.
 - d) Unit Weight: ASTM C567/C567M, test each time set of compressive specimens are made.
 - 2) Concrete floor flatness and floor levelness of interior slabs as per ASTM E1155.
 - 3) Concrete moisture and alkalinity testing. See Section 09 0503 Flooring Substrate Preparation.
 - d. Compression Test Specimen: ASTM C31/C31M, one (1) set of four (4) standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.
 - e. Compressive Strength Tests: ASTM C39/C39M:

- 1) Obtain one (1) composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd (4 cu m), but less than 50 cu. yd (38 cu m), plus one (1) set for each additional 50 cu. yd (38 cu m) or fraction thereof.
 - 2) One (1) specimen tested at seven (7) days, two (2) specimens tested at twenty-eight (28) days, and one (1) specimen retained in reserve for later testing if required.
 - 3) If strength of field-cured cylinders is less than eighty-five (85) percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing in-place concrete.
 - 4) Strength level of concrete will be considered satisfactory if averages of sets of three (3) consecutive strength test results equal or exceed specified compressive strength, and no individual strength test result falls below specified compressive strength by more than 500 psi (3.45 MPa).
- f. Samples:
- 1) Fresh Concrete: ASTM C172/C172M except modified for slump to comply with ASTM C94/C94M.
 - a) Slump: ASTM C143/C43M, test each time set of compressive specimens are made.
 - b) Air Content: ASTM C173/C173M, volumetric method for lightweight or normal weight concrete: ASTM C231/C231M, pressure method for normal weight.
 - c) Concrete Temperature: Test each time set of compressive specimens are made.
 - d) Unit Weight: ASTM C567/C567M, test each time set of compressive specimens are made.
- B. Non-Conforming Work: Non-conforming work as covered in the General Conditions applies, but is not limited to the following:
1. Correct any work found defective or not complying with contract document requirements at no additional cost to the Owner.

3.5 CLEANING

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

3.6 PROTECTION

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

END OF SECTION

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SECTION 03 3543**POLISHED CONCRETE FINISHING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
1. Apply chemical densifier and polished concrete finishing system with stain protection to concrete with specified level of exposed aggregate and finished gloss level in areas as described in Contract Documents.
- B. Related Requirements:
1. Section 03 3111: 'Cast-In Place Structural Concrete' for:
 - a. Concrete mix information and use admixtures.
 - b. Concrete floor flatness tolerances.
 - c. Concrete finish.
 - d. Pre-installation conference held jointly with other concrete related sections.

1.2 REFERENCES

- A. Associated Publications:
1. American Concrete Institute, Farmington Hills, MI www.concrete.org. Abstracts of ACI Periodicals and Publications.
 - a. ACI 302.1R-04: '*Guide for Concrete Floor and Slab Construction*'.
 2. Concrete Polishing Association of America (CPAA), Farmington Hills, MI www.concretepolishingassociation.com.
- B. Definitions:
1. Aggregate Exposure: Grinding concrete floor surface with bonded abrasives to achieve specified class of exposed aggregate. These are classified as A, B, C and D with varying levels of exposed aggregate:

Class	Name	Approximate Surface Cut Depth	Appearance
A	Cream	Very Little	Little aggregate exposure
B	Fine Aggregate (Salt & Pepper)	.1/16 inch (1.6 mm)	Fine aggregate exposure with little or no medium aggregate exposure at random locations
C	Medium Aggregate	.1/8 inch (3 mm)	Medium aggregate exposure with little or no large aggregate exposure at random locations
D	Large Aggregate	.1/4 inch (6.4 mm)	Large aggregate exposure with little or no fine aggregate exposure at random locations

2. Finished Gloss: Processing concrete floor surface to achieve specified level of finished gloss prior to application of any protective treatment; Flat [ground], satin [honed], semi polished, and highly polished are measured in reflective clarity (DOI), and reflective sheen (specular gloss). Finished Gloss is classified as levels 1, 2, 3 and 4 with varying degrees of reflective clarity, and sheen:

Level	Name	Reflective Clarity		Reflective Sheen		Suggested Grit Range	Min. # of Abrasive Passes
1	Flat (Ground)	Flat appearance with no to very slight diffused reflection	10 to 100	None to very low	15 to 80	Below 100	4
2	Satin (Honed)	Matte appearance with or without slight diffused reflection		Low to medium		100 to 400	5
3	Semi-Polished	Objects being reflected are not quite sharp and crisp but can be easily identified		Medium to high		800 and higher	6
4	Highly Polished	Objects being reflected are sharp and crisp as would be seen in a mirror-like reflection		High to highest		1200 and higher	9

3. Liquid Densifiers: Aqueous solution of SiO₂ dissolved in respective Hydroxide that penetrates into concrete surface and reacts with Calcium Hydroxide to provide permanent chemical reaction that hardens and densifies wear surface of cementitious portion of concrete. Four types are:
 - a. Sodium Silicate, Potassium Silicate, Lithium Silicate, and Alkaline solution of Colloidal Silicates or Silica.
 - 1) These products are same chemistry varying only by alkali used for solubility of SiO₂.
4. Polished Concrete: Act of changing concrete floor surface, with or without aggregate exposure, to achieve specified level of gloss using one of listed classifications; Bonded Abrasive Polished Concrete, Burnished Polished Concrete, or Hybrid Polished Concrete:
 - a. Bonded Abrasive Polished Concrete:
 - 1) Multi-step operation of mechanically grinding, honing, and polishing concrete floor surface with bonded abrasives to cut concrete floor surface and to refine each cut to maximum potential to achieve specified level of finished gloss. This yields most durable finish and requires the least maintenance. (This method is approved for this project).
 - b. Burnished Polished Concrete:
 - 1) Multi-step operation of mechanical friction-rubbing concrete floor surface with or without waxes or resins to achieve specified level of finished gloss. This operation yields less durable finish and requires more maintenance than bonded abrasive polished concrete. (This method is NOT approved for this project).
 - c. Hybrid Polished Concrete:
 - 1) Multi-step operation, using either standard grinding / polishing equipment, lightweight equipment, high speed burnishing equipment, or combination of, to combine mechanical grinding, honing, and polishing process with friction rubbing process by utilizing bonded abrasives, abrasive pads, or combination of, to achieve specified level of finished gloss. (This method is NOT approved for this project).
5. Polishing Process: Steps required to transform concrete substrate into specified finished gloss:
 - a. Grinding Stage:
 - 1) Steps of polishing process that refines concrete in preparation for honing stage.
 - 2) This stage is typically beginning for Class C and D specified floors and may meet requirements for level 1 specified gloss. This stage consists of any bonded abrasive that is 100 grit or lower.
 - b. Honing Stage:
 - 1) Steps of polishing process that refines concrete in preparation for polishing stage.
 - 2) This stage can sometimes be the beginning steps for Class B specified floors and may meet the requirements for a level 2 specified gloss. This stage consists of diamond tooling within the 100-400 grit range.
 - c. Polishing Stage:
 - 1) Final steps of polishing process that refines concrete to specified finished gloss levels 3 or 4. This stage consists of diamond tooling that is 800 grit or higher.

- d. Burnishing: Using high speed burnisher affixed with abrasive pad to further enhance microscopic abrasion of concrete surface to increase finished gloss.
 - 6. Reflective Clarity: DOI (distinction of image) value of degree of sharpness and crispness of reflection of overhead objects when measured by device in accordance to ASTM D5767.
 - 7. Reflective Sheen: Specular gloss value of degree of gloss reflected from surface, at specified angles of illumination, when measured by device in accordance to ASTM D523.
 - 8. Stain Protection:
 - a. Sealer-Semi Impregnating:
 - 1) Film forming material which will penetrate into polished and densified concrete leaving protective surface film of less than 0.5 mils which meets the OSHA requirements for slip resistance as tested by ASTM D 2047 and stain resistance of ASTM D1308.
 - b. Sealer-Impregnating:
 - 1) Non film forming stain and food resistant penetrating sealer designed to be applied to densified and polished concrete. Material must meet requirements of OSHA for slip resistance as tested by ASTM D2047, and Stain resistance of ASTM D1308.
- C. Reference Standards:
- 1. American National Standards Institute (ANSI) / National Floor Safety Institute (NFSI):
 - a. ANSI / NFSI B101.1-2009, 'Test Method for Measuring Wet SCOF of Common Hard Surface Floor Materials'.
 - b. ANSI / NFSI B101.3-2012, 'Test Method for Measuring Wet DCOF of Common Hard Surface Floor Materials'.
 - 2. ASTM International:
 - a. ASTM C642-13, 'Standard Test Method for Density, Absorption, and Voids in Hardened Concrete'.
 - b. ASTM C779/C779M-12, 'Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces'.
 - c. ASTM C803/C803M-18, 'Standard Test Method for Penetration Resistance of Hardened Concrete'.
 - d. ASTM D523-14(2018), 'Standard Test Method for Specular Gloss'.
 - e. ASTM D1308-02(2013), 'Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes'.
 - f. ASTM D2047-17, 'Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine'.
 - g. ASTM D5767-18, 'Standard Test Methods for Instrumental Measurement of Distinctness-of-Image Gloss of Coating Surfaces'.
 - h. ASTM G152-13, 'Standard Practice for Operating Open Flame Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials'.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate completion of polished concrete finishing installation with other trades.
- B. Pre-Installation Conference:
 - 1. Participate in pre-installation conference as specified in Section 03 3111.
 - a. Required attendance in addition to those already participating:
 - 1) Polished concrete finish manufacturer's technical representative.
 - 2) Polished concrete finishing Installer including Supervisor and those responsible for installation of polished finish system.
 - 3) Concrete finisher including Supervisor.
 - 4) Representative of liquid applied product manufacturer.
 - b. Conduct pre-installation conference at project site.
 - 2. In addition to agenda items specified in Section 01 3100, review following:
 - a. Review Installer's qualifications requirements.
 - b. Review compliance with approved submittals.
 - c. Review concrete surface preparation requirements, sequence of procedures, and other preparatory work performed by other trades.
 - d. Review concrete slab floor flatness requirements as specified in Section 03 3111.

- e. Review mock-up installation and requirements:
 - 1) Schedule and location of mockup.
 - 2) Use of same personnel, including supervisors, which will perform work.
 - f. Review polished concrete installation schedule including project phasing and for each step of grinding, honing and polishing operations including, but not limited to:
 - 1) Review proper disposal of concrete slurry and/or concrete dust.
 - 2) Protection of concrete substrate during construction and prior to polishing process.
 - g. Review 'Aggregate Exposure Level' and 'Finished Gloss Level' selected for Project.
 - h. Review 'Stain Protection' applied after polishing work is completed. Review which areas of the building will have stain protection applied.
 - i. Review electrical requirements for concrete polishing equipment used.
- C. Sequencing:
- 1. Polished Concrete Finishing:
 - a. Grind concrete.
 - b. Densifier applied.
 - c. Polish concrete.
 - d. Stain Protection.

1.4 SUBMITTALS

- A. Action Submittals:
- 1. Product Data:
 - a. Polished Concrete Finishing:
 - 1) Manufacturer's product literature or cut-sheets for specified products including information on compatibility of different products and limitation:
 - a) Provide data sheets for hardeners and densifiers.
 - b) Submit data sheets for joint and crack fillers and certification for using this product.
 - c) Submit data sheets for materials used in polishing process.
 - d) Submit data sheets for materials used for stain protection of concrete floor.
- B. Informational Submittals:
- 1. Certificates:
 - a. Installer:
 - 1) Provide Manufacturer's current certified training certificate.
 - 2) Provide documentation from Manufacturer that installer is approved and trained installer of polishing concrete for this project.
 - b. Manufacturer:
 - 1) Provide product certificates signed by Manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
 - 2. Test And Evaluation Reports:
 - a. Polished Concrete Finish:
 - 1) Provide certified test reports, by independent testing laboratory confirming compliance with products used for this project including but not limited to:
 - a) ASTM test results for abrasion, hardness, and weathering.
 - b) Light reflectivity.
 - 3. Manufacturer Instructions:
 - a. Polished Concrete Finish:
 - 1) Manufacturer's written preparation and application instructions including curing time.
 - 2) Manufacturer's written maintenance instructions.
 - 4. Special Procedure Submittals:
 - a. Equipment:
 - 1) Submit product data sheets for polishing equipment:
 - a) Grinding machine
 - b) Metal bonded diamond tools.
 - c) Resin bonded diamond tools.
 - d) Burnishing pads.
 - 2) Submit data sheets on dust control and run-off for both dry and wet polishing systems.
 - 3) If using wet polishing system, submit a slurry disposal plan.

- 4) If using dry polishing system, submit cfm's for vacuum.
5. Qualification Statement:
 - a. Installer:
 - 1) Provide Qualification documentation.
- C. Closeout Submittals:
 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Operations and Maintenance Data:
 - 1) Manufacturer's written maintenance instructions or manuals for polished concrete finish system.
 - 2) Manufacturer's written instructions on maintenance renewal of applied treatments of polished concrete finish system.
 - 3) Protocols and product specifications for crack repair and/or surface imperfection repair for polished concrete finish system concrete floor.
 - b. Warranty Documentation:
 - 1) Final, executed copy of 'Warranty' for polished concrete finish system.

1.5 QUALITY ASSURANCE

- A. Qualifications:
 1. Manufacturer:
 - a. Polished Concrete System:
 - 1) Manufacturer experienced in performing specified work similar in design, products, and extent to scope of this Project; with record of successful in-service performance; and sufficient production capability, facilities, and personnel to produce specified work.
 - 2) Manufacturer must be able to train and certify Installers to apply and install complete polished concrete finishing system.
 - 3) Manufacturer must be able to provide technically trained field representative during construction and approving application method.
 2. Supervisor Qualifications:
 - a. Requirements of Section 01 4301 applies but not limited to the following:
 - 1) Provide documentation if requested by Architect.
 - a) Maintain competent supervisor who is at Project during specified work times and skilled in his trade and qualified by Manufacturer.
 - b) Trained and have current Certification from Manufacturer for installing Concrete Polishing System.
 - c) Familiar with specified requirements and methods needed for proper performance of work of this section.
 - d) Minimum of two (2) years experienced in performing work of this section who has specialized in installation of polished concrete finishing similar to this project.
 3. Installers Qualifications:
 - a. Requirements of Section 01 4301 applies but not limited to the following:
 - 1) Provide documentation if requested by Architect.
 - a) Trained and have current Certification from Manufacturer for installing Concrete Polishing System.
 - b) Experienced in performing work of this section who has specialized in installation work similar to that required for this project.
- B. Mockup:
 1. Required for all projects. Scheduled as per pre-installation conference.
 2. Mockup shall be representative of work to be expected including typical joints, surface finish and standard of workmanship.
 3. Mockup will be used to judge workmanship, concrete substrate preparation, operation of equipment, material application, and shine level.
 - a. Aggregate Exposure Class and Finish Gloss Level selected for Project.
 4. Square footage or size of mock up is between Architect/Owner' Representative and Polishing Installer. Consider between **10 sq ft to 20 sq ft (0.93 to 1.86 sq m)** for small projects and **100 sq ft to 200 sq ft (9.3 to 18.6 sq m)** for larger floors.

5. Provide as many field mockups required to verify selections made under submittals and to demonstrate aesthetic effects of concrete polishing. Approval does not constitute approval of deviations from Contract Documents, unless such deviations are specifically approved by Architect in writing.
6. Install mockup in accordance with specification using same materials, staff and equipment.
7. Finish various levels to show maximum final finish and couple of options.
8. Use same personnel that will be doing project, including Supervisor. Perform grinding, honing, and polishing work as scheduled for Project using same personnel as will perform work for Project.
9. Approvals should be based on:
 - a. Compliance with approved submittals.
 - b. Compliance with specified 'Aggregate Exposure Class'.
 - c. Compliance with specified 'Finished Gloss Level'.
 - d. Protect and maintain approved field mockups during construction in an undisturbed condition as standard for judging completed work. Mockup may be part of completed work if undisturbed at time of completed floor.
10. Approval from Architect/Owner' Representative is required BEFORE starting work on Project.
11. Allow forty-eight (48) hours for inspection of mockup before proceeding with work.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
 1. Materials shall be delivered in original, unopened packages with labels intact.
- B. Storage And Handling Requirements:
 1. Store materials in a clean, dry area in accordance with manufacturer's instructions.
 2. Protect materials during handling and application to prevent damage.
 3. Protect low VOC products from temperatures below 50 deg F (10 deg C) or as directed by Manufacturer.
 4. Keep material containers closed and upright to prevent leakage.

1.7 FIELD CONDITIONS

- A. Ambient Conditions:
 1. Polished Concrete Finishing:
 - a. Comply with manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting liquid applied product application.

1.8 WARRANTY

- A. Manufacturer Warranty:
 1. Clear Polished Concrete Finish:
 - a. Manufacturer's twenty (20) year minimum labor and material system warranty including but not limited to: Polished concrete surface will remain water repellant, dust proof, hardened and abrasion resistant.

PART 2 - PRODUCTS

2.1 SYSTEM

- A. Manufacturers:
 1. Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories:
 - a. Curecrete Distribution, Inc., Springville, Utah www.ashfordformula.com.

- b. Vexcon Chemicals, Philadelphia, PA www.vexcon.com.
- B. Polished Concrete Finishing System:
- 1. Description:
 - a. Densifier:
 - 1) Chemical applied to concrete surface to fill pores, increasing surface density. Chemical densifiers are used on polished concrete to reduce dusting and wear. On polished concrete surfaces densifiers help concrete take better polish and make surface less permeable to liquids so slab does not require sealing.
 - b. Polished Concrete:
 - 1) Mechanically treated concrete, treated with diamond grinding tools. Polishing often includes using liquid hardeners and/or densifiers to add durability and serviceability to surface.
 - 2. Design Criteria:
 - a. Aggregate Exposure: Class B (Fine Aggregate (Salt & Pepper)).
 - b. Finished Gloss: Level 4 Highly Polished. Reflective Sheen: High to Highest.
 - c. Liquid Densifier:
 - 1) Sodium Silicate or Potassium Silicate.
 - d. Polished Concrete Method: Bonded Abrasive Polished Concrete.
 - e. Coefficient of Friction: Achieve following coefficient of friction in accordance to the following standards:
 - 1) ANSI / NFSI B101.1 Static Coefficient of Friction: Achieve minimum of .42 for level floor surfaces.
 - 2) ANSI / NFSI B101.3 Dynamic Coefficient of Friction: Achieve minimum of .35 for level floor surfaces.
 - 3. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a. Densifier:
 - 1) Clear Finish:
 - a) RetroPlate 99 by Curecrete.
 - b) Certi-Shine Clear Finish by Vexcon.

2.2 ACCESSORIES

- A. Crack Repair and Surface Imperfections:
- 1. Description:
 - a. Concrete repair for small air holes, aggregate pop-outs, voids, micro cracks, small spider and other surface imperfections.
 - 2. Design Criteria
 - a. Product that is designed to repair cracks and surface imperfections. Specified material must have sufficient bonding capabilities to adhere after polishing to concrete surface and provide abrasion resistance equal to or greater than surrounding concrete substrate.
 - b. Silicate binders densifying concrete floor mixed with cement dust from previous grinding steps.
 - c. Urethane repair materials are not approved for use.
 - 3. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a. CreteFill by Curecrete.
 - b. Certi-Shine Fusion by Vexcon.
- B. Cleaning Solution:
- 1. Clean and condition densified and densified-polished concrete:
 - a. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) CreteClean Plus by Curecrete.
 - 2) StarSeal EF Degreaser and Cleaner by Vexcon.
- C. Stain Protection:
- 1. Definition:
 - a. Impregnating stain penetrating sealer designed to be applied to densified and polished concrete.
 - 2. Design Criteria:

- a. Non-film forming material which will penetrate into polished and densified concrete leaving protective surface film of less than .05 mils which meets requirements of OSHA for slip resistance as tested by ASTM D2047 and stain resistance of ASTM D1308.
3. All Areas with Polished Concrete Finishing:
 - a. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) RetroPel by Curecrete.
 - 2) Certi-Shine Finish Coat Ultra by Vexcon.
- D. Protective Cover:
 1. Non-woven, puncture and tear resistant, polypropylene fibers laminated with multi-ply, textured membrane, not less than 18 mils in thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification Of Conditions:
 1. Examine substrates to be polished for compliance with requirements and other conditions affecting performance:
 - a. Concrete Finished Floor Flatness according to Section 03 3111: 'Cast-In Place Structural Concrete'.
 - b. Concrete curing methods according to applicable Section 03 3111: 'Cast-In Place Structural Concrete'.
 - c. Concrete Compression strength per Section 03 3111: 'Cast-In Place Structural Concrete'.
 - d. Concrete has cured twenty-eight (28) days or 3500 psi (24.13 MPa) minimum strength.
 - e. Inspect concrete surface for cracks and surface imperfections. Identify areas required for repair.
 2. Notify Architect of unsuitable conditions in writing.
 - a. Proceed only when unsatisfactory conditions have been corrected in manner complying with Contract Documents.

3.2 PREPARATION

- A. Protection:
 1. Protect surrounding surfaces from damage from polished concrete work.
- B. Surface Preparation:
 1. Grease or Oil Patches:
 - a. Remove grease or oil patches, and spillage of any material that has adhered to concrete surface.
 - b. If grinding does not remove oil spots, treat oil spots with emulsifier and oil absorber materials and high pH detergent.
 2. Cracks:
 - a. Repair concrete cracks and surface imperfections.
 - 1) Remove dust, grease, curing compounds, and foreign particles.
 3. Cleaning:
 - a. Follow Manufacturer's written instructions:
 - b. Clean concrete surface of all dirt, mud spots, silt spots, loose material, vegetation, oil spots, and other objectionable and foreign material.
 - c. Remove debris, sand, dirt, and dust from concrete surface.
 - d. Power brooms, power blowers, air compressors, water flushing equipment, and blowers are acceptable equipment for cleaning concrete surface.
 - e. Power rinse surface removing all traces of soap residue.
 4. Inspect concrete surface. Repeat any steps necessary to prepare surface for concrete polishing.
- C. Polishing Equipment:

1. Provide necessary equipment required for Bonded Abrasive Polished Concrete floor system
Quality equipment should be used at all times.

3.3 APPLICATION

- A. Perform all polishing procedures to ensure consistent appearance from wall to wall in areas indicated in Contract Drawings.
- B. Grinding and Hone:
 1. Following manufacturer's grinding procedures and instructions with proper grinding equipment.
 - a. Use manufacturer's recommended polishing grits for each sequence of the process and polishing to desired level.
 - b. Clean floor thoroughly after each pass using dust extraction equipment to remove all visible loose debris and dust.
 - c. All concrete surfaces shall be as uniform in appearance as possible.
- C. Treat cracks and surface imperfections:
 1. Follow manufacturer's written instructions including primers and approved sealant.
 2. Allow repair work to cure thoroughly.
- D. Densifier:
 1. Apply Densifier as per Manufacturer's written instructions at recommended rate of 200 sq ft (18.6 sq m) per gallon (3.785 liters) for maximum performance or rejection at 200 grit, hone.
 2. Do not allow material to puddle. Spread out to an even coat as it absorbs into concrete. Do not overwork an area.
 3. Keep applying thin even coats for minimum of sixty (60) minutes or until floor will no longer absorb, material should penetrate in and dry without leaving film.
 4. Allow application to dry as instructed.
 5. Foot traffic should be avoided until all installations have been completed.
- E. Polish Concrete Floor Finish:
 1. Use Polishing equipment to achieve required levels of Aggregate Exposure and Finish Gloss selected for Project and match that of approved mockup.
- F. Polished Concrete Floor Finish Defects:
 1. Remove defects and re-polish defective areas.
 2. Finish edges of floor finish adjoining other materials in clean and sharp manner.
- G. Stain Protection:
 1. Apply Stain Protection after densifier and polish concrete finishing is applied to concrete surface.
 2. Mixing:
 - a. Lightly stir before each use.
 - b. Do not over mix or bubbles and/or foaming can occur and make uniform application more difficult.
 3. Placement:
 - a. Uniformly apply and remove excessive liquid according to manufacturer's instructions.
 - b. Do not over apply stain protection. Very thin coats are best. Apply Stain Protection using micro fiber pad that has been pre-dampened with water:
 - 1) Using pump up sprayer or HVLP sprayer, spray lightly over top of concrete area to be treated. Spread material thinly and evenly using micro fiber pad over rest of area.
 - a) Limit size of area being treated at any one time to 20 feet (6.1 m) x 20 feet (6.1 m).
 - b) Spread at rate of 1,500-3000 sq ft./gal (37-74 sq. m/L) depending on porosity of concrete surface.
 - c) Spray another line of material when applicator pad begins to drag. Do not work material into surface - spread it and leave it.
 - d) Allow each application to dry at least 30 to 60 minutes between coats or before using floor.
 - 2) Second applications will improve sheen and stain protection.

- a) Buffing with high-speed burnisher (**1500-2100 rpm**) and hog's hair pad between coats is recommended and will speed curing and improve sheen.
- b) Second coats will usually take no more than **3000-4000 sq ft./gal** (**74 – 98 sq. m/L**) followed by burnish.
- c) Do not cover treated surfaces for at least one week as protective coverings may slow curing and cause some whitening by trapping moisture.

3.1 FIELD QUALITY CONTROL

A. Field Tests:

- 1. Field test to test for coefficient of friction if requested by Architect/Owner's Representative:
 - a. ANSI B101.1 for static coefficient of friction.
 - b. ANSI B101.3 for dynamic coefficient of friction.

B. Non-Conforming Work:

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

3.1 PROTECTION

A. General:

- 1. Installer's Responsibility:
 - a. Protect finished surfaces from damage and soiling and other construction activities:
 - 1) Protect polished concrete floors from subsequent construction activities with protective covering without damaging completed work.
- 2. General Contractor's Responsibility:
 - a. After completion and final inspection of floor, protect polished concrete surface from damage from other trades, abuse, vandalism, or damage occurring after installation is complete.

3.2 CLEANING

A. General:

- 1. Remove surplus and excess material, rubbish, tools, and equipment.
- 2. Remove dust extraction for grinding process.

B. Waste Management:

- 1. Disposal:
 - a. Installer's Responsibility:
 - 1) Do not allow trash, waste, or debris to collect. Remove on daily basis.
 - 2) Follow Manufacturer's recommendations for approved disposal of product and containers.
 - b. General Contractor's Responsibility:
 - 1) Provide adequate waste receptacles (dumpsters).

3.3 CLOSEOUT ACTIVITIES

A. Instruction Of Owner:

- 1. Include as part of maintenance training:
 - a. Training Owner's personnel by Manufacturer's designated representative or installer in proper procedures for maintaining polished concrete floor.
 - 1) Include Manufacturer's maintenance documentation required with closing submittal.
 - b. Maintenance of polished concrete should include:
 - 1) Spills.
 - 2) Dirt.
 - 3) Heavily soiled areas.
 - 4) Recommended cleaner products.

- 5) Recommended cleaning equipment.
- 6) Schedule of additional coats of material and burnishing.

END OF SECTION

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

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

1.2 REFERENCES

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

1.3 SUBMITTALS

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

1.4 QUALITY ASSURANCE

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

1.5 DELIVERY, STORAGE, AND HANDLING

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

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

1.6 FIELD CONDITIONS

A. Ambient Conditions:

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

PART 2 - PRODUCTS

2.1 MATERIALS

A. Membrane Concrete Curing:

1. Description:
 - a. Clear water-based, ready-to use 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.
 - 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, naptha, or other components detrimental to finish flooring installation.
 - f. Maintain ninety-five (95) percent of mix water present in concrete mass after application.
 - g. Gradually dissipate after twenty-eight (28) days without leaving stain or discoloring concrete surface.
3. Horizontal and Vertical Cast-In-Place Structural Concrete:
 - a. Type One Acceptable Products.
 - 1) Exterior 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.
 - 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.
 - d) 1100-Clear by W. R. Meadows, Inc. Hampshire, IL www.wrmeadows.com.
 - b. Equal product meeting design criteria requirements as approved by Architect/Owner's Representative before BID. See Section 01 6200.

PART 3 - EXECUTION: Not Used

END OF SECTION

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

- A. Includes But Not Limited To:
 - 1. Furnish and install structural grout as described in Contract Documents.
 - a. For securing anchor bolts and hardware in concrete.

1.2 REFERENCES

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

1.3 SUBMITTALS

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

1.4 DELIVERY, STORAGE AND HANDLING

- A. Delivery And Acceptance Requirements:
 - 1. Materials shall be delivered in original, unopened packages with labels intact clearly identifying product name and manufacturer until time of use.
- B. Storage And Handling Requirements:
 - 1. Follow Manufacturer's recommendations including but not limited to following:
 - a. Store in clean, dry location.
 - b. Keep containers sealed until ready for use.
 - c. Store materials at room temperature before use.
 - 2. Protect materials during handling and placement to prevent damage or contamination.
 - a. Protect materials from freezing or overheating.
 - 3. Shelf Life: One (1) year minimum in original, unopened containers.

1.5 FIELD CONDITIONS

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

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 EXAMINATION

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

- b. Commencement of Work by installer is considered acceptance of substrate.

3.2 PREPARATION

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

3.3 APPLICATION

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

3.4 FIELD QUALITY CONTROL

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

3.5 CLEANING

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

3.6 PROTECTION

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

END OF SECTION

DIVISION 04: MASONRY

04 0500 COMMON WORK RESULTS FOR MASONRY

04 0501 COMMON MASONRY REQUIREMENTS
04 0513 CEMENT AND LIME MASONRY MORTARING
04 0516 MASONRY GROUTING
04 0519 MASONRY ANCHORS AND INSERTS
04 0520 MASONRY REINFORCING

04 2000 UNIT MASONRY

04 2223 ARCHITECTURAL CONCRETE UNIT MASONRY

END OF TABLE OF CONTENTS

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SECTION 04 0501**COMMON MASONRY REQUIREMENTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Common requirements and procedures for Masonry including:
 - a. References.
 - b. Definitions.
 - c. Pre-Installation Conferences held jointly with masonry sections.
 - d. Joint backing for masonry control joints and masonry expansion joints.
 - e. Testing and Inspection for providing specific testing and inspections and Field Tests and Inspections administrative requirements for masonry.
- B. Related Requirements:
 - 1. Section 01 1200: 'Multiple Contract Summary' for Owner Furnished Testing and Inspecting Services.
 - 2. Section 01 4523: 'Testing And Inspection Services' for testing, inspections, special testing, special inspections, and testing laboratory services for materials, products, and construction methods.
 - 3. Section 07 9213: 'Elastomeric Joint Sealants' used with masonry joints.
 - 4. Sections Under 04 0000 Heading: 'Masonry':
 - a. Pre-installation conference held jointly with other masonry related sections including:
 - 1) Section 04 0513: 'Cement and Lime Masonry Mortaring'.
 - 2) Section 04 0516: 'Masonry Grouting'.
 - 3) Section 04 0519: 'Masonry Anchors And Inserts'.
 - 4) Section 04 2223: 'Architectural Concrete Unit Masonry'.

1.2 REFERENCES

- A. Association Publications:
 - 1. The Brick Industry Association, Reston VA: 'Technical Notes on Brick Construction' (July 2012), www.gobrick.com.
- B. Definitions:
 - 1. Brick:
 - a. Cavity Wall Masonry: Wall consisting of two wythes of masonry in which space between wythes is not grouted.
 - b. Hollow Brick: Masonry unit of clay or shale whose net cross-sectional area in any plane parallel to bearing surface is not less than 60 percent of its gross cross-sectional area measured in same plane (See ASTM C652).
 - c. Solid Brick: Solid masonry unit of clay or shale, usually formed into rectangular prism while plastic and burned or fired in a kiln. Solid brick can have core holes whose area is no more than twenty-five 25 percent of total bed surface of the brick.
 - d. Running Bond: Same as common bond, with continuous horizontal joints, but vertical joints are offset or in line. Bricks of each course are offset from the previous instead of being right on top of each other. If running bond is being used with modular brick, end of brick will be at mid-point of brick on course below. Running bond only requires minimal cutting at each end and will easily follow a gentle curve. Running bond method most used.
 - e. Unit Masonry: as referred to in this specification is defined as Brick Veneer, Hollow Brick, Architectural Concrete, Composite, and Cavity Wall.
 - f. Warpage: Distortion of surfaces or edges of an individual brick from a plane surface or from straight line.

- g. Wythe: Continuous vertical section of masonry one (1) unit in thickness.
- 2. Brick Classifications:
 - a. Brick Color:
 - 1) No color-related tolerances in ASTM standards for brick. Standards are dictated by sample panel, mockups, or project specification.
 - b. Brick Grade (durability and exposure):
 - 1) Brick is subjected to environmental and service conditions that vary. Brick is specified for its specific durability based on severity of weather and exposure and physical properties. Brick grades classifications are based on Weathering Index:
 - a) Grade SW: Severe weathering (stronger and more durable, and require less maintenance).
 - b) Grade MW: Moderate weathering (less durable).
 - c) Grade NW: Negligible or no weathering (least durable and should only be used for interior work).
 - c. Brick Types:
 - 1) Type FBX:
 - a) Brick for general use in masonry where higher degree of precision and lower permissible variation in size than permitted for Type FBS.
 - b) Maintains strict requirements on absorption, waste, chipping, cracks, dimensions and distortion (warping).
 - c) Allows very narrow color range, minimal size variations, and uniform in appearance.
 - 2) Type FBS:
 - a) Brick for general use in masonry:
 - b) Wider range of color and size variations, but lack of production controls results in many odd color lots.
 - 3) Type FBA:
 - a) Brick for general use in masonry selected to produce characteristic architectural effects resulting from non-uniformity in size and texture of individual units:
 - b) Used for aesthetic qualities.
 - c) Has no limits for size and color variations.
- 3. Cold Weather: as referred to in this Section, is four (4) hours with ambient temperature below **40 deg F (4.4 deg C)** in twenty-four (24) hour period.
- 4. Efflorescence: Deposit or encrustation of soluble salts, generally white and most commonly consisting of calcium sulfate that may form on surface of stone, brick, concrete, or mortar when moisture moves through and evaporates on masonry. Often caused by free alkalies leached from mortar, grout, adjacent concrete, or in clays. Test for efflorescence is described in ASTM C67 and CAN/CSA A82.
- 5. Flashing:
 - a. Cavity Wall Flashing: Same as flexible flashing.
 - b. Flashing: Thin impervious material placed in mortar joints and through air spaces in masonry to prevent water penetration and/or provide water drainage.
 - c. Flexible Flashing: Water-proof material typically used in cavity wall construction to contain and assist in proper water drainage that may penetrate wall system veneer. Other materials may be required to constitute the system.
 - d. Foundation Flashing: Same as flexible flashing.
 - e. Head And Sill Flashing: Same as flexible flashing.
 - f. Through-Wall Flashing: Generally considered same as flexible flashing.
- 6. Hot Weather: as referred to in this Section, is ambient air temperature above **100 deg F (38 deg C)** or ambient air temperature above **90 deg F (32 deg C)** with wind velocity **8 mph (13 kph)** or greater.
- 7. Masonry Joints:
 - a. Masonry Control Joint: Determines location of movement in concrete masonry walls that is due to volume changes resulting from shrinkage. Vertical control joint is vertical gap through concrete masonry wythe and filled with inelastic materials. Joint backing with sealant is used on exterior side of control joint to prevent water and air penetration. Concrete masonry generally shrinks over time.
 - b. Masonry Expansion Joint. Expansion joint separates brick masonry walls into segments to prevent cracking caused by changes in temperature, moisture expansion, elastic deformation, settlement and creep. Joints are formed by leaving continuous unobstructed

opening through brick wythe that may be filled with highly compressible material. Joint backing with sealant is used on exterior side of expansion joint to prevent water and air penetration. Brick masonry generally expands over time.

8. Vents:
 - a. Weep Hole: Opening placed in mortar joints of facing material at level of flashing, to permit escape of moisture.
 - b. Weep Vent: Inserts placed in Weep Hole to screen insects from entering but allowing escape of moisture.
 - c. Vents (Open Head Joints): Placed at top of drainage air space to help reduce moisture buildup in air space by promoting ventilation. Weep vents may be placed vents to screen insects from entering but allowing movement of air through weep holes.

C. Reference Standards:

1. ASTM International:
 - a. ASTM D2000-18, 'Standard Classification for Rubber Products in Automotive Applications'.
 - b. ASTM D2240-15, 'Standard Test Method for Rubber Property-Durometer Hardness'.
 - c. ASTM D2287-12, 'Standard Specification for Nonrigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds'.
2. International Building Code (IBC) (2018 or latest approved edition):
 - a. Chapter 17, 'Special Inspections And Tests':
 - 1) Section 1704, 'Special Inspections And Tests, Contractor Responsibility And Structural Observations'.
 - 2) Section 1705, 'Required Special Inspection And Tests':
 - a) Section 1705.2, 'Steel Construction'.
 - b. Chapter 21, 'Masonry' for materials, design, construction and quality of masonry.
3. The Masonry Society (TMS):
 - a. TMS 402/602-16, 'Building Code Requirements and Specification for Masonry Structures'.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate work with other trades with items to be built into masonry such as electrical switches and plumbing faucets.

B. Pre-Installation Conference:

1. Participate in MANDATORY pre-installation conference as specified in Section 01 3100 held jointly with other Division 04 'Masonry' specifications in this Project that require pre-installation conferences:
 - a. Conduct conference at Project site.
 - b. Schedule pre-installation conference during construction of mockup panel.
2. In addition to agenda items specified in Section 01 3100, review following:
 - a. Review storage and handling requirements.
 - b. Review cold and hot weather procedure requirements.
 - c. Review Section 01 4523 for Testing and Inspection administrative requirements and responsibilities and Field Quality Control tests and inspections.
 - 1) Review requirements and frequency of testing and inspections.
 - 2) Review specific testing and inspections and field test requirements as specified in Unit Masonry Sections.

C. Scheduling:

1. Brick Unit Veneer Masonry:
 - a. Structural Mortar:
 - 1) Notify Testing Agency and Architect twenty-four (24) hours minimum before placing masonry units, reinforcing, mortar and/or grout.
2. Concrete Unit Masonry:
 - a. Structural Mortar and Grout:
 - 1) Notify Testing Agency and Architect twenty-four (24) hours minimum before placing masonry units, reinforcing, mortar and/or grout.

1.4 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data: As specified in each masonry section.
 - 2. Samples: As specified in each masonry section.

1.5 QUALITY ASSURANCE

- A. Testing And Inspection:
 - 1. Owner is responsible for Quality Assurance. Quality assurance performed by Owner will be used to validate Quality Control performed by Contractor.
 - 2. Owner will provide Testing and Inspection for structural masonry (prisms, units, mortar, and grout):
 - a. Owner will employ testing agencies to perform testing and inspection for structural masonry as specified in Field Quality Control in Part 3 of this specification:
 - 1) Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform the Work in strict accordance with requirements of Contract Documents and perform contractor testing and inspection.
 - 2) See Section 01 1200: 'Multiple Contract Summary'.
- B. Scheduling:
 - 1. Notify Testing Agency and Architect twenty-four (24) hours minimum before placing mortar.
 - 2. Notify Testing Agency and Architect twenty-four (24) hours minimum before placing grout.

1.6 DELIVERY, HANDLING, AND STORAGE

- A. Delivery And Acceptance Requirements:
 - 1. Check, carefully unload, and deliver material to site in such manner as to avoid soiling, damaging, or chipping.
 - 2. Do not use damaged masonry units, damaged components of structure, or damaged packaged materials.
 - 3. Masonry Accessories: Materials shall be delivered in original, unopened packages with labels intact.
- B. Storage And Handling Requirements:
 - 1. Aggregate:
 - a. Store different aggregates separately.
 - b. Store on high ground, or ideally, off ground to prevent contamination from dirt, organic materials and ground water, any of which may contribute to efflorescence and may be deleterious to mortar performance.
 - c. Store under protective cover to avoid saturation and freezing in cold weather.
 - 2. Cementitious material:
 - a. Store in such manner as to prevent deterioration or intrusion of foreign material or moisture.
 - b. Do not use cementitious materials that have become contaminated.
 - c. Protect from precipitation and groundwater.
 - 1) Store materials on elevated platforms, under cover, and in dry location.
 - 2) Do not use cementitious materials that have become damp or has become unsuitable for good construction.
 - 3. Masonry accessories:
 - a. Store masonry accessories clear of ground, including metal items, to prevent corrosion and contamination by dirt and ground water which may contain soluble salts and other matter which may contribute to efflorescence and staining.
 - b. Plastic and asphalt coated flashing material should not be stored in areas exposed to sunlight. During installation, flashing must be pliable so that no cracks occur at corners or bends.
 - c. Protect from damage until installation.
 - 4. Masonry units:

- a. Store materials protected from exposure to harmful weather conditions as directed by manufacturer.
 - b. Store material on planks clear of ground which may contain soluble salts and protect from damage, dirt, or disfigurement.
 - c. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof membrane, securely tied. If units become wet, do not install until they are dry.
5. Masonry Reinforcement:
- a. Protect reinforcement, ties, and metal accessories from permanent distortions, elements and store off ground.

1.7 FIELD CONDITIONS

A. Ambient Conditions:

1. Mortar:
 - a. Ideal mortar temperature is **70 deg F ± 10 deg F (21 deg C ± 6 deg C)**. Mixing temperature should be maintained within **10 deg F (6 deg C)**.
2. Cold Weather Requirements. Implement approved cold weather procedures and comply with requirements contained in TMS 402/602 including but not limited to following:
 - a. Preparation requirements (prior to conducting masonry work):
 - 1) Do not lay masonry units having either temperature below **20 deg F (minus 7 deg C)** or containing frozen moisture, visible ice, or snow on their surface.
 - 2) Do not use frozen materials or materials mixed or coated with ice or frost. Keep materials free of ice and snow. Do not lay masonry on frozen material. Remove and replace unit masonry damaged by frost or by freezing conditions.
 - 3) Remove visible ice and snow from top surface of existing foundations and masonry to receive new construction. Heat these surfaces above freezing, using methods that do not result in damage.
 - 4) Preparation of mortar.
 - b. Construction requirements (work in progress and based on ambient air temperature):
 - 1) Do not heat water or aggregates used in mortar or grout above **140 deg F (60 deg C)**. Comply with cold weather requirements for ambient air temperatures prior to conducting masonry work in accordance with TMS 402/602.
3. Hot Weather Requirements. Implement approved hot weather procedures and comply with requirements contained in TMS 402/602 including but limited to following:
 - a. Preparation (prior to conducting masonry work). Comply hot weather procedures when:
 - 1) Ambient air temperature exceeds **100 deg F (37.8 deg C)**, or exceeds **90 deg F (32.2 deg C)** with wind velocity greater than **8 mph (12.9 kph)**.
 - 2) Ambient temperature exceeds **115 deg F (46.1 deg C)**, or exceeds **105 deg F (40.6 deg C)** with wind velocity greater than **8 mph (12.9 kph)**.
 - b. Construction requirements (work in progress). Comply hot weather procedures when prior to conducting masonry work in accordance with TMS 402/602.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Masonry Control Joints (if shown on Contract Drawings):

1. Description:
 - a. Extruded rubber or PVC.
 - b. Joint backing (backer rod).
 - c. Elastomeric joint sealant.
2. Design Criteria:
 - a. Extruded Rubber:
 - 1) Meet requirements of ASTM D2000 2AA-805.
 - b. PVC:

- 1) Meet requirements of ASTM D2287 (Type PVC 654-4) with durometer hardness of 85 (+ or -5) when tested in accordance with ASTM D2240.
- c. Type One Acceptable Products:
 - 1) RS standard rubber control joint by Hohmann & Barnard.
 - 2) VS standard PVC control joint by Hohmann & Barnard.
 - 3) Equals as approved by Architect.
- B. Masonry Expansion Joints:
 1. Description:
 - a. Closed Cell Neoprene Sponge without tear strip placed horizontally beneath relieving angle, or in vertical expansion joint to act as control joint.
 - b. Joint backing (backer rod).
 - c. Elastomeric joint sealant.
 2. Design Criteria:
 - a. Extruded Rubber:
 - 1) Meet requirements of ASTM D1056 Grade 2A1.
 - b. Type One Acceptable Products:
 - 1) NS neoprene sponge by Hohmann & Barnard.
 - 2) Equals as approved by Architect.

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

- A. Field Tests And Inspections:
 1. Unit Masonry:
 - a. Tests and Inspections are required as specified in Sections under Heading 04 2000 'Unit Masonry'.
 2. Stone Assemblies:
 - a. Inspections are NOT required as specified in Section 04 4300.
 3. Cast Stone Masonry:
 - a. Inspections are required as specified in Section 04 7213:

END OF SECTION

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

- A. Includes But Not Limited To:
 - 1. Quality of masonry mortar used on Project.
- B. Related Requirements:
 - 1. Section 01 1200: 'Multiple Contract Summary' for Owner Furnished Testing and Inspecting Services.
 - 2. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
 - 3. Section 04 0501: 'Common Masonry Requirements'.
 - 4. Sections Under 04 2000 Heading: Furnish and install mortar.

1.2 REFERENCES

- A. Definitions:
 - 1. See Section 04 0501: 'Common Masonry Requirements' for common masonry definitions.
- B. Reference Standards:
 - 1. ASTM International:
 - a. ASTM C144-18, 'Standard Specification for Aggregate for Masonry Mortar'.
 - b. ASTM C150/C150M-18, 'Standard Specification for Portland Cement'.
 - c. ASTM C207-18, 'Standard Specification for Hydrated Lime for Masonry Purposes'.
 - d. ASTM C270-14a, 'Standard Specification for Mortar for Unit Masonry'.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference:
 - 1. Participate in MANDATORY pre-installation conference as specified in Section 01 3100 held jointly with other Division 04 'Masonry' specifications in this Project that require pre-installation conference as specified in Section 04 0501: 'Common Masonry Requirements'.

1.4 SUBMITTALS

- A. Informational Submittals:
 - 1. Source Quality Control Submittals:
 - a. If pre-mixed wet mortar or pre-blended dry mortar mix are to be used, provide certification from Manufacturer or Supplier verifying that mixes meet specification requirements.
 - b. If site mixed / blended mortar is to be used, provide written description of proposed method of measuring and mixing of materials.
- B. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Record Documentation:
 - 1) Testing and Inspection Reports:
 - a) Testing Agency Inspecting Reports.

1.5 QUALITY ASSURANCE

- A. Testing And Inspection:
 - 1. As specified in Section 04 0501: 'Common Masonry Requirements'.

1.6 DELIVERY, HANDLING, AND STORAGE

- A. Delivery And Acceptance Requirements:
 - 1. As specified in Section 04 0501: 'Common Masonry Requirements'.
- B. Storage And Handling Requirements:
 - 1. Cementitious material:
 - a. As specified in Section 04 0501: 'Common Masonry Requirements'.

PART 2 - PRODUCTS

2.1 SYSTEM

- A. Design Criteria:
 - 1. Mixing:
 - a. Meet either proportion or property specifications of ASTM C270 for masonry mortar as per Table 3 'Proportion Specifications' and Table 4 'Physical Requirements for Masonry Cement Mortars'.
 - b. Conform with requirements of ASTM C780 and ASTM C1586.
 - c. Machine mixing should be used whenever possible.
 - 2. Mortar Minimum Compressive Strength at twenty-eight (28) days:
 - a. Type S: **1800 psi (12.4 MPa)**.
 - 1) Concrete Unit Masonry (CMU):
- B. Materials:
 - 1. Portland Cement:
 - a. Meet requirements of ASTM C150/C150M and ASTM C270.
 - 2. Hydrated Lime:
 - a. Meet requirements of ASTM C207 for hydrated lime.
 - 3. Aggregate:
 - a. Meet requirements of ASTM C144 and ASTM C270.
 - 4. Water:
 - a. Clean and free of acids, alkalis, and organic materials.
 - 5. Admixtures:
 - a. Use no admixtures, except for color pigments specified below, without Architect's written permission. Use of any admixture to meet cold weather requirements and admixtures that increase air entrainment are expressly forbidden under all circumstances.
- C. Mixes:
 - 1. General:
 - a. Heat water and sand to **140 deg F (60 deg C)** maximum if temperature is below **40 deg F (4.4 deg C)**.
 - 2. Unit Masonry for mortar as specified in each Masonry specification section:
 - a. Proportions of ingredients in compliance with proportion specification of ASTM 270 using Portland cement.

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

A. Field Tests And Inspections:

1. Field tests and inspection as specified in 04 0501: 'Common Masonry Requirements'.
2. Sampling and testing of mortar is not required.

END OF SECTION

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

- A. Includes But Not Limited To:
 - 1. Quality of masonry grout used on Project.
- B. Related Requirements:
 - 1. Section 01 1200: 'Multiple Contract Summary' for Owner Furnished Testing and Inspecting Services.
 - 2. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
 - 3. Section 04 0501: 'Common Masonry Requirements'.
 - 4. Sections under 04 2000 heading: Furnish and install masonry grout.

1.2 REFERENCES

- A. Definitions:
 - 1. See Section 04 0501 for common masonry definitions.
- B. Reference Standards:
 - 1. ASTM International:
 - a. ASTM C143/C143M-15a, 'Standard Test Method for Slump of Hydraulic-Cement Concrete'.
 - b. ASTM C404-18, 'Standard Specification for Aggregates for Masonry Grout'.
 - c. ASTM C476-18, 'Standard Specification for Grout for Masonry'.
 - d. ASTM C1019-18, 'Standard Test Method for Sampling and Testing Grout'.
 - 2. The Masonry Society (TMS):
 - a. TMS 402/602-16, 'Building Code Requirements and Specification for Masonry Structures'.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference:
 - 1. Participate in MANDATORY pre-installation conference as specified in Section 01 3100 held jointly with other Division 04 'Masonry' specifications in this Project that require pre-installation conference as specified in Section 04 0501.

1.4 SUBMITTALS

- A. Informational Submittals:
 - 1. Source Quality Control Submittals:
 - a. If pre-blended dry grout is to be used, provide certification from Manufacturer or Supplier verifying that mixes meet specification requirements.
 - b. If grout is to be mixed in field, provide written description of proposed procedure for measuring and mixing of materials.
- B. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Record Documentation:
 - 1) Testing and Inspection Reports:
 - a) Testing Agency Inspecting Reports.

1.5 QUALITY ASSURANCE

- A. Testing And Inspection:
 - 1. As specified in Section 04 0501.

1.6 DELIVERY, HANDLING, AND STORAGE

- A. Delivery And Acceptance Requirements:
 - 1. As specified in Section 04 0501.
- B. Storage And Handling Requirements:
 - 1. Cementitious material:
 - a. As specified in Section 04 0501.

PART 2 - PRODUCTS

2.1 SYSTEM

- A. Design Criteria:
 - 1. Provide grout that conforms to requirements of ASTM C476 and TMS 402/602.
- B. Materials:
 - 1. Proportions of Ingredients:
 - a. Grout proportions shall be determined by one of following methods:
 - 1) As per ASTM C476 Table 1: 'Grout proportions by Volume' for fine and coarse grout.
 - 2) Specified Compressive Strength: Proportions established by twenty-eight (28) day compressive strength tests in accordance with Test Method ASTM C1019 that obtain specified compressive strength:
 - a) Grout shall be mixed to slump of 8 to 11 inches (200 to 280 mm) as determined by Test Method ASTM C143/C143M and shall have minimum compressive strength of 2000 psi (14 MPa) at 28 days.
 - 2. Production Methods: Grout shall be produced using one of following procedures:
 - a. Materials mixed at job site:
 - 1) Individual cementitious materials and aggregates stored at job site shall be mixed in mechanical mixer for minimum of five (5) minutes with sufficient water to achieve desired consistency.
 - 2) Individual dry ingredients transported to job site in suitable compartments shall be mixed with water at job site using continuous volumetric proportioning equipment to achieve desired consistency. Mix with auger of appropriate length to provide adequate mixing.
 - b. Mixed materials transported to job site:
 - 1) Factory dry-blended cementitious materials and aggregates delivered to job site shall be mixed in mechanical mixer for minimum of five (5) minutes with sufficient water to achieve desired consistency.
 - 2) Wet-mixed grout shall arrive at job site in ready-mixed condition. Slump shall be adjusted as necessary, and grout shall be re-mixed at mixing speed for at least one minutes before discharging to achieve desired consistency.
 - c. Grout may be hand mixed on small jobs with written approval of mixing procedure by Architect.
 - 3. Portland Cement:
 - a. Meet requirements of ASTM C94/C94M, ASTM C150/C150M and ASTM C476.
 - 4. Aggregate:
 - a. Meet requirements of ASTM C144, ASTM C404, and ASTM C476.
 - 5. Water: Clean and potable free of acids, alkalis, and organic materials.
 - 6. Admixtures:

- a. No additives are allowed which will increase air entrainment. Other additives may be used as approved in writing by Architect before use.
- 7. Antifreeze Compounds:
 - a. No antifreeze liquids, salts or other substances shall be used in grout to lower freezing point.

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

- A. Field Tests And Inspections:
 - 1. Field tests and inspection as specified in 04 0501: 'Common Masonry Requirements'.

END OF SECTION

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

- A. Products Furnished But Not Installed Under This Section:
 - 1. Embedded Anchors for masonry.
 - 2. Post Installed Drilled Anchors for masonry:
 - a. Adhesive anchors and inserts.
 - b. Drilled-in mechanical anchors (expansion bolts).
 - c. Screw anchors.
 - 3. Masonry anchors and inserts not specified elsewhere.
- B. Related Requirements:
 - 1. Section 01 1200: 'Multiple Contract Summary' for Owner Furnished Testing and Inspecting Services.
 - 2. Section 01 4000: 'Quality Requirements' for administrative and procedural requirements for quality assurance and quality control.
 - 3. Section 01 4523: 'Testing and Inspecting Services' for post installed Drilled-In Anchor testing and inspection, and testing laboratory services for materials, products, and construction methods.
 - 4. Section 04 0501: 'Common Masonry Requirements' for installation of masonry anchors and inserts.
 - 5. Section 04 0521: 'Masonry Veneer Ties'.
 - 6. Section 04 0523: 'Masonry Accessories'.
 - 7. Sections Under 04 2000 Heading: 'Unit Masonry' for masonry anchors and inserts used in Unit Masonry.

1.2 REFERENCES

- A. Reference Standards:
 - 1. American Concrete Institute:
 - a. ACI 355.4-11, 'Qualification of Post-Installed Adhesive Anchors in Concrete and Commentary'.
 - b. ACI 548.12-12, 'Specification for Bonding Hardened Concrete and Steel to Hardened Concrete with an Epoxy Adhesive'.
 - 2. ASTM International:
 - a. ASTM A36/A36M-14, 'Standard Specification for Carbon Structural Steel'.
 - b. ASTM A307-14, 'Standard Specification for Carbon Steel Bolts and Studs, 60000 psi Tensile Strength'.
 - c. ASTM A563-15, 'Standard Specification for Carbon and Alloy Steel Nuts'.
 - d. ASTM E488/E488M-18, 'Standard Test Methods for Strength of Anchors in Concrete Elements'.
 - e. ASTM F3125/F3125-15a, 'Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions'.
 - 3. International Code Council (IBC) (2018 or latest edition available):
 - a. Chapter 17, 'Special Inspections And Tests':
 - 1) Section 1704, 'Special Inspections And Tests, Contractor Responsibility And Structural Observations'.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference:
 - 1. Participate in MANDATORY pre-installation conference as specified in Section 01 3100 held jointly with other Division 04 'Masonry' specifications in this Project that require pre-installation conference as specified in Section 04 0501.
- B. Scheduling:
 - 1. Inspection shall be performed according to Manufacturer's submitted ICC ES Evaluation Report.
 - 2. Notify Testing Agency and Architect twenty-four (24) hours minimum before testing Post Installed Drilled Anchors. Coordinate testing schedule with mortar and grout as specified in Section 04 0501.

1.4 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Post Installed Anchors:
 - 1) Manufacturer's product literature for each item.
- B. Informational Submittals:
 - 1. Test And Evaluation Reports:
 - a. Post Installed Anchors:
 - 1) Provide current Manufacturer's applicable ICC ESR Evaluation Reports and ICC ES Acceptance Criteria showing conformance for each item.
 - 2. Manufacturer's Instructions:
 - a. Post Installed Anchors:
 - 1) Manufacturer's published installation instructions for each item.
- C. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Record Documentation:
 - 1) Post Installed Anchors:
 - a) Testing Agency Inspecting Reports of Anchors.

1.5 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Manufacturer:
 - a. Having sufficient capacity to produce and deliver required materials without causing delay in work.
 - 2. Installer:
 - a. Acceptable to Manufacturer, experienced in performing work of this section and has specialized in installation of work similar to that required for this project.
- B. Testing and Inspection.
 - 1. Owner is responsible for Quality Assurance. Quality assurance performed by Owner will be used to validate Quality Control performed by Contractor.
 - 2. Owner will provide Testing and Inspection for Post Installed Anchors:
 - a. Owner will employ testing agencies to perform testing and inspection for anchors as specified in Field Quality Control in Part 3 of this specification.
 - 1) Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform the Work in strict accordance with requirements of Contract Documents and perform contractor testing and inspection.
 - 2) See Section 01 1200: 'Multiple Contract Summary'.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
 - 1. Materials shall be delivered in original, unopened packages with labels intact.
- B. Storage And Handling Requirements:
 - 1. Store materials protected from exposure to harmful weather conditions and as directed by manufacturer.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Manufactured Units:
 - 1. General:
 - a. Use hot-dipped galvanized or stainless steel with matching nuts and washers in exterior and moist interior applications unless indicated otherwise on Drawings.
 - b. Nut: Conform to requirements of ASTM A563, Grade A, Hex.
 - c. Conform to requirements of ASTM F3125/F3125M for chemical, physical and mechanical requirements for quenched and tempered bolts manufactured from steel and alloy steel.
- B. Embedded Anchor Bolts:
 - 1. Class Two Quality Standard. See Section 01 6200 for definition.
 - a. Meet following design criteria requirements:
 - 1) Bent-bar Anchors: J and L-Bolts (threaded steel rods with hooks embedded into masonry):
 - a) Non-headed type threaded **2 inches (50 mm)** minimum conforming to material requirements of ASTM A36/A36M.
 - b) Anchor hook to project **2 inch (50 mm)** minimum including bolt diameter.
 - 2) Headed Bolts:
 - a) Headed type threaded **2 inch (50 mm)** minimum conforming to requirements of ASTM A307, Grade A.
- C. Post Installed Anchors (Concrete Masonry Unit (CMS) and Hollow Brick Unit Masonry):
 - 1. Design Criteria:
 - a. Design loads are determined from testing minimum of five (5) specimens in accordance with ASTM E488 under stresses and conditions that represent intended use.
 - 1) Allowable stress design values are limited to twenty (20) percent of average tested anchor bolt strength.
 - 2) Using strength design provisions, nominal design strengths are limited to sixty-five (65) percent of average tested strength.
 - b. Effective embedment length: **2 inch (50 mm)** minimum.
 - 2. Adhesive Anchors:
 - a. Cartridge Injection Adhesive Anchors.
 - b. Products shall have current ICC ES Evaluation report conforming to current ICC ES Acceptance Criteria ICC ES AC 58 for masonry.
 - c. Rod diameter and embedment length as indicated on Contract Drawings.
 - d. Type Two Acceptable Products:
 - 1) HIT-HY 70 by Hilti Fastening Systems, Tulsa, OK; www.us.hilti.com.
 - 2) SET Epoxy by Simpson Strong-Tie Co., Pleasanton, CA www.simpsonanchors.com.
 - 3) Equal as approved by Architect before installation. See Section 01 6200.
 - 3. Drilled-In Mechanical Anchors (Expansion Bolts):
 - a. Products shall have current ICC ES Evaluation report conforming to current ICC ES Acceptance Criteria ICC ES AC 01 for masonry.
 - b. Type Two Acceptable Products:
 - 1) Kwik Bolt 3 by Hilti Fastening Systems, Tulsa, OK www.us.hilti.com.

- 2) Wedge-All by Simpson Strong-Tie Co., Pleasanton, CA www.simpsonanchors.com.
 - 3) Equal as approved by Architect before installation. See Section 01 6200.
4. Screw Anchors:
- a. Provide anchors with length identification markings conforming to ICC ES AC 106 for masonry.
 - b. Type Two Acceptable Products:
 - 1) Titen HD by Simpson Strong Tie Co, Dublin, CA www.strongtie.com.
 - 2) Equal as approved by Architect through shop drawing submittal before installation. See Section 01 6200.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions:
1. Post Installed Anchors (Concrete Masonry Unit (CMS) and Hollow Brick Unit Masonry):
 - a. Base Material Strength:
 - 1) Unless otherwise specified, do not drill holes in masonry until mortar, or grout has achieved full design strength.
 - b. Identify position of reinforcing steel and other embedded items before drilling holes for anchors.
 - c. Exercise care in coring or drilling to avoid damaging existing reinforcing or embedded items.
 - d. Take precautions as necessary to avoid damaging, electrical and telecommunications conduit, and gas lines.
 - e. Notify Architect/Engineer if reinforcing steel or other embedded items are encountered during drilling.

3.2 PREPARATION

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

3.3 INSTALLATION

- A. Embedded Anchor Bolts:
1. Embed Headed and J Bolts larger than **1/4 inch (6.4 mm)** diameter in grout that is placed in accordance with 'Grout Placement' as specified in Installation requirements in Part 3 of this specification. Anchor bolts of **1/4 inch (6.4 mm)** diameter or less are permitted to be placed in grout.
 2. For anchor bolts placed in top of grouted cells and bond beams, maintain clear distance between bolt and face of masonry unit of at least **1/4 inch (6.4 mm)** when using fine grout and at least **1/2 inch (12.7 mm)** when using coarse grout.
 3. For anchor bolts placed through face shell of hollow masonry unit, drill hole that is tight-fitting to bolt or provide minimum clear distance:
 4. For portion of bolt that is within grouted cell, maintain clear distance between bolt and face of masonry unit and between head or bent leg of bolt and formed surface of grout of at least 1/4 inch (6.4 mm) when using fine grout and at least **1/2 inch (12.7 mm)** when using coarse grout.
 5. Place anchor bolts with clear distance between parallel anchor bolts not less than nominal diameter of anchor bolt, nor less than **1 inch (25 mm)**.
- B. Post Installed Anchors (Concrete Masonry Unit (CMS) and Hollow Brick Unit Masonry):
1. General:

- a. Drill holes with rotary impact hammer drills using carbide-tipped bits or core drills using diamond core bits.
- b. Unless otherwise shown on Contract Drawings, drill holes perpendicular to masonry surface.
- c. Where anchors are to be installed in cored holes, use core bits with matched tolerances specified by Manufacturer. Cored holes may only be used if acceptable to Manufacturer.
- d. Perform anchor installation in accordance with Manufacturer's published instructions.
2. Adhesive Anchors:
 - a. Clean holes in accordance with Manufacturer's published instructions before installation of adhesive. Follow Manufacturer's instructions to ensure proper mixing of adhesive components.
 - b. Inject adhesive into holes proceeding from bottom of hole and progressing toward surface so as to avoid introduction of air pockets into adhesive. Inject sufficient adhesive into hole to ensure that annular gap is filled to surface.
 - c. Remove excess adhesive from surface.
 - d. Shim anchors with suitable device to center anchor in hole. Do not disturb or load anchors before Manufacturer's specified cure time has elapsed.
 - e. Observe Manufacturer's instructions with respect to installation temperatures for adhesive anchors. Base material temperatures must be maintained above minimum temperatures allowed by Manufacturer for full required epoxy cure time.
3. Drilled-in Mechanical Anchors (Expansion Bolts):
 - a. Protect threads from damage during anchor installation.
 - b. Set anchors to Manufacturer's recommended torque, using torque wrench. Following attainment of ten (10) percent of specified torque, one hundred (100) percent of specified torque shall be reached within 7 or fewer complete turns of nut. If specified torque is not achieved within required number of turns, remove and replace anchor, unless otherwise directed by Architect.
4. Screw Anchors:
 - a. Protect threads from damage during anchor installation.
 - b. Set anchors to Manufacturer's recommended torque, using torque wrench.

3.4 FIELD QUALITY CONTROL

- A. Field Tests and Inspections:
 1. Civil and structural field tests, laboratory testing, and inspections are provided by Owner's independent Testing Agency as specified in Section 01 4523 'Testing And Inspection Services':
 - a. Quality Control is sole responsibility of Contractor.
 - 1) Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform testing and inspection as part of his Quality Control:
 - a) Testing and inspections, if performed by Contractor, will be responsibility of Contractor to be performed by an independent entity.
 2. Post Installed Anchors (Concrete Masonry Unit (CMS) and Hollow Brick Unit Masonry):
 - a. Certified Inspector from Testing Agency shall verify procedures used for installation of all post installed anchors and monitor their installation for compliance with manufacturer's requirements.
 - b. Testing: Ten (10) percent of each type and size of drilled-in anchor shall be proof loaded by Testing Agency's testing laboratory or as directed by Architect. Adhesive anchors will not be torque tested unless otherwise directed by Architect. If more than ten (10) percent of tested anchors fail to achieve specified torque or proof load within limits defined on Drawings, all anchors of same diameter and type as failed anchors shall be tested at Contractors expense, unless otherwise instructed by Architect.
 - 1) Torque will be applied with calibrated torque wrench.
 - 2) Proof loads will be applied with calibrated hydraulic ram. Displacement of adhesive anchors at proof load shall not exceed $D/10$, where D is nominal anchor diameter.
- B. Non-Conforming Work:
 1. Remove and replace misplaced or malfunctioning anchors.

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

3.5 CLEANING

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

3.6 PROTECTION

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

END OF SECTION

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

- A. Products Furnished But Not Installed Under This Section:
 - 1. Masonry horizontal joint reinforcing.
 - 2. Steel reinforcing bars.
- B. Related Requirements:
 - 1. Sections under Division 03 'Concrete' for placement of dowels out of foundations for masonry reinforcing.
 - 2. Section 04 0501: 'Common Masonry Requirements' for installation of masonry reinforcing.
 - 3. Sections under 04 2000 Heading: 'Unit Masonry' for masonry units using masonry reinforcing.

1.2 REFERENCES

- A. Reference Standards:
 - 1. ACI 117.1R-14, 'Guide for Tolerance Compatibility in Concrete Construction'.
 - 2. ACI 117-10, 'Specifications for Tolerances for Concrete Construction and Materials and Commentary' - Reapproved 2015).
- B. Definitions:
 - 1. See Section 04 0501 for common masonry definitions.
- C. Reference Standards:
 - 1. ASTM International:
 - a. ASTM A153/A153M-16a, 'Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware'.
 - b. ASTM A615/A615M-18, 'Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement'.
 - c. ASTM A951/A951M-16, 'Standard Specification for Steel Wire for Masonry Joint Reinforcement'.
 - d. ASTM A1064/A1064M-18a, 'Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete'.
 - 2. CSA Group (Canadian Standards Association):
 - a. CSA G30.18-09 (2014), 'Carbon Steel Bars for Concrete Reinforcement'.

1.3 SUBMITTALS

- A. Informational Submittals:
 - 1. Certificates:
 - a. Mill certificate.
 - 2. Fabricator Instructions:
 - a. Reinforcing bar placement drawings.

1.4 DELIVERY, HANDLING, AND STORAGE

- A. Delivery And Acceptance Requirements:
 - 1. Steel reinforcing bars shall be free of heavy rust scales and flakes, and other bond-reducing coatings at time of delivery and placing.

2. Separate steel reinforcing bars by size and tag with manufacturer's heat or test identification number.
 3. Tag continuous joint reinforcing with Manufacturer's name, wire size, and ASTM / CSA specification.
- B. Storage And Handling Requirements:
1. Properly protect reinforcing on site after delivery.

PART 2 - PRODUCTS

2.1 SYSTEMS

- A. Manufacturers:
1. Manufacturers Contact List:
 - a. Heckman Building Products Inc, Chicago, IL www.heckmannbuildingprods.com.
 - b. Hohmann & Barnard, Hauppauge, NY www.h-b.com.
 - c. Masonry Reinforcing Corporation of America, Charlotte, NC www.wirebond.com.
- B. Materials:
1. Design Criteria:
 - a. Steel Reinforcing Bars:
 - 1) Steel reinforcing bars shall have grade identification marks and meet requirements of ASTM A615/A615M, Grade 60 minimum. All but No. 2 bars shall be deformed type.
 - b. Cold-drawn steel conforming to ASTM A1064/A1064M.
 - c. Continuous Joint Reinforcing:
 - 1) Conform to ASTM A1064/A1064M. Exterior wall reinforcing shall be galvanized to meet requirements of ASTM A153/A153M, Class B-2. Interior wall reinforcing shall be galvanized to meet requirements of ASTM A1064/A1064M, Class A.
 - 2) Size: **2 inches (50 mm)** less than nominal thickness of wall.
 - 3) Rod Size:
 - a) Side rods: **9 gauge (1.48 inch or 3.7 mm)** or **3/16 inch (4.76 mm)** diameter.
 - b) Cross rods: **9 gauge (1.48 inch or 3.7 mm)** or **3/16 inch (4.76 mm)** diameter.
 - 4) Cross rods that serve as metal ties in exterior cavity and other multi-wythe walls shall be drip crimped.
 - 5) Corners And Tee Sections: Prefabricated of material and design similar to main reinforcement.
 - d. Finish: Hot-dipped galvanized as per ASTM A153/A153M (**1.5 oz/ft² (458 g/m²)** after fabrication).
 2. Multi-Wythe Masonry:
 - a. Where bed joints of wythes align, use joint reinforcing extending across wythes.
 - 1) Prefabricated joint reinforcement for embedment in horizontal mortar joints tying multi-wythe masonry walls together.
 - b. Where bed joints of wythes do not align, use:
 - 1) Type Two Acceptable Products. See Section 01 6200:
 - a) No. 170-2X S.I.S. Truss Eye-Wire Adjustable Truss Eye-Wire w/2X-Hook & Seismiclip Interlock System by Hohmann & Barnard.
 - b) No. 270-2X-SH Ladder adjustable reinforcement with 2X-Seismic Hook by Hohmann & Barnard.
 - c) Equal meeting Design Criteria as approved by Architect before bidding. See Section 01 6200.
 3. Single-Wythe Masonry:
 - a. Description:
 - 1) Prefabricated reinforcement for embedment in horizontal mortar joints if Contract Drawings.
 - b. Type Two Acceptable Products. See Section 01 6200:
 - 1) No. 120 Truss-Mesh by Hohmann & Barnard.

- 2) Equal meeting Design Criteria as approved by Architect before bidding. See Section 01 6200.

C. Fabrication:

1. Fabricate and bend steel reinforcing bars according to 'ACI Detailing Manual' (2004 edition or latest available) and as detailed on Contract Drawings.
2. Reinforcement:
 - a. Fabricate reinforcing bars in accordance with fabricating tolerances of ACI 117.
 - b. Bend bars cold and do not heat bars.
 - c. Do not bend Grade 40 bars in excess of 180 degrees. Minimum inside diameter of bend is five bar diameters.
 - d. Minimum inside bend diameter for other bars is as follows:
 - 1) No. 2 through No. 8 (M #10 through M #25): 6 bar diameters.
 - 2) No. 9 through No. 11 (M #29 through M #36): 8 bar diameters.
 - e. Provide standard hooks that conform to following:
 - 1) Standard 180-degree hook: 180-degree bend plus minimum extension of 4 bar diameters or 2-1/2 inch (64 mm), whichever is greater.
 - 2) Standard 90-degree hook: 90-degree bend plus minimum extension of 12 bar diameters.
 - 3) For stirrups and tie hooks for No. 5 (M #16) bar and smaller: 90-degree or 135-degree bend plus minimum of 6 bar diameters or 2-1/2 inch (64 mm), whichever is greater.

2.2 ACCESSORIES

A. Rebar Positioners (Used with structural CMU construction):

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

PART 3 - EXECUTION

3.1 INSTALLATION

A. Interface With Other Work:

1. Coordinate with Division 03 'Concrete'.

B. Reinforcement

1. Basic requirements:
 - a. Place reinforcement in accordance with the sizes, types, and locations indicated on Contract Drawings and as specified.
 - b. Do not place dissimilar metals in contact with each other.
 - c. Reinforcing shall be free of material that may destroy bond.
 - d. Dowel vertical reinforcing bars out of structure below with bars of same size and spacing
 - e. Support reinforcement to prevent displacement caused by construction loads or by placement of grout or mortar, beyond allowable tolerances.

- f. Unless accepted by Architect, do not bend reinforcement after it is embedded in grout or mortar.
- g. Brick Veneer Unit Masonry:
 - 1) Attach joint reinforcing to brick veneer ties in accordance with Manufacturer's instructions.
- 2. Placing Reinforcement:
 - a. Completely embed reinforcing bars in grout in accordance with 'Grout Placement' as specified in Installation requirements in Part 3 of Section 04 0501: 'Common Masonry Requirements'.
 - b. Dowel vertical reinforcing bars out of structure below with bars of same size and spacing.
 - c. Maintain clear distance between reinforcing bars and interior of masonry unit or formed surface of at least **1/4 inch (6.4 mm)** for fine grout and **1/2 inch (12.7 mm)** for coarse grout.
 - d. Place reinforcing bars maintaining the following minimum cover:
 - 1) Masonry face exposed to earth or weather:
 - a) **2 inch (50.8 mm)** for bars larger than No. 5 (M #16).
 - b) **1-1/2 inch (38.1 mm)** for No. 5 (M #16) bars or smaller.
 - e. Maintain minimum clear distance between parallel bars of the nominal bar size or **1 inch (25.4 mm)**, whichever is greater.
 - f. In columns and pilasters, maintain minimum clear distance between vertical bars of one and one-half times nominal bar size or **1-1/2 inch (38.1 mm)**, whichever is greater.
 - g. Continue bond beam units and reinforcement uninterrupted around corners and across wall intersections. See Contract Drawings.
- 3. Splicing:
 - a. Splice reinforcing steel as shown on Contract Drawings.
 - b. Noncontact lap splices: Position bars spliced by noncontact lap splice no farther apart transversely than one-fifth specified length of lap nor more than **8 inch (200 mm)**.
- 4. Rebar Positioners:
 - a. Before grouting, secure masonry reinforcing steel in place before grouting with rebar positioners at top of first course and bottom of top course minimum.
 - b. Install intermediary positioners for every 192 bar diameters maximum between positioners.
 - c. Locate intermediary positioners with approximately equidistant spacing in wall when number required has been determined.
- 5. Joint Reinforcement (Single-Wythe Unit Masonry):
 - a. Beginning approximately **8 inch (203 mm)** from base of masonry, provide joint reinforcing **16 inches (400 mm)** on center vertically, except **8 inch (203 mm)** on center if drip crimped unless noted otherwise in Contract Drawings.
 - b. Place joint reinforcement so that longitudinal wires are embedded in mortar with minimum cover of **1/2 inch (12.7 mm)** when not exposed to weather or earth; or **5/8 inch (15.9 mm)** when exposed to weather or earth.
 - c. Provide minimum **6 inch (150 mm)** lap splices for joint reinforcement.
 - d. Ensure that all ends of longitudinal wires of joint reinforcement at laps are embedded in mortar or grout.
- 6. Placement tolerances:
 - a. Place reinforcing bars in walls and flexural elements within tolerance of $\pm$ **1/2 inch (12.7 mm)** when:
 - 1) Distance from centerline of reinforcing bars to opposite face of masonry is equal to **8 inch (203 mm)** or less.
 - 2) $\pm$ **1 inch (25.4 mm)** for centerline of reinforcing bars to opposite face of masonry equal to **24 inch (610 mm)** or less but greater than **8 inch (203 mm)**.
 - 3) $\pm$ **1-1/4 inch (32 mm)** for centerline of reinforcing bars to opposite face of masonry greater than **24 inch (610 mm)**.
 - b. Place vertical bar within:
 - 1) **2 inch (50.8 mm)** of required location along length of wall when wall segment length exceeds **24 inch (610 mm)**.
 - 2) **1 inch (25 mm)** of required location along length of wall when wall segment length does not exceed **24 inch (610 mm)**.
 - c. If it is necessary to move bars more than one (1) bar diameter or distance exceeding tolerance stated above to avoid interference with other reinforcing steel, conduits, or embedded items, notify Architect for acceptance of resulting arrangement of bars.

- d. Foundation dowels that interfere with unit webs are permitted to be bent to maximum of 1 inch (25 mm) horizontally for every 6 inch (150 mm) of vertical height.

3.2 CLEANING

A. Waste Management:

- 1. Disposal of rubbish, debris, and packaging materials.

END OF SECTION

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

- A. Includes But Not Limited To:
 - 1. Furnish and install architectural concrete unit masonry as described in Contract Documents.
 - 2. Furnish and install anchor bolts and embedded anchors as described in Contract Documents.
 - 3. Grout door frames installed in CMU walls.
- B. Products Installed But Not Furnished Under This Section:
 - 1. Anchor bolts.
 - 2. Door frames.
 - 3. Elastomeric joint sealants.
 - 4. Foamed in place insulation.
 - 5. Grout.
 - 6. Metal lintels.
 - 7. Mortar.
 - 8. Reinforcement bars.
 - 9. Reglets.
 - 10. Wall vents.
- C. Related Requirements:
 - 1. Section 03 2100: 'Reinforcement Bars'.
 - 2. Section 04 0501: 'Common Masonry Requirements' for:
 - a. Common masonry requirements and procedures.
 - b. Pre-installation conference held jointly with other masonry related sections.
 - 3. Section 04 0513: 'Cement and Lime Masonry Mortaring' for quality of mortar.
 - 4. Section 04 0516: 'Masonry Grouting' for quality of grout.
 - 5. Section 04 0519: 'Masonry Anchors and Inserts' for anchor bolts used in masonry.
 - 6. Section 05 1223: 'Structural Steel For Buildings' for metal Lintels.
 - 7. Section 07 1900: 'Water Repellent' for sealing masonry after cleaning.
 - 8. Section 07 2119: 'Foamed-In-Place Insulation'.
 - 9. Section 07 7126: 'Reglets'.
 - 10. Section 07 9213: 'Elastomeric Joint Sealants'.
 - 11. Section 08 1213: 'Hollow Metal Frames' for door frames.
 - 12. Section 08 9516: 'Wall Vents'.

1.2 REFERENCES

- A. Definitions:
 - 1. Section 04 0501: 'Common Masonry Requirements' for:
 - a. Common Masonry Terms.
- B. Reference Standards:
 - 1. ASTM International:
 - a. ASTM C90-16a, 'Standard Specification for Loadbearing Concrete Masonry Units'.
 - b. ASTM C331/C331M-17, 'Standard Specification for Lightweight Aggregates for Concrete Masonry Units'.
 - 2. The Masonry Society (TMS):
 - a. TMS 402/602-16, 'Building Code Requirements and Specification for Masonry Structures'.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference:
 - 1. Participate in MANDATORY pre-installation conference as specified in Section 01 3100 held jointly with other Division 04 'Masonry' specifications in this Project that require pre-installation conference as specified in Section 04 0501.

1.4 SUBMITTALS

- A. Informational Submittals:
 - 1. Certificates:
 - a. Prior to construction, certificates for materials used in masonry construction indicating compliance with contract documents are to be submitted. This is "Unit Strength Method" approach.
 - 2. Source Quality Control Submittals:
 - a. Manufacturer's certification that units meet compressive strength specified requirements.
- B. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Record Documentation:
 - 1) Testing and Inspection Reports:
 - a) Testing Agency Testing and Inspecting Reports.

1.5 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Installer: Requirements of Section 01 4301 applies, but not limited to following:
 - a. Minimum of five (5) years' experience on successfully completed projects of similar nature.
- B. Testing And Inspection:
 - 1. As specified in Section 04 0501: 'Common Masonry Requirements'.

1.6 DELIVERY, HANDLING, AND STORAGE

- A. Delivery And Acceptance Requirements:
 - 1. As specified in Section 04 0501: 'Common Masonry Requirements'.
- B. Storage And Handling Requirements:
 - 1. Aggregate, Cementitious Material, Masonry Accessories, Masonry Units, and Reinforcement:
 - a. As specified in Section 04 0501: 'Common Masonry Requirements'.

1.7 FIELD CONDITIONS

- A. Ambient Conditions:
 - 1. Cold Weather and Hot Weather Limitations:
 - a. As specified in Section 04 0501: 'Common Masonry Requirements'.

PART 2 - PRODUCTS

2.1 SYSTEM

- A. Design Criteria:
 - 1. Minimum Compressive Strength of (2000 psi 13.8 MPa).

B. Materials:

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

2.2 ACCESSORIES**A. Construction Cleaning Compounds:**

1. Type Two Acceptable Products:
 - a. 202 or 202V by Diedrich Technologies, Oak Creek, WI www.diedrichtechnologies.com.
 - b. Surekleen No. 600 or Vana-Trol by ProSoCo Inc, Kansas City, KS www.prosoco.com.
 - c. Equal as approved by Architect before use. See Section 01 6200.

PART 3 - EXECUTION**3.1 EXAMINATION****A. Verification Of Conditions:**

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

3.2 PREPARATION

- A. Coordinate placement of reinforcement, anchors and accessories, flashings and weep holes and other moisture control products specified in other sections.
- B. Prior to placing masonry:
 1. Clean reinforcement by removing mud, oil, or other materials that will adversely affect or reduce bond at time mortar or grout is placed.
 2. Remove laitance, loose aggregate, and anything else that would prevent mortar from bonding to foundation.
- C. Wetting Masonry Units:
 1. Concrete masonry:
 - a. Do not wet concrete masonry units before laying. Wet cutting is permitted.
- D. Reinforcement:
 1. Place reinforcement and ties in grout spaces prior to grouting.
- E. Provide temporary bracing during installation of masonry work:
 1. Design, provide, and install bracing that will assure stability of masonry during construction.
 2. Maintain bracing in place until building structure provides permanent support.

3.3 INSTALLATION

- A. Interface With Other Work:
 - 1. Masonry Cutting:
 - a. Make cuts proper size to accommodate work of other trades.
 - b. Cut openings for electrical devices using cover plates no larger than can be covered by standard size plate.
 - c. Replace unit masonry in which larger than necessary openings are cut.
 - d. Do not patch openings with mortar or other material.
- B. General:
 - 1. Cold Weather and Hot Weather Limitations:
 - a. Place grout and mortar as specified in Section 04 0501: 'Common Masonry Requirements'.
 - 2. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
 - 3. Step back unfinished work for joining with new work. Use toothing only with Architect's approval.
 - 4. Built-In Work:
 - a. As work progresses, install masonry flashings and weep holes and other built-in work specified in other sections.
- C. Tolerances:
 - 1. Masonry work shall be true to vertical and horizontal planes within **1/8 inch (3 mm)** in **10 feet (3 meters)**, non-cumulative.
 - 2. Maintain **3/8 inch (9.5 mm)** mortar joints throughout.
 - 3. Grout space or cavity width, except for masonry walls passing framed construction: minus **1/4 inch (6.4 mm)**, plus **3/8 inch (9.5 mm)**.
- D. Mortar:
 - 1. Use mortar within two (2) hours of initial mixing. Discard mortar that has begun to set. Set masonry units within one (1) minute of spreading mortar.
 - 2. Do not allow mortar build-up in cavity between brick veneer and Concrete Masonry Units (CMU).
- E. Grouting:
 - 1. General:
 - a. Provide grout that conforms to requirements as specified in Section 04 0516: 'Masonry Grouting'.
 - b. Use fine grout for cavities **2 inches (50 mm)** and smaller in smallest dimension. Use coarse grout for cavities greater than **2 inches (50 mm)** in smallest dimension.
 - c. Grout hollow metal door frames installed in masonry walls solid.
 - d. Provide grout-leveling bed for support of wall plates.
 - 2. Concrete Masonry Units:
 - a. Fully grout cells containing reinforcing bars.
 - b. Consolidate grout by means of mechanical vibrator. Do not use cell reinforcing to rod grout.
 - c. Before loss of plasticity, mechanically reconsolidate grout.
 - 3. Placing time:
 - a. Place grout within **1-1/2 inches (38 mm)** introducing water in the mixture and prior to initial set:
 - 1) Discard site-mixed grout that does not meet specified slump without adding water after initial mixing.
 - 2) For ready-mixed grout:
 - a) Addition of water is permitted at time of discharge to adjust slump.
 - b) Discard ready-mixed grout that does not meet specified slump without adding water, other than water that was added at time of discharge.
 - c) Time limitation is waived as long as ready-mixed grout meets specified slump.
 - 4. Confinement:
 - a. Confine grout to areas indicated on Contract Drawings. Use material to confine grout that permits bond between masonry units and mortar.
 - 5. Grout Pour Height:
 - a. Place grout in **48 inch (1 200 mm)** maximum lifts.
 - 6. Consolidation:

- a. Consolidate grout at the time of placement:
 - 1) Consolidate grout at time of placement in height by mechanical vibration or by puddling.
 - 2) Consolidate pours exceeding **12 inch (305 mm)** in height by mechanical vibration, and reconsolidate by mechanical vibration after initial water loss and settlement has occurred.
 - b. Consolidation or reconsolidation is not required for self-consolidating grout.
 7. Grout Key:
 - a. When grouting, form grout keys between grout pours. Form grout keys between grout lifts when first lift is permitted to set prior to placement of subsequent lift:
 - 1) Form grout key by terminating grout minimum of **1-1/2 inch (38 mm)** below mortar joint.
 - 2) Do not form grout keys within beams.
 - 3) At beams or lintels laid with closed bottom units, terminate grout pour at bottom of beam or lintel without forming grout key.
- F. Laying:
 1. Layout:
 - a. Running bond except where indicated otherwise.
 2. Joints:
 - a. Tool concave. Fill completely except where indicated differently.
 - b. Do not tool until mortar has taken initial set.
 - c. Point holes in joints. Fill and tool properly.
 3. Concrete Masonry Units:
 - a. Lay hollow masonry units dry. Do not lay masonry on frozen material.
 - b. Place hollow units so:
 - 1) Face shells of bed joints are fully mortared.
 - 2) Webs are fully mortared in all courses of piers, columns and pilasters and when necessary to confine grout or insulation.
 - 3) Head joints are mortared, minimum distance from each face equal to face shell thickness of unit.
 - 4) Vertical cells to be grouted are aligned and unobstructed openings for grout are provided in accordance with Contract Drawings.
 - c. Align cells or cavities to preserve unobstructed cavity for grouting:
 - 1) Foamed Insulation:
 - a) Provide unobstructed cavity for foamed-in-place insulation installed in cells.
 - b) Install in ungrouted cells in exterior walls.
 - 2) Do not allow excess mortar to block cells.
 - 3) Full bedding required on both webs and face shell under first course. Other courses need only face shell bedding except where bedding is needed to control flow of grout.
- G. Reinforcing:
 1. Reinforcing shall be free of material that may destroy bond.
 2. Continuous Joint Reinforcing:
 - a. Beginning approximately **8 inches (200 mm)** from base of masonry, provide joint reinforcing **16 inches (400 mm)** on center vertically, except **8 inches (200 mm)** on center if drip crimped.
 - b. Maximum offset between brick and block coursing is **1-1/4 inch (32 mm)** using ladder adjustable-wire reinforcement or ladder adjustable-wire reinforcement with seismic hook type reinforcing. If brick and block coursing is exactly lined up, ladder adjustable-wire reinforcing may be used. However, such reinforcing may not be bent to fit coursing that does not line up.
 - c. Lap splices and intersections minimum of **6 inches (150 mm)**.
 3. Reinforcing:
 - a. Place steel as shown on Contract Drawings.
 - b. Splice 48 bar diameters minimum.
 - c. Dowel vertical reinforcing bars out of structure below with bars of same size and spacing.
 - d. Place horizontal bars in **8 inch (200 mm)** deep bond beam units at top of wall and at **48 inches (1 200 mm)** on center between. Continue bond beam units and reinforcement uninterrupted around corners and across wall intersections.
 - e. Place special vertical bars of same size as normal vertical reinforcement at corners and jambs of openings and recesses where bond beams are interrupted and at beam bearing locations not otherwise detailed.

- f. Unless detailed otherwise, place special horizontal bars of same size as normal reinforcing above and below openings. Extend bars **24 inches (600 mm)** minimum beyond opening.
- 4. Rebar Positioners:
 - a. Before grouting, secure masonry reinforcing steel in place with rebar positioners at top of first course and bottom of top course minimum.
 - b. Install intermediary positioners for every 192 bar diameters maximum between positioners.
 - c. Locate intermediary positioners with approximately equidistant spacing in wall when number required has been determined.
- H. Embedded items and accessories:
 - 1. Install embedded items and accessories as follows:
 - a. Construct chases as masonry units are laid.
 - b. Install pipes and conduits passing horizontally through masonry partitions.
 - c. Place pipes and conduits passing horizontally through piers, pilasters, or columns.
 - d. Place horizontal pipes and conduits in and parallel to plane of walls.
 - e. Install and secure connectors, flashing, weep holes, weep vents, nailing blocks, and other accessories.
 - f. Install movement (control and expansion) joints.
 - g. Provide control joints as shown on Contract Drawings if included for Project.
 - h. Aluminum:
 - 1) Do not embed aluminum conduits, pipes, and accessories in masonry, grout, or mortar, unless they are effectively coated or isolated to prevent chemical reaction between aluminum and cement or electrolytic action between aluminum and steel.

3.4 FIELD QUALITY CONTROL

- A. Field Tests And Inspections:
 - 1. Unit Masonry:
 - a. Civil and structural field tests, laboratory testing, and inspections are provided by Owner's independent Testing Agency as specified in Section 01 4523 'Testing And Inspection Services':
 - 1) Quality Control is sole responsibility of Contractor.
 - a) Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform testing and inspection as part of his Quality Control:
 - (1) Testing and inspections, if performed by Contractor, will be responsibility of Contractor to be performed by an independent entity.
 - b. Masonry (Masonry Prisms, Masonry Units, Reinforcement, Mortar and Grout):
 - 1) Testing and Inspections shall conform to IBC Section 17 'Special Inspections And Tests' and in accordance with Chapter 3 'Quality And Construction' of TMS 402/602, 'Building Code Requirements and Specification for Masonry Structures':
 - a) Quality assurance program shall comply with requirements of Chapter 3, for Level A 'Quality Assurance' for Risk Category I, II, or III structures or Level B 'Quality Assurance' for Risk Category IV structures and as defined in ASCE 7 or latest approved adopted building code. See Structural Design Criteria as shown on Contract Documents.
- B. Non-Conforming Work:
 - 1. Remove and replace defective material at Architect's direction and at no additional cost to Owner.

3.5 CLEANING

- A. General:
 - 1. Clean exposed masonry surfaces of stains, efflorescence, mortar and grout droppings, and debris using methods that do not damage masonry.

2. After mortar has hardened, wet masonry and clean with specified cleaning compound. Use stiff fibered brush for application. Rinse masonry surfaces with water immediately after cleaning. Leave masonry clean, free of mortar daubs, and with tight mortar joints.
3. Wash adjacent non-masonry surfaces. Use detergent and soft brushes or cloth.
4. Sweep and rake adjacent pavement and grounds to remove mortar and debris. Where necessary, pressure wash pavement surfaces to remove mortar, dust, dirt, and stains.

B. Waste Management:

1. Unit Masonry:
 - a. Clean up masonry debris and remove from site.

3.6 PROTECTION

A. General:

1. Brace masonry walls until walls attain adequate strength and are tied into building structure.
2. Do not allow structural loading of masonry walls until walls attain adequate strength.
3. During construction, all walls should be kept dry by covering top of wall with strong, water-resistant membrane at end of each day or shutdown period. Covering should overhang wall by at least **24 inches (610 mm)** on each side, and should be secured against wind.
4. Covering should remain in place until top of cavity wall is completed or protected by adjacent materials.
5. Protect masonry with covering during rainy weather.

B. Cold Weather Requirements:

1. In cold weather, all materials and walls should be properly protected against freezing including storing of materials, preparation of mortar, heating of masonry units, laying precautions, and protection of Work.
2. Remove all masonry deemed frozen or damaged.

END OF SECTION

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DIVISION 05: METALS

05 0500 COMMON WORK RESULTS OF METALS

05 0503 SHOP-APPLIED METAL COATINGS
05 0523 METAL FASTENINGS

05 1000 STRUCTURAL METAL FRAMING

05 1223 STRUCTURAL STEEL FOR BUILDINGS

05 3000 METAL DECKING

05 3123 STEEL ROOF DECKING

05 4000 COLD-FORMED METAL FRAMING

05 4010 COLD-FORMED LOAD-BEARING METAL FRAMING

END OF TABLE OF CONTENTS

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SECTION 05 0503**SHOP-APPLIED METAL COATINGS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Quality of factory or shop-applied priming applied to steel supplied to Project without finish coat.
 - 2. Quality of and procedures for field touch-up and repair of factory-applied priming and galvanizing.
- B. Related Requirements:
 - 1. Section 05 4010: 'Cold-Formed Load-Bearing Metal Framing' for repair to galvanized coatings.
 - 2. Sections under 09 9000 heading: Finish painting.

1.2 REFERENCES

- A. Reference Standards:
 - 1. ASTM International:
 - a. ASTM A780/A780M-09(2015), 'Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings'.
 - b. ASTM B695-04(2016), 'Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel'.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference:
 - 1. Participate in pre-installation conference.
 - 2. In addition to requirements of Section 01 3100, review following:
 - a. Meet with Architect before commencing repair of galvanized surfaces to establish extent of repairs required and, if applicable, choice of methods to be used.

1.4 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Product data and samples, if requested by Architect.

PART 2 - PRODUCTS**2.1 FINISHES**

- A. Factory And Shop-Applied Primer:
 - 1. Compatible with and of equal or better quality than finish paint system to be applied by Sections under 09 9000 heading.
 - 2. Primer on unexposed, unfinished surfaces may be fabricator's standard shop coat.
- B. Repairs To Primed Surface:

- C. Unless otherwise specified, use primer which matches characteristics of original primer and is compatible with and of equal or better quality than finish paint system to be applied by Sections under 09 9000 heading.
- D. Material For Repairs Of Galvanized Surfaces:
 - 1. Non-Structural, Non-Load-Bearing Items Not Exposed To Weather:
 - a. Zinc-Rich Paints:
 - 1) Zinc-Dust Content: Dried film shall contain 94 percent minimum of zinc-dust by weight.
 - 2) Type One Acceptable Manufacturers:
 - a) Galvax by Alvin Products Inc, Everett, MA www.alvinproducts.com.
 - b) ZRC Galvilite by ZRC Worldwide, Marshfield, MA www.zrcworldwide.com.
 - c) Equal as approved by Architect before bidding. See Section 01 6200.
 - 2. Structural, Load-Bearing Items And Items Exposed To Weather:
 - a. Zinc-Based Solders, Powder, Or Rod:
 - 1) Zinc-Cadmium solder with liquidus temperature range from 518 to 527 deg F (270 to 275 deg C), or
 - 2) Zinc-Tin-Lead alloy with liquidus temperature range from 446 to 500 deg F (230 to 260 deg C).
 - b. Sprayed Zinc: Wire, ribbon, or powdered zinc suitable for process.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Preparation:
 - 1. General:
 - a. Clean, grind, or otherwise prepare welds in steel that is to be coated within limits acceptable to welder responsible for structural integrity.
 - b. Surfaces to be coated shall be clean, dry and free of oil, grease, and corrosion products.
 - 2. Preparation Of Primed, Ungalvanized Surfaces:
 - a. Clean welds and grind serious abrasions.
 - 3. Preparation Of Galvanized Surfaces:
 - a. Follow requirements of ASTM A780/A780M and following:
 - b. For Repair Using Zinc-Rich Paints:
 - 1) Blast clean surfaces to near-white metal, in accordance with SSPC-SP10 (1 to 2 mil anchor pattern), as minimum.
 - 2) Where circumstances do not allow blast cleaning, power disk sand to bright metal finish.
 - 3) Extend surface preparation into undamaged galvanized area.
 - 4) Remove flux residue and weld spatter from welded areas.
 - c. For Repair Using Zinc-Based Alloys:
 - 1) Clean surface to be reconditioned using wire brush, light grinding action, or mild blasting.
 - 2) Extend surface preparation into surrounding, undamaged galvanized areas.
 - 3) Remove flux residue and weld spatter from welded areas.
 - 4) Preheat cleaned area to at least 600 deg F (316 deg C).
 - a) Do not overheat surface beyond 750 deg F (400 deg C) or allow surrounding galvanized coatings to be burned.
 - b) Wire brush surface during preheating.
 - d. For Repair Using Sprayed Zinc (Metallizing):
 - 1) Blast clean surfaces to near-white metal, in accordance with SSPC-SP5 as minimum.
 - 2) Extend surface preparation into undamaged galvanized area.
 - 3) Remove flux residue and weld spatter from welded areas.

3.2 REPAIR / RESTORATION

- A. Repairs To Primed, Ungalvanized Surfaces:
 - 1. Thoroughly clean metal and give one (1) prime coat of specified material, well-worked into metal joints and open spaces. Match existing primed finish as required.
 - a. Do not apply primer at temperatures below 45 deg F (7 deg C).
 - b. Protect un-primed machine-finished surfaces against corrosion by priming.
- B. Repairs To Galvanized Surfaces:
 - 1. Non-Structural, Non-Load-Bearing Items Not Exposed To Weather:
 - a. Repair Using Zinc-Rich Paints: Spray- or brush-apply zinc-rich paint to prepared area. Apply paint in single application employing multiple spray passes to achieve dry film thickness of 2 mils.
 - 2. Structural, Load-Bearing Items And Items Exposed To Weather:
 - a. Repair Using Zinc-Based Alloys:
 - 1) Rub cleaned, pre-heated areas with repair stick to deposit evenly distributed layer of zinc alloy. If powdered zinc alloys are used, sprinkle powder on surface and spread out with spatula or similar tool.
 - 2) Remove flux residue by rinsing with water or wiping with damp cloth.
 - b. Repair Using Sprayed Zinc (Metallizing): Apply 2 mil minimum coating by means of metal-spraying pistols fed with either zinc wire or zinc powder in accordance with requirements of ASTM B695, Type I.
 - 3. All Items:
 - a. Apply repair materials immediately after surface preparation is complete.
 - b. Take thickness measurements, with either magnetic or electromagnetic gauge, to ensure applied coating is as specified or agreed to.

END OF SECTION

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SECTION 05 0523**METAL FASTENING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Quality of structural metal-to-metal, wood-to-metal, and wood-to-wood bolts used on Project.
 - 2. Requirements and standards for site welded metal-to-metal connections.
- B. Related Requirements:
 - 1. Section 03 1511: 'Concrete Anchors And Inserts' for cast-in-place and drilled-in anchor bolts.
 - 2. Furnishing and installing of structural bolts specified under Section concerned.
 - 3. Performance of welding specified under Section concerned.

1.2 REFERENCES

- A. Reference Standards:
 - 1. American National Standards Institute / American Welding Society:
 - a. ANSI/AWS D1.1/D1.1M:2015, 'Structural Welding Code - Steel'.
 - b. ANSI/AWS D1.3/D1.3M:2018, 'Structural Welding Code - Sheet Steel'.
 - 2. ASTM International:
 - a. ASTM A307-14, 'Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength'.

1.3 QUALITY ASSURANCE

- A. Qualifications: Requirements of Section 01 4301 applies, but not limited to the following:
 - 1. 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. Certifications:
 - 1. Maintain welder's certifications on job-site.

PART 2 - PRODUCTS**2.1 MANUFACTURED UNITS**

- A. Materials:
 - 1. Bolts And Threaded Fasteners:
 - a. Bolts: Conform to requirements of ASTM A307, Grade A.

2.2 ACCESSORIES

- A. Arc-Welding Electrodes: Type E70XX AWS Iron and Steel Arc-welding electrodes and meeting current AISC Specifications.

PART 3 - EXECUTION

3.1 PERFORMANCE

- A. Welding shall meet requirements of ANSI / AWS D1.1 and D1.3.

END OF SECTION

SECTION 05 1223**STRUCTURAL STEEL FOR BUILDINGS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
 - 1. Miscellaneous structural steel including following:
 - a. Channel frames for doors.
 - b. Lintels.
 - c. Structural pipe for bollards.
 - d. Structural pipe for bollards with sleeves.
- B. Related Requirements:
 - 1. Section 03 3111: 'Cast-In-Place Structural Concrete' for installation of bollards
 - 2. Sections under 04 2000 heading: Installation of lintels, channel frames, and miscellaneous structural steel.
 - 3. Section 05 0503: 'Shop-Applied Metal Coatings' for quality of priming.
 - 4. Section 05 0523: 'Metal Fastening' for quality of welding.
 - 5. Section 06 1100: 'Wood Framing' for installation of miscellaneous structural steel.

1.2 REFERENCES

- A. Reference Standards:
 - 1. American Society For Testing And Materials:
 - a. ASTM A36/A36M-14, 'Standard Specification for Carbon Structural Steel'.
 - b. ASTM A53/A53M-18, 'Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless'.
 - c. ASTM A500/A500M-18, 'Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes'.

PART 2 - PRODUCTS**2.1 COMPONENTS**

- A. Materials:
 - 1. Structural Pipe for Bollards.
 - a. Meet requirements of ASTM A53/A53M, Type E or S, Grade B.
 - 1) Weight Class, STD, Schedule 40.
 - 2) Weight Class, XS, Schedule 80.
 - 3) Weight Class, DXS.
 - 2. Structural Pipe for Bollards With Sleeves:
 - a. Bollards: **6 inch (150 mm)** minimum diameter meeting requirements of ASTM A53/A53M, Type E or S, Grade B, Weight Class, STD, Schedule 40.
 - b. Sleeves:
 - 1) Polyethylene thermoplastic. Custom Color G198456-M Bright Purple.
 - 2) Type One Acceptable Product:
 - a) BPD-YL-42-P by IdealShield, Detroit, MI www.idealshield.com.
 - b) Equal as approved by Architect before bidding. See Section 01 6200.
 - 3. Structural Tubing: Meet requirements of ASTM A500/A500M, Grade B.
 - 4. Miscellaneous Steel:

- a. Meet requirements of ASTM A36/A36M for the following:
 - 1) Miscellaneous structural steel.
 - 2) Channel frames.
 - 3) Lintels for exterior walls.
 - 4) Miscellaneous structural steel.
- B. Fabrication:
 - 1. After fabrication and before shop priming, hot-dip or mechanically galvanize to be installed in following:
 - a. Bollards.
 - b. Channel frames.
 - c. Lintels in exterior walls.
 - 2. Shop prime steel provided under this Section.
- C. Finishes:
 - 1. Galvanized:
 - a. Galvanize finish for following:
 - 1) Bollards.
 - 2) Channel frames.
 - 3) Lintels in exterior walls.
 - b. See Section 09 9113 for preparing and painting new exterior exposed galvanized metal surfaces.

PART 3 - EXECUTION: Not Used

END OF SECTION

SECTION 05 3123**STEEL ROOF DECKING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install steel roof decking without concrete as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 01 1200: 'Multiple Contract Summary' for multiple contracts.
 - 2. Section 01 3100: 'Project Management and Coordination' for pre-installation conference.
 - 3. Section 01 4000: 'Quality Requirements' for administrative and procedural requirements for quality assurance and quality control.
 - 4. Section 01 4301: 'Quality Assurance – Qualifications' establishes minimum qualification levels required.
 - 5. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
 - 6. Section 01 7800: 'Closeout Submittals'.

1.2 REFERENCES

- A. Association Publications:
 - 1. Council of American Structural Engineers. CASE Form 101: *Statement of Special Inspections*. Washington, DC: CASE, 2001. (c/o American Council of Engineering Companies, 1015 15th St., NW, Washington, DC 20005; 202-347-7474; www.acec.org).
 - 2. Federal Emergency Management Agency: FEMA 353, *Recommended Specifications and Quality Assurance Guidelines for Steel Moment-Frame Construction for Seismic Applications*. 500 C Street Southwest Washington, DC, www.fema.gov.
- B. Definitions (Following are specifically referenced for testing):
 - 1. Accreditation: Process in which certification of competency, authority, or credibility is presented. Verify that laboratories have an appropriate quality management system and can properly perform certain test methods (e.g., ANSI, ASTM, and ISO test methods) and calibration parameters according to their scopes of accreditation.
 - 2. Approved: To authorize, endorse, validate, confirm, or agree to.
 - 3. Field Quality Control: Testing, Inspections, Special Testing and Special Inspections to assure compliance to Contract Documents.
 - 4. Inspection/Special Inspection: Inspection of materials, installation, fabrication, erection or placement of components and connections requiring special expertise to ensure compliance with approved construction documents and referenced standards:
 - a. Inspection: Not required by code provisions but may be required by Contract Documents.
 - b. Special Inspection: Required by code provisions and by Contract Documents.
 - c. Inspection-Continuous: Full-time observation of the Work requiring inspection by approved inspector who is present in area where the Work is being performed.
 - d. Inspection-Periodic: Part-time or intermittent observation of the Work requiring inspection by approved inspector who is present in area where the Work has been or is being performed and at completion of the Work.
 - 5. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform particular construction operation, including installation, erection, application, and similar operations.
 - 6. Observation: Visual observation of building / site elements or structural system by registered design professional for general conformance to approved construction documents at significant

- construction stages and at completion. Observation does not include or waive responsibility for performing inspections or special inspections.
7. Owner's Representative: Owner's Designated Representative (Project Manager or Facilities Manager) who will have express authority to bind Owner with respect to all matters requiring Owner's approval or authorization.
 8. Preconstruction Testing: Tests and inspections that are performed specifically for Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
 9. Product Testing: Tests and inspections that are performed by testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.
 10. Quality Assurance: Testing, Inspections, Special Testing and Special Inspections provided for by Owner.
 11. Quality Control: Testing, Inspections, Special Testing and Special Inspections provided for by Contractor.
 12. Service Provider: Agency or firm qualified to perform required tests and inspections.
 13. Source Quality Control Testing: Tests and inspections that are performed at source, i.e., plant, mill, factory, or shop.
 14. Special Inspection: See Inspection.
 15. Special Inspector: Certified individual or firm that implements special inspection program for project.
 16. Special Test: See Test.
 17. Test/Special Test: Field or laboratory tests to determine characteristics and quality of building materials and workmanship.
 - a. Test: Not required by code provisions but may be required by Contract Documents.
 - b. Special Test: Required by code provisions and by Contract Documents.
 18. Testing Agency: Entity engaged to perform specific tests, inspections, or both.
 19. Testing Agency Laboratory: Agency or firm qualified to perform field and laboratory tests to determine characteristics and quality of materials and workmanship.
 20. Verification: Act of reviewing, inspecting, testing, etc. to establish and document that product, service, or system meets regulatory, standard, or specification requirements.

C. Reference Standards:

1. American National Standards Institute / American Institute of Steel Construction:
 - a. ANSI/AISC 360-16, 'Specification for Structural Steel Buildings'.
 - b. ANSI/AISC S200-12, 'North American Standard for Cold-Formed Steel Framing - General Provisions'.
2. American National Standards Institute / American Welding Society (Following are specifically referenced for Structural Steel testing):
 - a. ANSI/AWS D1.1/D1.1M:2015, 'Structural Welding Code - Steel'.
 - b. ANSI/AWS D1.3/D1.3M:2010, 'Structural Welding Code - Sheet Steel'.
 - c. ANSI/AWS D1.4/D1.4M:2018, 'Structural Welding Code - Reinforced Steel'.
3. American National Standard Institute / Steel Deck Institute:
 - a. ANSI/SDI C-2017, 'Standard for Composite Steel Floor Deck – Slabs'.
 - b. ANSI/SDI NC-2017, 'Non-Composite Steel Floor Deck'.
 - c. ANSI/SDI QA/QC-2017, 'Quality Control and Quality Assurance for Installation of Steel Deck'.
 - d. ANSI/SDI RD-2017, 'Standard for Steel Deck'.
 - e. ANSI/SDI T-CD-2017, 'Test Standard for Composite Steel Deck - Slabs'.
4. American Society for Nondestructive Testing (Following are specifically referenced for Structural Steel testing):
 - a. ASNT CP-189-2016, 'Standard for Qualification and Certification of Nondestructive Testing Personnel'.
 - b. ASNT SNT-TC-1A-2016, 'Standard Topical Outlines for Qualification of Nondestructive Testing Personnel'.
5. American Welding Society:
 - a. AWS QC1:2007, 'Standard for AWS Certification of Welding Inspectors'.
6. 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 A1008/A1008M-18, 'Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable'.
- 7. International Code Council (IBC) (2018 or most recent edition adopted by AHJ):
 - a. IBC Chapter 17, 'Structural Tests and Special Inspections'.
- 8. Research Council on Structural Connections (RCSC):
 - a. 'RCSC Specification for Structural Joints Using High-Strength Bolts' (2014).
- 9. Steel Deck Institute:
 - a. Design Manual for Composite Decks, Form Decks, Roof Decks' No. 31 (2007).
 - a. MOC3, 'SDI Manual of Construction with Steel Deck' (2016 Edition 3).

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference:
 - 1. In addition to agenda items specified in Section 01 3100, review following:
 - 2. Review Section 01 4523 for Testing and Inspection administrative requirements and responsibilities and Field Quality Control tests and inspections required of this section.
 - a. Review frequency of testing and inspections.
- B. Scheduling:
 - 1. Notify Testing Agency and Architect twenty four (24) hours minimum before placing steel roof decking.

1.4 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Provide Manufacturer's cut sheets including, but not limited to, dimensions of individual components, profiles, and finishes.
 - 2. Shop Drawings:
 - a. Show location of metal deck panels, anchorage details, and other information required for thorough review.
- B. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Record Documentation:
 - 1) Testing and Inspection Reports:
 - a) Testing Agency Inspecting Reports of steel roof decking.

1.5 QUALITY ASSURANCE

- A. Qualifications. Requirements of Section 01 4301 applies, but is not limited to following:
 - 1. Fabricator Qualifications:
 - a. Qualified Fabricator who participates in AISC Quality Certification Program and is designated AISC-Certified Plant, Category Sbd.
 - 1) Submit documentation.
 - 2. Inspector Qualifications:
 - a. All inspectors shall be trained and competent in accordance with quality assurance plan in Section 01 4523.
 - b. Non-destructive testing Personnel Qualifications:
 - 1) NDT personnel shall be qualified under either ANSI/ASNT CP-189 or ANSI/ASNT SNT-TC-1A.
 - 2) Ultrasonic Testing (UT) shall be performed only by certified ASNT Level III technicians or by certified ASNT Level II technicians acting under direct supervision of ASNT Level III technician.

- 3) Technicians who perform flaw detection or sizing shall be trained in applicable procedures and authorized to operate in jurisdiction in which Project is located and shall demonstrate their competence through testing as prescribed in FEMA 353 Appendix E for all connections that are part of SFRS.
 - c. Welding Inspector Qualifications:
 - 1) All Welding Inspectors shall meet qualification as set forth in ANSI/AWS D1.1/D1.1M.
 - 2) For welds in SWD Categories A and B, Welding Inspectors shall be AWS Certified Welding Inspectors (CWI) or Senior Certified Welding Inspectors (SCWI) as defined in AWS QC1 'Standard for AWS Certification of Welding Inspectors'.
 - 3) Submit documentation.
- B. Testing and Inspection:
1. Owner will provide Testing and Inspection for inspection of steel roof decking:
 - a. Owner will employ testing agencies to perform inspection for steel roof decking as specified in Field Quality Control in Part 3 of this specification:
 - 1) Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform the Work in strict accordance with requirements of Contract Documents and perform contractor testing and inspection.
 - 2) See Section 01 1200: 'Multiple Contract Summary'.
 - b. Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform testing and inspection as part of his Quality Control:
 - 1) Testing and inspections, if performed by Contractor, will be responsibility of Contractor to be performed by an independent entity.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
1. Protect metal deck panels from corrosion, deformation, and other damage during delivery and handling.
- B. Storage And Handling Requirements:
1. Protect metal deck panels from corrosion, deformation, and other damage during storage, and handling.
 2. If ground storage is required, store bundles of metal deck panels off ground with one end elevated to provide drainage.
 3. Protect bundles from condensation with ventilated waterproof covering.
 4. Stack bundles to prevent material damage.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Type One Acceptable Manufacturer:
1. Any current member of Steel Deck Institute.
 2. Equal as approved by Architect before bidding. See Section 01 6200.

2.2 MATERIALS

- A. Roof Decking:
1. Design Criteria:
 - a. Steel Decking:
 - 1) Steel decking panels shall be 20 ga (0.91 mm) composite intermediate rib deck formed from flat rolled carbon steel sheets meeting requirements of ASTM A653/A653M, Galvanized G60.
 2. Product Standard: 1-1/2 inch (38 mm), USD, B-Deck.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification Of Conditions:
 - 1. Examine support framing and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance of work of this Section.
 - 2. Notify Architect of unsuitable conditions in writing.
 - 3. Do not install decking over unsuitable conditions.
 - 4. Commencement of Work by installer is considered acceptance of substrate.

3.2 PREPARATION

- A. Surface Preparation:
 - 1. Locate bundles to prevent overloading of support members.
 - 2. Hoisting: Provide hoisting of all materials required to be furnished and installed.

3.3 INSTALLATION

- A. Install in accordance with Steel Deck Institute 'Design Manual for Composite Decks, Form Decks, Roof Decks' and as shown on placement drawings, and as specified.
- B. Each deck piece shall span across minimum of two (2) spans.
- C. Place deck panels on structural supports and adjust to final position with ends aligned. Attach firmly to supports immediately after placement.
- D. Cut and neatly fit deck units and accessories around openings and other work projecting through or adjacent to decking.
- E. Do not cut unscheduled openings through deck without approval of Architect. Reinforce openings as shown on Drawings or as directed by Architect.
- F. Install deck ends over supports with minimum end bearing **1-1/2 inches (38 mm)**.

3.4 FIELD QUALITY CONTROL

- A. Field Inspections:
 - 1. General:
 - a. Owner is responsible for Quality Assurance. Quality assurance performed by Owner will be used to validate Quality Control performed by Contractor.
 - b. Quality Control is sole responsibility of Contractor as specified in Section 01 4523 'Testing And Inspection Services'.
 - c. Before placement, inspect metal deck for tears, dents, or other damage that may prevent deck from performing as tight and substantial form.
 - 2. Steel Decking Requirements:
 - a. Periodic inspection shall be provided for field attachment of all steel roof decking.
 - b. Inspections shall include required verification and inspection of steel construction as referenced in IBC Table 1704.3 and in accordance with ANSI/AISC 360, Section M5.5, and applicable ASTM material standards. Periodic and continuous inspections include:
 - 1) Material verification of structural steel and cold-formed steel deck:
 - a) For structural steel, identification markings to conform to ANSI/AISC 360 (periodic).
 - b) For other steel, identification markings to conform to ASTM standards specified in approved construction documents (periodic).

- c) Manufacturer's certified test reports (periodic).
 - c. Welding Inspection: In addition to specified operator qualifications, prior to each welder starting work on job and periodically as testing agency determines each welder shall perform weld test to demonstrate to inspector his ability to produce satisfactory weld. Weld test shall be as follows:
 - 1) Weld at least two samples of deck material to base steel section simulating framing with one weld each sample. Twist deck sample with respect to base until failure occurs. If decking tears or if welds shearing in torsion show proper fusion area, welds are satisfactory.
 - 3. Welding Requirements: Inspection shall be provided by Testing Agency for all welding in accordance with Building Code.
 - a. Nondestructive testing shall be performed as required by Building Code and ANSI/AWS D1.1/D1.1M as specified herein for all shop and field welds.
 - b. All welds shall be visually inspected. Welds considered suspect shall be further checked by other means deemed necessary by welding inspector.
 - c. Inspections shall include required verification and inspection of steel construction as referenced in IBC Table 1704.3 and in accordance with ANSI/AISC 360, Section A3.5 and applicable AWS A5 documents, ANSI/AWS D1.1/D1.1M, ANSI/AWS D1.3/D1.3M, ANSI/AWS D1.4/D1.4M, and ACI 318, Section 3.5.2. Periodic inspections include:
 - 1) Material verification of weld filler materials:
 - a) Identification markings to conform to AWS designation listed in WPS (periodic).
 - b) Manufacturer's certification of compliance required (periodic).
 - 2) Inspection of welding:
 - a) Structural steel and cold-formed steel deck:
 - (1) Roof decking welds (periodic).
- B. Non-Conforming Work:
 - 1. Repair or replace damaged metal deck panels as required at no additional cost to Owner.

END OF SECTION

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

- A. Includes But Not Limited To:
 - 1. Furnish and install load-bearing metal framing and blocking as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 05 0503: 'Shop-Applied Metal Coatings' for steel framing galvanizing repair.
 - 2. Section 09 2216: 'Non-Structural Metal Framing'.
 - 3. Section 09 2900: 'Gypsum Board'.

1.2 REFERENCES

- A. Association Publications:
 - 1. American Iron and Steel Institute (AISI):
 - a. Cold-Formed Steel Design Manual, (2013 Edition) www.steelframing.org.
 - 2. Architectural Testing Inc. (ATI):
 - a. ATI Evaluation Service, Code Compliance Research Report, www.architecturaltesting.com.
 - 3. International Code Council (ICC):
 - a. ICC-ES Evaluation Reports, www.icc-es.org.
 - 4. Steel Framing Industry Association (SFIA):
 - a. SFIA 'Technical Guide for Cold-Formed Steel Framing Products', www.sfia.net.
 - 5. Steel Stud Manufacturers Association (SSMA):
 - a. 2015 IBC - SSMA 'Product Technical Guide'.
- B. Reference Standards:
 - 1. American Iron and Steel Institute (AISI):
 - a. AISI S100-12, 'North American Specification For The Design Of Cold-Formed Steel Structural Members'.
 - b. AISI S110-07-S1-09 (2012), 'Standard For Seismic Design Of Cold-Formed Steel Structural Systems – Special Bolted Moment Frames'.
 - c. AISI S200-12, 'North American Standard For Cold-Formed Steel Framing – General Provisions'.
 - d. AISI S201-12, 'North American Standard For Cold-Formed Steel Framing – Product Data'.
 - e. AISI S210-07 (2012), 'North American Standard For Cold-Formed Steel Framing – Floor and Roof System Design'.
 - f. AISI S211-07 W/SI-12 (2012), 'North American Specification For Cold-Formed Steel Framing – Wall Stud Design'.
 - g. AISI S212-07 (2012), 'North American Specification For Cold-Formed Steel Framing – Header Design'.
 - h. AISI S213-07/S1-09 (2009), 'North American Standard For Cold-Formed Steel Framing – Lateral Design'.
 - i. AISI S214-12, 'North American Standard For Cold-Formed Steel Framing – Truss Design'.
 - 2. American Welding Society:
 - a. AWS D1.3/D1.3M:2010, 'Structural Welding Code - Sheet Steel'.
 - 3. 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 A780/A780M-09(2015), 'Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings'.

- c. ASTM A924/A924M-18, 'Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.'
- d. ASTM A1003/A1003M-18, 'Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members'.
- e. ASTM C955-18, 'Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases.'
- f. ASTM C1007-11a (2015), 'Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories'.
- g. ASTM C1513-18, 'Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections'.
- h. ASTM E119-18c, 'Standard Test Methods for Fire Tests of Building Construction and Materials'.
- 4. Canadian Standards Association (CSA Group):
 - a. CSA S136-12 (R2015), 'North American Specification for the Design of Cold-Formed Steel Structural Members'.
- 5. International Code Council (IBC) (2018 or most recent edition adopted by AHJ).

1.3 ADMINISTRATIVE REQUIREMENTS

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

1.4 SUBMITTALS

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

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

1.5 QUALITY ASSURANCE

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

1.6 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 ASSEMBLIES

- A. Manufacturers:
 - 1. Type One Acceptable Manufacturers:
 - a. Any member in good standing of Steel Framing Industry Association (SFIA) or Steel Stud Manufacturer's Association (SSMA).
 - b. Equal as approved by Architect before bidding. See Section 01 6200.
- B. Design Criteria:

1. Fabricate framing members and accessories in accordance with ASTM C955 from metal meeting requirements of ASTM A653/A653M and/or ASTM A1003/A1003M.
 - a. All structural members in gauges 22, 20 and 18 shall be SQ Grade 33 Grade 33, i.e., with $F_y=33$ Ksi.
 - b. All members in gauges of 16, 14 and 12 shall be SQ Grade 50, i.e., with $F_y=50$ Ksi.
 - c. Tracks in all gauges shall be SQ Grade 33, i.e., with $F_y=33$ Ksi., SQ (Structural Quality) - Grade 50 Class 2 minimum.
 - d. All studs, joists, tracks and other framing materials shall be made with steel having G-60 galvanized coating meeting ASTM A653/A653M, ASTM A924/A924M, and ASTM C955.
- C. Materials:
 1. Wall Framing:
 - a. Studs: C-shaped steel studs, punched, and with stiffened 1-5/8 inch (41.3 mm) flanges. Metal thickness and section properties as shown on Drawings.
 - b. Tracks: U-shaped steel track, unpunched and with straight, 1-1/4 inch (32 mm) wide flanges. Metal thickness to match studs.
 2. Floor Framing:
 - a. Joists: C-shaped steel joists, punched, and with stiffened 1-5/8 inch (41.3 mm) flanges. Metal thickness and section properties as shown on Drawings.
 - b. Tracks: U-shaped steel track, unpunched and with straight, 1-5/8 inch (41.3 mm) wide flanges. Metal thickness to match joists.
 3. Welding:
 - a. Welding is permitted on 18 gauge or heavier material only:
 - 1) Specify welding configuration and size on Structural Calculation submittal.
 - 2) Qualify welding operators in accordance with Section 6.0 of AWS D1.3.
 - 3) Touch up all welds with zinc-rich paint in compliance with ASTM A780/A780M.
 4. Fabrication:
 - a. Framing components shall be cut squarely or at desired angle for a proper square or angular fit. Components shall be held in position with adequate means until properly fastened.

2.2 ACCESSORIES

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

1. Corrosion resistant coated, self-drilling, self-threading steel drill screws complying with ASTM C1513.

PART 3 - EXECUTION

3.1 EXAMINATION:

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

3.2 INSTALLATION

- A. Interface With Other Work:
 1. Coordinate with other Sections to provide blocking necessary for their work.
 2. Coordinate with other Sections for location of blocking required for installation of equipment and building specialties.
- B. General:
 1. Install metal framing in accordance with ASTM C1007, Manufacturer's printed recommendations, and Contract Document requirements, whichever is most stringent on an item-by-item basis.
 2. Notify Architect of conflicts in these requirements.
- C. Erection Tolerances:
 1. **1/4 inch (6 mm)** in **20 feet (500 mm)**, non-cumulative in length of wall.
 2. **1/8 inch (3 mm)** in **10 feet (250 mm)** with **1/4 inch (6 mm)** maximum in height of wall.
 3. Distances between parallel walls shall be **1/4 inch (6 mm)** maximum along length and height of wall.
 4. Space individual framing members plus or minus **1/8 inch (3 mm)** maximum from required location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
- D. Wall Framing:
 1. Securely anchor tracks to supporting structures.
 2. Provide complete uniform and level bearing support for bottom track.
 3. Securely anchor abutting pieces of track to common structural element or butt weld or splice.
 4. Securely attach studs to flanges or webs of both upper and lower tracks, and plumb and align.
 5. Install jack studs at door heads and elsewhere as required to furnish structural support and securely attach to supporting members.
 6. Provide temporary bracing until erection is completed.
 7. Install wall stud bridging in manner to provide resistance to both minor axis bending and rotation. Space bridging rows equally not to exceed **48 inch (1 200 mm)**.
 8. Furnish and install insulation equal to that specified in Division 07 in doubled jamb studs and doubled header members that will not be accessible to insulation installer.
 9. Wrap multiple, adjacent framing members with duct tape or otherwise secure to eliminate 'chattering.'
 10. Use grommets at framing penetrations where unsecured items pass through.
- E. Joists:
 1. Install perimeter joist track. Align and securely anchor track to supporting structure at corners and ends, and at required spacing.
 2. Install joists bearing on supporting frame, level, straight, and plumb. Fasten to both flanges of joist track.
 3. Space joists **2 inches (50 mm)** maximum from abutting walls, unless indicated otherwise.

4. Frame openings with built-up joist headers consisting of joist and joist track, nesting joists, or other acceptable combination of connected joists.
5. Install joist reinforcement at interior supports with single length of joist section directly over interior support, with joists lapped an amount equal to joist reinforcement.
6. Install web stiffeners to transfer axial loads of walls above.
7. Install bridging at both ends of joists and at intervals required by Contract Documents.
8. Secure joists to load bearing interior walls to prevent lateral movement of bottom flange.
9. Install accessories as required by Manufacturer to provide complete and stable joist framing system.

3.3 REPAIR

A. Galvanizing Repairs:

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

3.4 PROTECTION

- #### **A. Protect installed products until completion of project.**

END OF SECTION

DIVISION 06: WOOD, PLASTICS, AND COMPOSITES

06 1000 ROUGH CARPENTRY

06 1011 WOOD FASTENINGS
06 1100 WOOD FRAMING

06 2000 FINISH CARPENTRY

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

06 4000 ARCHITECTURAL WOODWORK

06 4001 COMMON ARCHITECTURAL WOODWORK REQUIREMENTS
06 4512 ARCHITECTURAL WOODWORK WOOD TRIM

END OF TABLE OF CONTENTS

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

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

1.2 REFERENCES

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

1.3 SUBMITTALS

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

PART 2 - PRODUCTS**2.1 MANUFACTURED UNITS**

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

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

B. Materials:

1. Wood fastener list:
 - a. Provide VMR Suppliers with wood fastener list.
2. Fasteners:
 - a. General:
 - 1) Fasteners for preservative treated and fire-retardant-treated wood shall be of hot dipped zinc-coated galvanized steel, stainless steel, silicon bronzed, or copper. Coating weights for zinc-coated fasteners shall be in accordance with ASTM A153/A153M.
 - b. Nails:
 - 1) Meet requirements of ASTM F1667.
 - 2) Unless noted otherwise, nails listed on Drawings or in Specifications shall be common nail diameter, except 16d nails, which shall be box diameter.
 - c. Wood Screws:
 - 1) SDS Screws:
 - a) Category Four Approved Products. See Section 01 6200 for definitions of categories.
 - (1) SDS Screws by Simpson Strong Tie Co, Dublin, CA www.strongtie.com.
 - 2) All Other: Standard type and make for job requirements.
 - d. Powder-Actuated Fasteners:
 - 1) Type One Quality Standard: Hilti X-DNI 62P8.
 - 2) Manufacturers:
 - a) Hilti, Tulsa, OK www.us.hilti.com.
 - b) Redhead Division of ITW, Wood Dale, IL www.itw-redhead.com and Markham, ON www.itwconstruction.ca.
 - c) Equals as approved by Architect through shop drawing submittal before installation. See Section 01 6200.
 3. Adhesives:
 - a. Construction Mastics:
 - 1) Meet requirements of 'APA-The Engineered Wood Association' Specification AFG-01 or ASTM D3498.
 - 2) Use phenol-resorcinol type for use on pressure treated wood products.

PART 3 - EXECUTION

3.1 ERECTION

- A. Secure one Manufacturer approved fastener in each hole of framing anchor that bears on framing member unless approved otherwise in writing by Architect.
- B. Provide washers with bolt heads and with nuts bearing on wood.

END OF SECTION

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

- A. Includes But Not Limited To:
 - 1. Furnish and install wood framing and blocking as described in Contract Documents.
- B. Related Requirements:
 - 1. Sections under 06 4000 Heading: 'Architectural Woodwork' for wall blocking requirements.

1.2 REFERENCES

- A. Reference Standards:
 - 1. American Lumber Standard Committee (ALSC) (Maintains NIST standard):
 - a. Voluntary Product Standard:
 - 1) PS 20-15, 'American Softwood Lumber Standard'.
 - 2. National Institute of Standards and Technology (NIST), U. S. Department of Commerce:
 - a. Voluntary Product Standard DOC PS 20-15, 'American Softwood Lumber Standard'.
 - b. CSA-O141-05 (R2014), 'Softwood Lumber'.
 - c. CSA-O151-09 (R2014), 'Canadian Softwood Plywood'.

1.3 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS**2.1 MATERIAL**

- A. Dimension Lumber:
 - 1. Meet requirements of PS 20 and National Grading Rules for softwood dimension lumber.
 - 2. Bear grade stamp of WWSA, SPIB, or other association recognized by American Lumber Standards Committee identifying species of lumber by grade mark or by Certificate of Inspection.
 - 3. Lumber 2 inches (50 mm) or less in nominal thickness shall not exceed 19 percent in moisture content at time of fabrication and installation and be stamped 'S-DRY', 'K-D', or 'MC15'.
 - 4. Preservative Treated Plates / Sills:
 - a. 2x4 (38 mm by 64 mm): Standard and better Douglas Fir, Southern Pine, or HemFir, or StrandGuard by iLevel by Weyerhaeuser Boise, ID www.ilevel.com. (LSL 1.3 E)
 - b. 2x6 (38 mm by 140 mm) And Wider: No. 2 or or MSR 1650f - 1.5e Douglas Fir, Southern Pine, HemFir, or StrandGuard by iLevel by Weyerhaeuser, Boise, ID www.ilevel.com. (LSL 1.3 E).
- B. Lumber Ledgers:

1. No. 1 Douglas Fir, Larch, or Southern Pine.
- C. Blocking:
 1. Sound lumber without splits, warps, wane, loose knots, or knots larger than **1/2 inch (13 mm)**.
- D. Furring Strips:
 1. Utility or better.

PART 3 - EXECUTION

3.1 ERECTION

- A. General:
 1. Use preservative treated wood for wood members in contact with concrete or masonry.
- B. Accessory / Equipment Mounting And Standing & Running Trim Blocking (nailers):
 1. Furnish and install blocking in wood framing required for hardware, specialties, equipment, accessories, and mechanical and electrical items, etc.
 2. Attach blocking not installed with clips with two fasteners in each end of each piece of blocking.
- C. Furring Strips
 1. On Wood or Steel: Nail or screw as required to secure firmly.
 2. On Concrete or Masonry:
 - a. Back up furring strips on exterior walls or walls in contact with earth with **15 lb (6.8 kg)** felt strip.
 - b. Nail at **12 inches (300 mm)** on center maximum.

END OF SECTION

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

- A. Includes But Not Limited To:
 - 1. Furnish and install sealants required for items installed under this Section, as described in Contract Documents.
- B. Products Installed But Not Furnished Under This Section:
 - 1. Architectural Woodwork.
 - 2. Chair Rails.
 - 3. Selected Building Specialties.
 - 4. TV Wall Mounted Support Bracket (Owner Furnished).
 - 5. Miscellaneous as specified elsewhere.
- C. Related Requirements:
 - 1. Section 06 1100: 'Wood Framing' for furring and blocking.
 - 2. Section 06 2210: 'Miscellaneous Wood Trim'.
 - 3. Sections under 06 4000 Heading: Furnishing of Architectural Woodwork.
 - a. Section 06 4001: 'Common Architectural Woodwork Requirements':
 - 1) Approved Fabricators.
 - 2) Quality of wood materials to be used in Finish Carpentry.
 - b. Section 06 4005: 'Plastic Laminate' for countertops.
 - c. Section 06 4512: 'Architectural Woodwork Wood Trim'.
 - 4. Section 06 6001: 'Miscellaneous Plastic Fabrications' for quality of Window Stools.
 - 5. Section 07 9213: 'Elastomeric Joint Sealants' for quality of sealants, submittal and installation requirements.
 - 6. Sections under 09 9000 heading: Back priming of work to be installed against concrete or masonry or subjected to moisture, and finishing of finish carpentry and architectural woodwork.
 - 7. Sections in Division 10: Furnishing of Specialties.

1.2 REFERENCES

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

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Bommer Industries, Landrum, SC www.bommer.com.
 - b. ClosetMaid, a division of Emerson Electric, Ocala, Florida www.closetmaid.com.
 - c. Stanley, New Britain, CT www.stanleyhardware.com or Oakville, ON (800) 441-1759.
- B. Glue: Waterproof and of best quality.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

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

3.3 INSTALLATION

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

END OF SECTION

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

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

1.2 ADMINISTRATIVE REQUIREMENTS

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

1.3 SUBMITTALS

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

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
 - 1. Wood Doors:
 - a. Do not have doors delivered to building site until after plaster, cement, and taping compound are dry.
 - b. If doors are to be stored at job-site for more than one week, seal top and bottom edges if not factory sealed.

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

PART 2 - PRODUCTS: Not Used

PART 3 - EXECUTION

3.1 INSTALLATION

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

- C. Hardware:
 - 1. General:
 - a. Install using set of Manufacturer's installation, adjustment, and maintenance instructions submitted with hardware under Section 08 7101. Follow as closely as possible.
 - b. Mount closers on jamb stop side of door in parallel arm configuration where it is physically possible to do so and not damage or hinder operation of door or closer.
 - 2. Hardware for Wood Doors:
 - a. If doors are not factory-machined, use hardware templates furnished by Hardware Manufacturer when mounting hardware.
 - b. Set hinges flush with edge surface. Be sure that hinges are set in a straight line to prevent distortion.
 - c. Mount door latches high in strike plate opening so when door later settles, latch will not bind.

3.2 FIELD QUALITY CONTROL

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

3.3 CLOSEOUT ACTIVITIES

- A. Instruction of Owner:
 - 1. Using Owner's Operations And Maintenance Manual, explain keying systems at same time keys and locking mechanisms are tested.

END OF SECTION

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

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

1.2 REFERENCES

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

1.3 SUBMITTALS

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

- a) Owner will provide Control Sample for finish.

PART 2 - PRODUCTS

2.1 MATERIALS

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

2.2 SOURCE QUALITY CONTROL

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

PART 3 - EXECUTION: Not Used

END OF SECTION

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

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

1.2 REFERENCES

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

1.3 SUBMITTALS

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

1.4 QUALITY ASSURANCE

- A. Qualifications: Requirements of Section 01 4301 applies, but not limited to following:
 - 1. Fabricator:
 - a. Fabricator Firm specializing in performing work of this section.

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

1.5 DELIVERY, HANDLING, AND STORAGE

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

PART 2 - PRODUCTS

2.1 FABRICATORS

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

2.2 ASSEMBLIES

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

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

B. Fabrication:

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

PART 3 - EXECUTION: Not Used

END OF SECTION

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

- A. Products Furnished But Not Installed Under This Section:
 - 1. Chair rails.
- B. Related Requirements:
 - 1. Section 06 1100: 'Wood Framing' for wall blocking required for Wood Trim.
 - 2. Section 06 2001: 'Common Finish Carpentry Requirements':
 - a. Installation of chair rails.
 - b. Installation of Wood Trim.
 - 3. Section 06 2210: Remaining Wood Trim.
 - 4. Section 06 4001: 'Common Architectural Woodwork Requirements':
 - a. Approved Fabricators.
 - b. General standards for materials and fabrication of Architectural Woodwork.
 - 5. Section 09 9324: 'Interior Clear-Finished Hardwood'.

1.2 REFERENCES

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

1.3 SUBMITTALS

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

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

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Manufacturers:
 - 1. Approved Fabricators. See Section 06 4001 for Approved Fabricators.
- B. Performance / Design Criteria: Conform to requirements of Section 06 4001 'Common Architectural Woodwork Requirements'.
 - 1. Glue: Waterproof and of best quality.
 - 2. Factory-finish to match Owner selected sample as specified in Section 09 9324.
- C. Architectural Woodwork Wood Trim:
 - 1. Interior Hardwood For Transparent Finish:
 - a. Design Criteria:
 - 1) Solid wood shall be plain sawn Red Oak.
 - 2) Finish to match Owner selected sample as specified in Section 09 9324.
 - 3) Color:
 - a) LDS 110. [verify to match existing stain on project]
- D. Shelves:
 - 1. Conform to applicable requirements of Sections 06 4001 and 06 4114.
 - 2. Use **3/4 inch (19 mm)** Kortron or Melamine faced Panel Product with hot glued 3 mm thick PVC edge banding with eased edges. Apply banding on exposed edges with **one inch (25 mm)** return onto unexposed edges. Edge banding color to match Panel Product.

2.2 SOURCE QUALITY CONTROL

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

PART 3 - EXECUTION Not Used

END OF SECTION

DIVISION 07: THERMAL AND MOISTURE PROTECTION

07 2000 THERMAL PROTECTION

07 2116 BLANKET INSULATION
07 2616 BELOW-GRADE VAPOR RETARDERS

07 5000 MEMBRANE ROOFING

07 5419 POLYVINYL-CHLORIDE ROOFING: PVC

07 9000 JOINT PROTECTION

07 9213 ELASTOMERIC JOINT SEALANTS
07 9219 ACOUSTICAL JOINT SEALANTS

END OF TABLE OF CONTENTS

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

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

1.2 REFERENCES

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

1.3 QUALITY ASSURANCE

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

PART 2 - PRODUCTS**2.1 SYSTEMS**

- A. Manufacturers:
 - 1. Insulation:
 - a. Type One Acceptable Manufacturers:
 - 1) 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.
 - b. Equal as approved by Architect before bidding. See Section 01 6200.
- B. Materials:
 - 1. Thermal And Acoustic Insulation:
 - a. Unfaced Insulation: Meet requirements of ASTM C665, Type I.
 - b. Order insulation by 'R' values rather than 'U' value, rating, or thickness, either **16 or 24 inches (400 or 600 mm)** wide according to framing spacing.
 - c. 'R' Value Required:
 - 1) Acoustically Insulated Ceilings:
 - a) Enclosed Spaces: Fill framed cavity with batt of appropriate thickness.

- b) Unenclosed Spaces: R-19.
2) Wood Wall Stud Framing:

R-11	3-1/2 inches deep	89 mm deep
R-19	5-1/2 inches deep	140 mm deep
R-25	7-1/4 inches deep	184 mm deep

- 3) Metal Wall Stud Framing:

R-11	3-1/2 inches deep	89 mm deep
R-19	5-1/2 inches deep	140 mm deep
R-25	7-1/4 inches deep	184 mm deep

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General:
1. Leave no gaps in insulation envelope.
 2. Provide minimum clearance around recessed lighting fixtures as approved by local code.
- B. In Framing:
1. Install insulation behind plumbing and wiring, around duct and vent line penetrations, and in similar places.
 2. Fit ends of batts snug against top and bottom plates.
 3. Fit batts snug against stud framing at each side.

END OF SECTION

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

- A. Products Furnished and Installed Under This Section:
1. Vapor retarder, seam tape, and penetration accessories for installation under interior slabs-on-grade.

1.2 REFERENCE

- A. Association Publications:
1. American Concrete Institute:
 - a. ACI 302.1R-04, 'Guide for Concrete Floor and Slab Construction'.
 - 1) Section 3.2.3, 'Vapor Retarder'.
 - b. ACI 302.2R-06, 'Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials'.
- B. Definitions:
1. Vapor Barrier: Material that has permeance of 0.1 perm or less. Vapor barrier is a material that is essentially vapor impermeable. Vapor barrier is a Class I vapor control layer. Test procedure for classifying vapor retarders is ASTM E-96 Test Method A—the desiccant or dry cup method.
 2. Vapor Retarder: Vapor retarder is a material that has permeance of 1.0 perm or less and greater than 0.1 perm. Vapor retarder is a material that is vapor semi-impermeable. Vapor retarder is a Class II vapor control layer. The test procedure for classifying vapor retarders is ASTM E-96 Test Method A—the desiccant or dry cup method.
 3. Vapor Retarder Classes and Permeance Descriptions:
 - a. Classes of Vapor Retarders:
 - 1) Class I Vapor Retarder: 0.1 perm or less.
 - 2) Class II Vapor Retarder: 1.0 perm or less and greater than 0.1 perm.
 - 3) Class III Vapor Retarder: 10 perm or less and greater than 1.0 perm.
 - b. Four general classes based on permeance):
 - 1) Vapor Impermeable: 0.1 perm or less.
 - 2) Vapor semi-impermeable: 1.0 perm or less and greater than 0.1 perm.
 - 3) Vapor semi-permeable: 10 perm or less and greater than 1.0 perm.
 - 4) Vapor permeable: greater than 10 perms.
- C. Reference Standards:
1. ASTM International:
 - a. ASTM D1709-16a, 'Standard Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method'.
 - b. ASTM E96/E96M-16, 'Standard Test Methods for Water Vapor Transmission of Materials'.
 - c. ASTM E1745-11, 'Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs'.

1.3 SUBMITTALS

- A. Action Submittals:
1. Product Data:
 - a. Manufacturer's literature or cut-sheets.
 2. Samples:
 - a. Vapor Retarder:

- 1) Submit sample of specified vapor retarder.
- B. Informational Submittals:
1. Test And Evaluation Reports:
 - a. Independent laboratory test results showing compliance with ASTM C1745 Standard.
 2. Source Quality Control Submittals:
 - a. Vapor Retarder:
 - 1) Installation, seaming, and penetration boot instructions.
- C. Closeout Submittals:
1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Warranty Documentation:
 - 1) Final, executed copy of Warranty:
 - b. Record Documentation:
 - 1) Manufacturers documentation:
 - a) Manufacturer's documentation showing compliance to Contract Documents.

1.4 WARRANTY

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

PART 2 - PRODUCTS

2.1 ASSEMBLIES

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

2.2 ACCESSORIES

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

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

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SECTION 07 5419**POLYVINYL-CHLORIDE ROOFING: PVC****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install roofing membrane with flashings and other components to comprise total roofing system as described in Contract Documents including:
 - a. 80 mil Single-ply membrane.
 - b. Gypsum Cover Board
 - c. Poly-isocyanurate tapered insulation system with crickets (R-30 above building areas)
 - d. 5/8" Gypsum thermal barrier board
- B. Related Requirements:
 - 1. Section 06 0573.13: 'Preservative Wood Treatment' for roof related blocking and roof nailers.
 - 2. Section 06 1100: 'Wood Framing' for roof related blocking, nailing and sheathing.
 - 3. Section 06 2001: 'Common Finish Carpentry Requirements' for wood nailers, curbs and blocking.
 - 4. Section 07 6220: 'Stainless Steel Flashing And Trim' for metal work installation and requirements.
- C. Products Installed But Not Furnished Under This Section:
 - 1. Sheet metal work including caps, sleeves, umbrella hoods, pipe enclosures boxes, strapping, and scuppers.
- D. Related Requirements:
 - 1. Division 07 for sheet metal work specialties and accessories.

1.2 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'.
 - c. ASTM D4434/D4434M-15, 'Standard Specification for Polyvinyl Chloride Sheet Roofing'.
 - d. ASTM E84-18b, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
 - e. 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':
 - 1) Section 1507, 'Requirements for Roof Coverings':
 - a) 1507.13, 'Thermoplastic single-ply Roofing'.
3. National Fire Protection Association:
 - a. NFPA 101: 'Life Safety Code' (2018 or most recent edition adopted by AHJ).
4. Underwriters Laboratories (UL):
 - a. UL 580: 'Tests for Uplift Resistance of Roof Assemblies' (5th Edition).
 - b. UL 723, 'Tests for Safety Test for Surface Burning Characteristics of Building Materials' (11th Edition).
 - c. UL 790, 'Standard Test Methods for Fire Tests of Roof Coverings' (8th Edition).
 - d. UL 2218, 'Standard for Impact Resistance of Prepared Roof Coverings Materials' (2nd Edition).

1.3 ADMINISTRATIVE REQUIREMENTS

- A. 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 membrane safety stripe required to be located around perimeter of roof.
 - g. Review roofing drainage requirements.
 - h. Review temporary protections for roofing system.
 - i. Review cleaning and disposal requirements.
 - j. Review Special Procedure Submittal for Warranty Information to be given to Manufacturer before Manufacture will issue Roof Warranty by Installer.
 - k. Review safety issues.
 - l. Review field inspections and non-conforming work requirements.
 - m. Review protection of membrane by other trades after installation of membrane.

1.4 SUBMITTALS

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

- 3) Membrane terminations.
 - 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.
- B. Informational Submittals:
1. Certificates:
 - a. Installer's signed certificate stating roofing system complies with Contract Documents performance requirements and work only performed by trained and authorized personnel in those procedures.
 - b. Manufacturer'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.
- C. Closeout Submittals:
1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Warranty Documentation:
 - 1) Final, executed copy of 'Roofing Manufacturer System Warranty' including wind speed coverage and required Owner mandatory information.
 - 2) Final, executed copy of 'Roof Installer Workmanship Warranty' including required Owner mandatory information.
 - 3) Verify mandatory information as specified in Special Procedure Submittal has been included in Final Warranty.
 - b. Record Documentation:
 - 1) Manufacturers Documentation:
 - a) Record Shop Drawings if requested. Record shop drawings shall be given shop drawing number by Roofing Manufacturer.
 - b) Certificate: Manufacturer Inspection report by Technical Service Representative.
 - c) Certificate: Installer statement of compliance for performance requirements.
 - d) Test And Evaluation Report: UL fire-resistance rating test report.
 - e) Test And Evaluation Report: Factory Mutual Research Classification approval.

1.5 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 average R value not less than 30.
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
6. Parapet Cap / Coping Requirements:
 - a. Zone 2 (perimeter, vertical load direction): 52.2 pounds per square foot
 - b. Zone 3 (corners, vertical load direction): 78.5 pounds per square foot
 - c. Zone 4 (perimeter, horizontal load direction): 33.7 pounds per square foot
 - d. Zone 5 (corners, horizontal load direction): 41.6 pounds per square foot

B. Qualifications:

1. Requirements of Section 01 4301 applies but not limited to the following:
 - a. Installers Qualifications:
 - 1) Provide documentation if requested by Architect:
 - a) Roofing Installer shall be approved and authorized by Roofing System Manufacturer to install Manufacturer's product and eligible to receive Manufacturer's special warranty before bid.
 - b) Roofing Installer shall be able to document roofing membrane installation for five (5) year minimum.
 - c) Roofing Installer must have current license for the city, county, and state where project is located.
 - d) Roofing Installer must have license for specific type of roofing work to be preformed.
 - e) Roofing Installer's foreman shall be skilled in his trade and qualified to lay out and supervise the Work.
 - f) Membrane and flashing installation shall be performed by personnel trained and authorized by Roofing Manufacturer.
 - g) Welding equipment shall be provided by or approved by Roofing Manufacturer. Mechanics intending to use equipment shall have successfully completed training course provided by Manufacturer's Technical Representative before welding.
 - b. Manufacturer Qualifications:
 - 1) Manufacturer shall manufacture membrane material for five (5) consecutive years.
 - a) No product with documented failure will be allowed.
 - 2) Manufacturer that is UL listed for membrane roofing system used for this Project.
 - 3) Source Limitations:
 - a) Provide roof components including roof insulation and fasteners for roofing system from same Manufacturer as membrane roofing or approved by Roofing Membrane Manufacturer.

1.6 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 (4 deg C).and below 180 deg F (82 deg C).
 - e. Unacceptable Material:
 - 1) Remove from job site materials that are determined to be damaged by Architect or by Roofing Manufacturer and replace at no additional cost to Owner.
 - 2) 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.

1.7 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 (4 deg C) and rising before applying.
- c. Hot temperature:
 - 1) Do not expose membrane and accessories to constant temperature in excess of 180 deg F (82 deg C).
- 2. Proceed with roofing work when existing and forecasted weather conditions permit.

1.8 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

2.1 SYSTEM

- A. Manufacturer:
 - 1. Category Three Approved Manufacturers. See Section 01 6200 for definitions of Categories:
 - a. Sika Sarnafil, Canton, MA (800) 576-2358 or (781) 828-5400. www.sikacorp.com.
 - 1) Contact Information (USA, Canada and Global):
 - a) Primary Contact: Steve Moosman, District Manager, office (801) 575-8648 x7551 cell (801) 201-6269 moosman.steve@us.sika.com.
 - b) Secondary Contact: Jim Greenwell, Mountain Region Manager: office (801) 575-8648 x7558 cell (801) 455-3838 greenwell.jim@us.sika.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. Description:
 - 1) 'Mechanically Attached':
 - a) Meet requirements of ASTM D4434/D4434M, Type III:
 - b) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (1) Sika Sarnafil: S327 polyester reinforced membrane:
 - (a) 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. 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) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (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) Category Four 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.

2.2 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. Pourable Sealer:
 - a. Approved by Roofing Membrane Manufacturer for specified roof system.
 3. Membrane:
 - a. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Sika Sarnafil:
 - a) Sarnacol 2170: Solvent based membrane adhesive.
 4. Insulation:
 - a. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Sika Sarnafil:
 - a) Sarnacol 2163/AD/OM: Low rise polyurethane foam adhesive.
- 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.
 2. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a. Sika Sarnafil:
 - 1) 25 ga (0.56 mm) G90 galvanized sheet metal laminated with 0.020 inch (0.55 mm) thick membrane:
 - 2) Sarnclad membrane cover strips:
 - a) 0.060 inch (1.5 mm) thick.
 - b) 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. Category Four 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. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 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. Standard Walkway:****a. Description:**

- 1) Traffic surface used to protect roof membrane with limited slip surface.
- 2) Approved for all wind load areas.
- 3) Heat weldable walk roll.

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

- 1) Sika Sarnafil:
 - a) SarnaTred Walkway Roll.

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**3.1 INSTALLERS****A. Category Three Approved Manufacturer's Roofing Installers: See Section 01 4301:**

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

3.2 EXAMINATION**A. Verification Of Conditions:**

1. Fastener Pull Out Test
 - a. Contractor to arrange for a fastener pull out test with the roofing manufacturer representative to determine the density and spacing requirements of roofing fasteners.
2. Examine deck to determine if it is satisfactory for installation of roofing system:
 - a. Inspect for defects such as excessive surface roughness, contamination, structural inadequacy, or any other condition that will adversely affect quality of work.
 - b. Verify that roof drain lines are functioning correctly before starting work of this Section. Report such blockages in writing to Architect, with copy to Roofing Manufacturer, for corrective action before beginning work of this Section.
 - c. 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.
3. 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.

B. Examination And Assessment:

1. Examine decks for adequacy before commencing work. Requirements shall include but not limited to the following:
 - a. Designed slope required for proper drainage.
 - b. Location of roof drains.
 - c. Moisture conditions that will adversely affect quality of work.
 - d. Other condition incompatible with good roofing practice.

2. Notify Architect in writing of conditions with letter copy to Roofing Membrane Manufacturer that would limit guarantee on part of Manufacturer or applicator.

3.3 PREPARATION

A. Surface Preparation:

1. General:
 - a. Substrate shall be clean, smooth, dry, and free of flaws, sharp edges, loose and foreign material, oil and grease. Roofing shall not start until defects have been corrected.
 - b. Provide temporary walkways and work platforms as necessary to complete work under this section with no damage to surfaces exposed during work.
 - c. Coordinate application of membrane to provide protection of underlying materials from wetting or other damage by the elements on a continuous basis.
 - d. Sheet metal sleeves, caps, and enclosures shall be completely installed on daily basis.
 - e. 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.
 - f. 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.
 - g. Remove and discard temporary seals before beginning work on adjoining roofing.

B. Wood Nailers:

1. Install continuous treated wood nailers at perimeter of entire roof and around roof projections and penetrations as described on Contract Drawings by Section 06 1100 'Wood Framing'.

3.4 INSTALLATION

A. Interface With Other Work:

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

B. General:

1. Installation shall be in conformance with latest edition of manufacturer's specification except where Contract Documents are more restrictive.
2. Roof surfaces shall be free of water, ice and snow. Surfaces to receive insulation, membrane, or flashings shall be dry. Should surface moisture occur, provide equipment necessary to dry surface before application.
3. Secure new and temporary construction, including equipment and accessories, so as to preclude wind blow-off and subsequent roof or equipment damage.
4. Install only as much roofing as can be made weathertight each day, including flashing and detail work. Clean seams and heat-weld before leaving jobsite.
5. Schedule and execute work without exposing interior building areas to effects of inclement weather. Protect existing building and its contents against all risks.
6. Before and during application, remove dirt, debris, and dust from surfaces either by vacuuming, sweeping, blowing with compressed air, or similar methods.
7. Report rooftop contamination that is anticipated or that is occurring to Roofing Manufacturer to determine corrective steps to be taken.

C. Vapor Retarder / Air Barrier Installation:

1. Conduct moisture and adhesion tests.

D. Insulation:

1. Install insulation as recovery layer over substrate and to obtain desired thermal value. Roof assembly shall be dry.
2. Neatly cut insulation cut to fit around penetrations and projections.
3. Install tapered insulation in accordance with insulation manufacturer's shop drawings.
4. Install tapered insulation around drains creating a drain sump.

5. Do not install more insulation board than can be covered with roofing membrane by end of day's work or onset of inclement weather.
6. '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.
- E. Roof System Cover Board:
 1. Offset roof system cover board joints **24 inches (600 mm)** minimum from joints in underlying substrate or insulation.
 - a. Rhinobond roof assembly attachment plates and fasteners.
 - 1) Secure roof system cover board using insulation plates and fasteners spaced as required by Membrane Manufacturer's warranty requirements.
- F. 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. 'Mechanically Attached':
 - a. In Seam Option:
 - 1) Unroll and position membrane without stretching. Provide and secure both perimeter and field membrane sheets in accordance with manufacturer's most current specifications and details.
 - 2) Install adjoining membrane sheets in same manner in accordance with manufacturer's specifications.
 - b. Rhinobond Option:
 - 1) Preparation: Using test strip of membrane and loose Rhinobond plates, provide at least four (4) varied heat settings to calibrate Rhinobond welder for operation during each work period.
 - 2) Roll out and set membrane. Follow Manufacturer's written instructions:
 - a) Provide **3 inches (75 mm)** shingled lap seaming area in all membrane overlaps.
 - b) Weld random perimeter Rhinobond plates to secure field membrane from shifting during seam and field welds.
 - c) Identify remaining Rhinobond plates and weld membrane using repeated leap frog method of welding followed by placement of cooling magnets.
 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.
 - d. Safety Stripe:
 - 1) Install continuous yellow membrane safety stripe **6 feet (1.80 m)** typical from perimeter edge of roof.
- G. 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. Mechanically fasten flashing membranes along top edge through tin discs or pre-drilled, galvanized metal strip washers spaced at of **12 inches (300 mm)** maximum on center.
 - 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) Sika Sarnafil Sarnaclad:
 - a) Hot-air weld **4 inch (100 mm)** wide strip of flashing membrane over joint.
- H. 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.
- I. Walkway Rolls:
- 1. Mark lines on membrane to determine location and direction(s) of walkway network. Membrane surface shall be clean.
 - 2. Follow Manufacturer's written application instructions including adhesive coverage rate requirements.

3.5 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.

3.6 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.

3.7 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

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

- A. Includes But Not Limited To:
 - 1. Furnish and install sealants not specified to be furnished and installed under other Sections.
 - 2. Quality of sealants to be used on Project not specified elsewhere, including submittal, material, and installation requirements.
- B. Related Requirements:
 - 1. Furnishing and installing of sealants is specified in Sections specifying work to receive new sealants.
- C. Products Furnished But not Installed Under This Section:
 - 1. Interior Ceramic Tile Joint Sealants:
- D. Related Requirements:
 - 1. Section 09 3013: 'Ceramic Tiling'.

1.2 REFERENCES

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

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

B. Reference Standards:

- 1. ASTM International:
 - a. ASTM C920-18, 'Standard Specification for Elastomeric Joint Sealants'.
 - b. ASTM C1193-16, 'Standard Guide for Use of Joint Sealants'.
 - c. ASTM C1330-18, 'Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants'.
 - d. ASTM C1481-12(2017) 'Standard Guide for Use of Joint Sealants with Exterior Insulation & Finish Systems (EIFS)'.
 - e. ASTM D5893/D5893M-16, 'Standard Specification for Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements'.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Scheduling:

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

1.4 SUBMITTALS

A. Action Submittals:

- 1. Product Data:
 - a. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.
 - b. Manufacturer's literature for each Product.
 - c. Schedule showing joints requiring sealants. Show also backing and primer to be used.

B. Informational Submittals:

- 1. Certificates:
 - a. Manufacturer's Certificate:
 - 1) Certify products are suitable for intended use and products meet or exceed specified requirements.
 - 2) Certificate from Manufacturer indicating date of manufacture.
- 2. Manufacturers' Instructions:
 - a. Manufacturer's installation recommendations for each Product.
 - b. Manufacturer's installation for completing sealant intersections when different materials are joined.

1.5 QUALITY ASSURANCE

A. Qualifications:

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

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

1.6 DELIVERY, STORAGE, AND HANDLING

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

1.7 FIELD CONDITIONS

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

1.8 WARRANTY

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

PART 2 - PRODUCTS

2.1 SYSTEMS

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

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

B. Materials:

1. Design Criteria:

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

2. Sealants At Exterior Sheet Metal And Miscellaneous:

- a. Description:
 - 1) Weathersealing expansion, contraction, perimeter, and other movement joints which may include all or part of the following for project:
 - a) Flashings.
 - b) Gutters.
 - c) Penetrations in soffits and fascias.
 - d) Roof vents and flues.
 - e) Lightning protection components.
- b. Design Criteria:
 - 1) Meet following standards for Sealant:
 - a) ASTM C920: Type S Grade NS, Class 25 (min) Use NT, M, G, A and O.
 - 2) Limitations:
 - a) Do not use below-grade applications.
 - b) Do not use on surfaces that are continuously immersed or in contact with water.
 - c) Do not use on wet, damp, frozen or contaminated surfaces.
 - d) Do not use on building materials that bleed oils, plasticizers or solvents, green or partially vulcanized rubber gaskets or tapes.
- c. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Dow Corning: 790 Silicone Building Sealant.
 - 2) Momentive Performance Materials (formerly, GE Sealants & Adhesives): GE SCS2350 Silicone Elastomeric Sealant.
 - 3) Tremco: Tremsil 600 Silicone Sealant.

3. General Interior Sealants:

- a. General:
 - 1) Inside jambs and heads of exterior door frames.
 - 2) Both sides of interior door frames.
 - 3) Inside perimeters of windows.
 - 4) Miscellaneous gaps between substrates.
- b. Design Criteria:

- 1) Meet ASTM C920, Type S, Grade NS, NT, and Class 25 test requirements.
- 2) 100 percent silicone sealant.
- c. Non-Paintable Sealant (Installer Option A):
 - 1) Category Four Approved Product. See Section 01 6200 for definitions of Categories:
 - a) Dow Corning: Tub, Tile, And Ceramic Silicone Sealant.
 - b) Laticrete: Latasil Silicone Sealant.
 - c) Momentive Performance Materials (formerly, GE Sealants & Adhesives): GE SCS2800 SilGlaze II Silicone Sealant.
 - d) Sherwin Williams: White Lightning Silicone Ultra Low Odor Window and Door Sealant.
 - e) Tremco: Tremsil 200 Silicone Sealant.
 - f) Franklin International: Titebond 2601 (White) 2611 (Clear) 100% Silicone Sealant.
- d. Paintable Sealant (Installer Option B):
 - 1) Category Four Approved Product. See Section 01 6200 for definitions of Categories:
 - a) Momentive Performance Materials (formerly, GE Sealants & Adhesives): GE SCS7000 Paintable Silicone Sealant.
4. Sealants For Interior Joints:
 - a. General:
 - 1) Countertops and backsplash to wall.
 - 2) Sinks and lavatories to countertops.
 - 3) Joints between plumbing fixtures and other substrates.
 - b. Interior Ceramic Tile Joints are furnished in Section 07 9213 and installed in Section 09 3013 'Ceramic Tiling' including the following:
 - 1) Ceramic tile inside corners.
 - 2) Ceramic tile and paver tile joints.
 - c. Description:
 - 1) One-part acetoxycure silicone sealant with fungicides to resist mold and mildew.
 - d. Design Criteria:
 - 1) Meet ASTM C920, Type S, Grade NS, NT, and Class 25 test requirements.
 - 2) 100 percent silicone sealant.
 - e. Color: As selected by Architect from Manufacturer's standard colors.
 - f. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Dow Corning: Tub, Tile, And Ceramic Silicone Sealant.
 - 2) Laticrete: Latasil Tile and Stone Silicone Sealant.
 - 3) Momentive Performance Materials (formerly, GE Sealants & Adhesives): GE SCS1700 Sanitary Silicone Sealant.
 - 4) Tremco: Tremsil 200 Silicone Sealant.

2.2 ACCESSORIES

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

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

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

3.3 APPLICATION

- A. General:
 - 1. Apply silicone sealant in accordance with Manufacturer's instructions.
 - 2. Do not use damaged or deteriorated materials.
 - 3. Install primer and sealants in accordance with ASTM C1193 and Manufacturer's instructions.
 - 4. Apply primer where required for sealant adhesion.
 - 5. Install sealants immediately after joint preparation.

6. Do not use silicone sealant as per the following:
 - a. Apply caulking/sealant at temperatures below 40 deg F (4 deg C).
 - b. Below-grade applications.
 - c. Brass and copper surfaces.
 - d. Materials bleeding oils, plasticizers, and solvents.
 - e. Structural glazing and adhesive.
 - f. Surfaces to be immersed in water for prolonged time.
- B. Joint Backing:
 1. Install joint backing to maintain sealant joint ratios recommended by Manufacturer.
 2. Install without gaps, twisting, stretching, or puncturing backing material. Use gage to ensure uniform depth to achieve correct profile, coverage, and performance.
 3. Rod for open joints shall be at least 1-1/2 times width of open joint and of thickness to give solid backing. Backing shall fill up joint so depth of sealant bite is no more than 3/8 inch (9.5 mm) deep.
- C. Bond Breaker:
 1. Install bond breaker where joint backing is not used or where backing is not feasible.
 - a. Apply bond-breaker tape in shallow joints as recommended by Sealant Manufacturer.
- D. Sealant:
 1. Apply sealant with hand-caulking gun with nozzle of proper size to fit joints. Use sufficient pressure to insure full contact to both sides of joint to full depth of joint. Apply sealants in vertical joints from bottom to top.
 2. Fill joint opening to full and proper configuration.
 3. Apply in continuous operation.
 4. Tool joints immediately after application of sealant if required to achieve full bedding to substrate or to achieve smooth sealant surface. Tool joints in opposite direction from application direction, i.e., in vertical joints, from the top down. Do not 'wet tool' sealants.
 5. Depth of sealant bite shall be 1/4 inch (6 mm) minimum and 1/2 inch (12.7 mm) maximum, but never more than one half or less than one fourth joint width.
- E. Caulk gaps between painted or coated substrates and unfinished or pre-finished substrates. Caulk gaps larger than 3/16 inch (5 mm) between painted or coated substrates.

3.4 TOLERANCES

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

3.5 FIELD QUALITY CONTROL

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

3.6 CLEANING

- A. Remove masking tape and excess sealant.

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

END OF SECTION

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

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

1.2 REFERENCES

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

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

1.3 SUBMITTALS

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

1.4 QUALITY ASSURANCE

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

1.5 DELIVERY, STORAGE, AND HANDLING

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

1.6 FIELD CONDITIONS

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

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

2.2 ACCESSORIES

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

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

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

3.3 INSTALLATION

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

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

3.4 FIELD QUALITY CONTROL

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

3.5 CLEANING

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

END OF SECTION

DIVISION 08: OPENINGS

08 0100 OPERATION AND MAINTENANCE OF OPENINGS

08 0601 HARDWARE GROUP AND KEYING SCHEDULES

08 1000 DOORS AND FRAMES

08 1213 HOLLOW METAL FRAMES

08 1313 HOLLOW METAL DOORS

08 1429 FLUSH WOOD DOORS: FACTORY-FINISHED, CLEAR

08 3000 SPECIALTY DOORS AND FRAMES

08 3323 OVERHEAD COILING DOORS

08 3819 RIGID TRAFFIC DOORS

08 7000 HARDWARE

08 7101 COMMON FINISH HARDWARE REQUIREMENTS

08 7102 HANGING DEVICES

08 7103 SECURING DEVICES

08 7106 CLOSING DEVICES

08 7107 PROTECTIVE PLATES AND TRIM

08 7108 STOPS AND HOLDERS

08 7109 ACCESSORIES

END OF TABLE OF CONTENTS

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

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

1.2 REFERENCES

- A. Definitions:
 - 1. Builders Hardware Manufacturer's Association (BHMA) Hardware Functions:
 - a. F75 Passage Latch: Latch bolt operated by lever from either side at all times.
 - b. F76 Privacy Lock: Latch bolt operated by lever from either side. Outside lever locked by push button inside and unlocked by emergency key from outside or rotating lever from inside.
 - c. F81 Office Door Lock: Dead locking latch bolt operated by lever from either side, except when outside lever is locked by turn button in inside lever. When outside lever is locked, latch bolt is operated by key in outside lever or by rotating inside lever. Turn button must be manually rotated to unlock outside lever.
 - d. 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.

1.3 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - HARDWARE GROUPS**2.1 EXTERIOR DOORS**

- A. Single Exterior Doors:
 - 1. **Group 2C:**
 - a. 1 set: Weatherstrip.
 - b. 1 each: Closer.
 - c. 1 each: Exit Device with Exit Alarm.
 - d. 3 each: Hinges.
 - e. 1 each: Stop.
 - f. 1 each: Sweepstrip.
 - g. 1 each: Threshold.
- B. Exterior Double Doors:
 - 1. **Group 10:**
 - a. General:
 - 1) 1 each: Threshold.
 - 2) 1 set: Weatherstrip.
 - b. Active Leaf:
 - 1) 3 each: Hinges.
 - 2) 1 each: Lockset Function F86.

- 3) 1 each: Stop and Holder.
- 4) 1 each: Sweepstrip.
- c. Inactive Leaf:
 - 1) 2 each: Flush Bolts.
 - 2) 3 each: Hinges.
 - 3) 1 each: Stop and Holder.
 - 4) 1 each: Sweepstrip.

2.2 INTERIOR DOORS

A. Single Interior Doors:

- 1. **Group 24B:**
 - a. 1 set: Smoke Gaskets.
 - b. 1 each: Armor Plate.
 - c. 3 each: Hinges.
 - d. 1 each: Lockset Function F81.
 - e. 1 each: Stop.
 - f. 1 each: Threshold where indicated on Contract Documents.
- 2. **Group 28F:** [New door and hardware, existing frame]
 - a. 1 set: Smoke Gaskets.
 - b. 1 each: Closer.
 - c. 3 each: Hinges.
 - d. 1 each: Pull.
 - e. 1 each: Push.
 - f. 1 each: Kick Plate.
 - g. 1 each: Stop.
 - h. 1 each: Threshold where indicated on Contract Drawings.
- 3. **Group 29:** [New door frame, salvaged existing flush wood door with glass lite]
 - a. 1 set: New Smoke Gaskets.
 - b. 1 each: Salvaged existing Closer.
 - c. 3 each: Salvaged existing Hinges.
 - d. 1 each: Salvaged existing Lockset.
 - e. 1 each: Stop.
 - f. 1 each: New carpet edge.

2.3 MISCELLANEOUS DOORS

A. Exterior Double Rigid Traffic Doors:

- 1. **Group 60:**
 - a. General: (See Section 08 3819):
 - 1) 2 each: Cane Bolts.
 - 2) 1 each: Chain.
 - 3) 2 each: Dust-Proof Strikes.
 - 4) 1 each: Gaskets.
 - 5) 2 each: Hinges.
 - 6) 1 each: Padlock.
 - 7) 1 each: Stop.
 - 8) 1 each: Threshold.
 - 9) 1 each: Vision Panel with bars.

END OF SECTION

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

- A. Products Furnished But Not Installed Under This Section:
 - 1. Hollow metal frames.
- B. Related Requirements:
 - 1. Section 06 2024: 'Door, Frame, And Finish Hardware Installation' for installation.

1.2 REFERENCES

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

1.3 SUBMITTALS

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

PART 2 - PRODUCTS**2.1 MANUFACTURED UNITS**

- A. Suppliers:
 - 1. Category Three Approved Suppliers. See Section 01 6200 for definitions of Categories and Section 01 4301 for Qualification Requirements:
 - a. Architectural Building Supply, Salt Lake City, UT www.cookandboardman.com:
 - 1) Contact Information: Russ Farley: phone (800) 574-4369, fax 801-484-6817, or e-mail russf@absdoors.com.
 - b. Beacon Metals Inc, Salt Lake City, UT www.beacon-metals.com:
 - 1) Contact Information: Jared Butler: phone (801) 486-4884, cell (435) 216-2297, FAX 801-485-7647, or e-mail Jared@beacon-metals.com.
 - c. Midwest D-Vision Solutions, Salt Lake City, UT www.mwdsutah.com.
 - 1) Contact Information: Dan Mercer, office (801) 377-4355, cell (801) 618-9456, e-mail danm@mwdsutah.com.
- B. Manufacturers:

1. Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories:
 - a. Any current member of Steel Door Institute.
- C. Frames:
 1. Cold rolled furniture steel:
 - a. Interior Frames: 16 ga. (1.6 mm).
 - b. Exterior Frames: 14 ga. (1.9 mm).
 2. Provide labeled frame to match fire rating of door.
 3. Finish:
 - a. Use one of following systems:
 - 1) Prime surfaces with rust inhibiting primer.
 - 2) Galvanize.
 4. Anchors: 16 US ga (1.6 mm) minimum meeting UL or other code acceptable requirements for door rating involved.
- D. Fabrication:
 1. General Requirements:
 - a. Frames shall be welded units. Provide temporary spreader on each welded frame.
 - b. Provide Manufacturer's gauge label for each item.
 - c. Make breaks, arrises, and angles uniform, straight, and true. Accurately fit corners.
 2. Frame width dimension:
 - a. Fabricate frame 1/8 inch (3 mm) wider than finished wall thickness as described in Contract Documents.
 3. Provide mortar guards at strikes and hinges.
 4. Anchors:
 - a. Provide three jamb anchors minimum for each jamb. On hinge side, install one anchor at each hinge location. On strike side, install one anchor at strike level and anchors at same level as top and bottom hinges. Tack weld anchors on frames intended for installation in framed walls.
 - b. Frames installed before walls are constructed shall be provided with extended base anchors in addition to other specified anchors.
 - c. Anchor types and configurations shall meet wall conditions.

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

SECTION 08 1313**HOLLOW METAL DOORS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
 - 1. Hollow metal doors.
- B. Related Requirements:
 - 1. Section 06 2024: 'Door, Frame, And Finish Hardware Installation' for door installation.
 - 2. Section 08 7105: 'Accessories For Pairs Of Doors' for astragals.
 - 3. Section 08 8100: 'Glass Glazing' for quality of glass glazing.

1.2 REFERENCES

- A. Association Publications:
 - 1. National Association of Architectural Metal Manufacturers (NAAMM):
 - a. HMMA 810-09, 'Hollow Metal Doors'.
 - b. HMMA 860-13, 'Guide Specifications For Hollow Metal Door and Frames'.
 - 2. Steel Door Institute:
 - a. SDI-108, 'Recommended Selection and Usage Guide for Standard Steel Doors'.
- B. Reference Standards:
 - 1. American Architectural Manufacturers Association / Window & Door Manufacturers Association / CSA Group:
 - a. AAMA/WDMA/CSA 101/I.S.2/A440-17, 'North American Fenestration Standard/Specification for windows, doors, and skylights'.
 - 2. ASTM International:
 - a. ASTM A568/A568M-17a, 'Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for'.
 - b. ASTM A653/A653M-17, 'Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process'.
 - c. ASTM C1036-16, 'Standard Specification for Flat Glass'.
 - d. ASTM C1048-18, 'Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass'.
 - 3. Steel Door Institute:
 - a. SDI A250.8-2017, 'Specifications for Standard Steel Doors and Frames'.

PART 2 - PRODUCTS**2.1 MANUFACTURED UNITS**

- A. Suppliers:
 - 1. Category Three Approved Suppliers. See Section 01 6200 for definitions of Categories and Section 01 4301 for Qualification Requirements:
 - a. Architectural Building Supply, Salt Lake City, UT www.cookandboardman.com:
 - 1) Contact Information: Russ Farley: phone (800) 574-4369, fax 801-484-6817, or e-mail russf@absdoors.com.
 - b. Beacon Metals Inc, Salt Lake City, UT www.beacon-metals.com:
 - 1) Contact Information: Jared Butler: phone (801) 486-4884, cell (435) 216-2297, FAX 801-485-7647, or e-mail Jared@beacon-metals.com.

- c. Midwest D-Vision Solutions, Salt Lake City, UT www.mwdsutah.com.
 - 1) Contact Information: Dan Mercer, office (801) 377-4355, cell (801) 618-9456, e-mail danm@mwdsutah.com.
- B. Manufacturers:
 - 1. Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories:
 - a. Any current member of Steel Door Institute.
- C. 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.
 - 2. Factory Glazing:
 - a. Narrow Light:
 - 1) Glazing (non-fire-rated openings):
 - a) Tempered glazing meeting requirements of ASTM C1048, Kind FT, Condition A, Type I, Class I, Quality q3.
 - b) Thickness **1/4 inch (6 mm)**.
- 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.

2.2 SOURCE QUALITY CONTROL

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

PART 3 - EXECUTION: Not Used

END OF SECTION

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

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

1.2 REFERENCES

- A. Abbreviations And Acronyms:
 - 1. AWS: Architectural Woodwork Standards (formerly AWI).
 - 2. FD: Fire-resistant core, fire-resistant materials assembled to stiles and rails according to methods prescribed by the testing agency to meet rigorous smoke, flame, and pressure tests.
 - 3. FD-5: Core with 2 layers on each side.
 - 4. ME: Matching edges, i.e., vertical edges same as decorative faces.
 - 5. PC: Particleboard core, solid core door with stiles and rails bonded to the core and abrasive planed flat prior to the application of the faces.
 - 6. PC-5: Core with 2 layers on each side.
- B. Association Publications:
 - 1. Architectural Woodwork Institute / Architectural Woodwork Manufacturers Association of Canada, 46179 Westlake Drive, Suite 120, Potomac Falls, VA www.awinet.org.
 - a. Architectural Woodwork Standards (AWS), 2nd Edition, 2014.
- C. Definitions:
 - 1. Book-Match: Matching between adjacent veneer leaves on one panel face. Every other piece of veneer is turned over so that the adjacent leaves are "opened" as two pages in a book. The fibers of the wood, slanting in opposite directions in the adjacent leaves, create a characteristic light and dark effect when the surface is seen from an angle.
 - 2. Fire-rated: Fire-retardant particleboard with an Underwriters' Laboratory (UL) stamp for Class 1 fire rating (Flame Spread 20, Smoke Developed 25). Fire-rated doors are available with particleboard and mineral cores for ratings up to 1-1/2 hours.
 - 3. Fire-rated Door: A door made of fire-resistant material that can be closed to prevent the spread of fire and can be rated as resisting fire for 20 minutes (1/3 hour), 30 minutes (1/2 hour), 45 minutes (3/4 hour) (C), 1 hour (B), or 1-1/2 hours (B). The door must be tested and carry an identifying label from a qualified testing and inspection agency.
 - 4. Grade: Unless otherwise noted, this term means Grade rules for Economy, Custom, and/or Premium Grade.
 - a. Custom Grade: Typically specified for and adequately covers most high-quality architectural woodwork, providing a well-defined degree of control over a project's quality of materials, workmanship, or installation.
 - b. Premium Grade: The highest Grade available in both material and workmanship where the highest level of quality, materials, workmanship, and installation is required.
 - 5. Running Match: Each panel face is assembled from as many veneer leaves as necessary. Any portion left over from one panel may be used to start the next.
- D. Reference Standards:

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

1.3 SUBMITTALS

- A. Action Submittals:
 1. Shop Drawings:
 - a. Schedule showing type of door at each location. Included shall be size, veneer, core type, fire rating, hardware prep, openings, blocking, etc.
 - b. Indicate factory finish color and type.
 2. Samples:
 - a. Interior Hardwood for Transparent Finish:
 - 1) Approval subject to Annual Review:
 - a) Prepare sample to match Control Sample available from Owner to be used as finishing standard for interior clear finished hardwood as specified in Section 09 9324.
 - b) Approval of sample by Owner will establish performance standard of stain to be used until next annual review.
 - 2) Design Criteria:
 - a) Provide 8 inch by 10 inch (200 mm by 255 mm) sample of Red Oak to match stain Control Sample provided by Owner.
- B. Informational Submittals:
 1. Source Quality Control Submittals:
 - a. Samples:
 - 1) Interior Hardwood for Transparent Finish:
 - a) Owner will provide Control Sample for finish.
- C. Closeout Submittals:
 1. Include following information in Operations And Maintenance Manuals specified in Section 01 7800:
 - a. Record Documentation:
 - 1) Manufacturers Documentation:
 - a) Manufacturer's product literature on doors and factory finish.
 - b) Maintenance and repair instructions.

1.4 DELIVERY, STORAGE, AND HANDLING

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

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

1.5 WARRANTY

A. Manufacturer Warranty:

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

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Suppliers:

1. Category Three Approved Suppliers. See Section 01 6200 for definitions of Categories and Section 01 4301 for Qualification Requirements:
 - a. Architectural Building Supply, Salt Lake City, UT www.cookandboardman.com:
 - 1) Contact Information: Russ Farley: phone (800) 574-4369, fax 801-484-6817, or e-mail russf@absdoors.com.
 - b. Beacon Metals Inc, Salt Lake City, UT www.beacon-metals.com:
 - 1) Contact Information: Jared Butler: phone (801) 486-4884, cell (435) 216-2297, FAX 801-485-7647, or e-mail Jared@beacon-metals.com.
 - c. Midwest D-Vision Solutions, Salt Lake City, UT www.mwdsutah.com.
 - 1) Contact Information: Dan Mercer, office (801) 377-4355, cell (801) 618-9456, e-mail danm@mwdsutah.com.

B. Manufacturers:

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

C. Wood Doors:

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

- 1) 32 lb density meeting requirements of ANSI A208.1 Mat Formed Wood Particle Board, Grade 1-L-1 minimum.
 - 2) Stiles:
 - a) 1-3/8 inches (35 mm) deep minimum before fitting.
 - b) Stile face to be hardwood matching face veneer material, thickness manufacturer's standard.
 - 3) Rails:
 - a) 1-1/8 inches (28 mm).
 - b) Manufacturer's option.
6. Factory Glazing:
- a. 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 (6 mm).
 - b. Lite Kit:
 - 1) Design Criteria:
 - a) Pre-finished wood or wood veneer frames.
 - 2) Dimensions:
 - a) Doors shown on Door Schedule are to have 6 inch (150 mm) wide by 33 inches (850 mm) high clear opening) security view window with bottom of opening located 42 inches (1 000 mm) above finish floor and side located 6 inches (150 mm) from strike edge of door.
 - 3) Category Four Approved Product. See Section 01 6200 for definitions of Categories:
 - a) Profile M6G by Graham.
 - b) Profile W6 by Marshfield.
 - c) Profile VT1 by VT Industries.
- D. Fabrication:
1. Doors shall be factory-machined. Coordinate with Section 08 1213 and Sections under 08 7000.
- E. Finishes:
1. Factory Finishing:
 - a. Applied by Door Manufacturer before leaving factory.
 - b. Performance / Design Criteria:
 - 1) Finish factory-finish to match Owner selected sample as specified in Section 09 9324.
 - 2) Color:
 - a) OAK 110.
 - c. Finish: AWS Finish System TR-6 Catalyzed Polyurethane Premium Grade for unfilled, open-grain woods.

2.2 SOURCE QUALITY CONTROL

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

PART 3 - EXECUTION: Not Used

END OF SECTION

SECTION 08 3323**OVERHEAD COILING DOORS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install overhead electric operated coiling insulated rolling doors as described in Contract Documents.
- B. Products Furnished But Not Installed Under This Section:
 - 1. Anchors and inserts to be installed in masonry.
- C. Related Requirements:
 - 1. Section 04 2223: 'Architectural Concrete Unit Masonry' for installation of anchors in masonry.
 - 2. Section 11 1319: 'Loading Dock Levelers'.
 - 3. Division 26: 'Electrical' for electrical wiring and conduit, fuses, disconnect switches, and connection of operator to power supply.

1.2 REFERENCES

- A. Association Publications:
 - 1. The American Society of Heating, Refrigerating and Air Conditioning Engineers:
 - a. 2017 ASHRAE Handbook-Fundamentals.
- B. Reference Standards:
 - 1. American Society of Civil Engineers:
 - a. ASCE 7-10, 'Minimum Design Loads for Buildings and Other Structures'.
 - 2. 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'.
 - c. ASTM E90-09(2016), 'Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements'.
 - 3. Underwriters Laboratories, Inc.:
 - a. UL 723: 'Standard for Safety Test for Surface Burning Characteristics of Building Materials'; (11th Edition - 2018).

1.3 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Manufacturer's standard color chart for Architect's color selection.
 - 2. Shop Drawings:
 - a. Show special components and installations that are not fully dimensioned or detailed on Manufacturer's data sheets.
- B. Informational Submittals:
 - 1. Test And Evaluation Reports: Submit evidence that overhead coiling doors has been tested and approved or listed as follows:
 - a. Submit evidence that doors has been tested to meet UL Class requirement required for fire-resistance rating for this Project.

- 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 product data and color selection.

1.4 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Fire-Test Response Characteristics: As determined by qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Surface-Burning Characteristics:
 - 1) Overhead Coiling Doors: Flame spread index of 0 and smoke developed index of 10 as tested per ASTM E84 or UL 723.
- B. Qualifications:
 - 1. Installers:
 - a. Approved by Manufacturer.

1.5 WARRANTY

- A. Manufacturer's Warranty:
 - 1. Provide Manufacturer's Warranty against defects in material and workmanship.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

- A. Manufacturers:
 - 1. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a. Motor-Operated: Model ESD20 Thermiser Insulated Rolling Door by CornellCookson, Inc.
 - b. Manually-Operated: Model ESD20 Thermiser Insulated Rolling Door by CornellCookson, Inc.
- B. Description:
 - 1. Insulated rolling doors designed for exterior openings where maintaining different temperatures on each side of door is desirable.
 - 2. Full perimeter seal of doors.
- C. Design Criteria:
 - 1. Cycle Life:
 - a. Design doors of standard construction for normal use of up to 20 cycles per day maximum, and overall maximum of 50,000 operating cycles for life of door.
 - 2. Seismic Performance:
 - a. Provide manufacturer's seismic calculations confirming ASCE7-10.
 - 3. Insulated Door Slat Material Requirements:
 - a. Meet flame spread index requirements of Quality Assurance in Part 1 of this specification.
 - b. Sound Transmission Class requirements of Source Quality Control in Part 2 of this specification.
 - c. STC Rating: Up to 30 for the curtain and up to 22 for entire assembly, as tested per ASTM E90 and based on testing complete, operable assembly.
 - d. Minimum R-value of 8.0 (U-value of 0.125) as calculated using ASHRAE Handbook of Fundamentals.
 - e. Insulation to be CFC free with Ozone Depletion Potential (ODP) rating of zero.
 - f. Wind Loading:

- 1) Doors to withstand up to **20 psi** (**138 kPA** design wind load).
- D. Curtain:
1. Fabrication:
 - a. Slat Material:
 - 1) Structural quality, cold-rolled galvanized steel sheets complying with ASTM A653 with 24/24 gauge, Grade 40 zinc coating and phosphate treated before fabrication.
 - 2) Insulation: **7/8 inch** (**22 mm**) foamed-in-place, close cell urethane.
 - 3) Total Slat Thickness: **15/16 inch** (**24 mm**).
- E. Endlocks:
1. Fabricate interlocking sections with high strength nylon endlocks on alternate slats each secured with two (2) **1/4 inch** (**6.4 mm**) rivets.
 2. Provide windlocks as required to meet specified wind load.
- F. Bottom Bar:
1. Insulated extruded aluminum bottom bar.
- G. Guides:
1. Fabrication:
 - a. Minimum **3/16 inch** (**4.76 mm**) structural steel angles:
 - 1) Provide windlock bars of same material when windlocks are required to meet specified wind load.
 - 2) Top of inner and outer guide angles to be flared outwards to form bellmouth for smooth entry of curtain into guides.
 - 3) Provide removable guide stoppers to prevent over travel of curtain and bottom bar.
 - 4) Top **16 1/2 inches** (**419.1 mm**) of coil side guide angles to be removable for ease of curtain installation and as needed for future curtain service.
- H. Counterbalance Shaft Assembly:
1. Barrel: Steel pipe capable of supporting curtain load with maximum deflection of **0.030 inch per foot** (**0.76 mm per 305 meter**) of width.
 2. Spring Balance:
 - a. Oil-tempered, heat-treated steel helical torsion spring assembly designed for proper balance of door to ensure that maximum effort to operate will not exceed **25 lbs** (**110 N**).
 - b. Provide wheel for applying and adjusting spring torque.
- I. Brackets:
1. Fabricate from minimum **3/16 inch** (**4.76 mm**) steel plate with permanently lubricated ball or roller bearings at rotating support points to support counterbalance shaft assembly and form end closures.
- J. Hoods:
1. Fabrication:
 - a. Form to entirely enclose coiled curtain and operating mechanism at opening head, and act as weather seal. Contour to suit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Provide closed ends for surface-mounted hoods, and any portion of between-jamb mounting projecting beyond wall face. Provide intermediate support brackets as required to prevent sag.
 - b. Fabricate steel hoods for doors of not less than **24 gauge** (**0.64 mm**) hot-dip galvanized steel sheet with Grade 40 zinc coating, complying with ASTM A653. Phosphate treat before fabrication.
- K. Weatherstripping:
1. Bottom Bar:
 - a. Motor Operated Doors: Sensing/weather edge with neoprene astragal extending full width of door bottom bar.
 - b. Guides: Replaceable vinyl strip on guides sealing against both sides of curtain.
 - c. Hood: Neoprene/rayon baffle to impede air flow above coil.

- d. Lintel Seal: Nylon brush seal fitted at door header to impede air flow.

L. Operation:

1. Electric Door Operators:

- a. Provide electric door operator assembly complete with 1/2 hp, 208 V, single phase heavy duty motor and factory-wired motor controls, gear head drive in oil bath, gear reduction unit, solenoid operated brake, remote control stations, control devices, conduit and wiring from controls to motor and central stations, and accessories required for proper operation.
- b. Provide hand-operated disconnect or mechanism for automatically engaging sprocket and chain operator and releasing brake for emergency manual operation. Mount disconnect and operator so they are accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engage.
- c. Design operator so motor can be removed without disturbing limit-switch adjustment and without affecting emergency auxiliary operator.
- d. Provide wall or bracket-mounted door operator units consisting of electric motor, worm gear drive from motor to reduction gear box, chain or worm gear drive from reduction box to gear wheel mounted on counterbalance shaft, and disconnect release for manual operation. Provide motor and drive assembly of horsepower and design as determined by Door Manufacturer for size of door required.
- e. Electric Motor:
 - 1) High-starting torque, reversible, constant duty, Class A insulated electric motors with overload protection, sized to move door in either direction, from any position, at **8 inches (200 mm)** minimum and **1 foot (300 mm)** maximum per second.
 - 2) Open-drip-proof type motor and controller with NEMA Type 1 enclosure.
- f. Remote Control Station: Surface-mounted, Dust-proof and sealed, 3-button pushbutton stations. Interior units, full-guarded, heavy-duty, with general purpose NEMA Type 1B enclosure.
- g. Automatic Reversing Control: Furnish each door with electrically actuated automatic bottom bar including automatic safety switch extending full width of door bottom, and located within neoprene or rubber astragal mounted to bottom door rail. Contact with switch before fully closing will immediately stop downward travel and reverse direction to fully opened position. Connect to control circuit through retracting safety cord and reel, or self-coiling cable.
- h. Operator must not extend above or below door coil when mounted front-of-coil.
- i. Rated for maximum of 20 cycles per hour (not to be used for consecutive hours) UL/ULC listed.
- j. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Model MG (Industrial Duty Gear Head) Operator by CornellCookson.

2. Hood:

- a. Form to entirely enclosed Electrical Door Operator.
- b. Provide intermediate support brackets as required to prevent sag.
- c. Fabricate steel hoods for doors of not less than **24 gauge (0.64 mm)** hot-dip galvanized steel sheet with Grade 40 zinc coating, complying with ASTM A653. Phosphate treat before fabrication.

M. Finish:

- 1. Powder-coat finish with custom color designated by Owner.
 - a. ASTM A653 galvanized base coating treated with dual process rinsing agents in preparation for chemical bonding, gray baked-on base coat and gray baked-on polyester finish coat.
 - b. Phosphate treatment followed by baked-on polyester powder coat.
- 2. Finish for:
 - a. Brackets.
 - b. Bottom bar (Interior and exterior).
 - c. Guides.
 - d. Hoods.
 - e. Slats (Interior and exterior).
- 3. Color:
 - a. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) SpectraShield Coating System by CornellCookson.
 - a) Powder-coat finish with custom color designated by Owner.
 - b) Color: SpectraShield 30-7192 Grey.

4. Ferrous Metal And Galvanized Surfaces: Except fayed and lubricated surfaces, shop clean and prime with door Manufacturer's standard rust inhibitive primer.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- A. Interface With Other Work:
 1. Interlock coiling door controls with dock leveler controls so coiling door will not close when dock leveler is raised, and dock leveler will not raise when coiling door is closed.
- B. General:
 1. Install door and operating equipment with necessary hardware, anchors, inserts, hangers and supports.
 2. Follow manufacturer's installation instructions.
- C. Secure continuous wall angles to wall framing by **3/8 inch (9.5 mm)** minimum bolts at not more than **30 inches (762 mm)** on center, unless closer spacing recommended by Door Manufacturer. Place anchor bolts on exterior wall guides so they are concealed when door is in closed position.

3.3 FIELD QUALITY CONTROL

- A. Field Tests and Inspections:
 1. Upon completion of the Work, lubricate, test, and adjust doors to operate easily, free from warp, twist, and distortion and fitting weather-tight for entire perimeter.
 2. Upon completion of the Work, lubricate, test, and adjust doors for ease of operation, free from warp, twist, or distortion, and fitting weather-tight for entire perimeter.

3.4 CLEANING

- A. Clean surfaces soiled by work as recommended by manufacturer.
- B. Waste Management:
 1. Remove surplus materials and debris from the site.

3.5 CLOSEOUT ACTIVITIES

- A. Instruction Of Owner:
 1. Demonstrate proper operation of overhead coiling doors to Owner's Representative.
 2. Instruct Owner's Representative in maintenance procedures.

END OF SECTION

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SECTION 08 3819**RIGID TRAFFIC DOORS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install high impact door systems as described in Contract Documents including following:
 - a. Monolithically (one piece) formed, insulated, high impact door system.
 - b. Spring bumpers and windows.
 - c. Hardware and accessories.
- B. Related Requirements:
 - 1. Section 05 1223: Steel channel jambs and headers.
 - 2. Section 08 7103: Securing devices.
 - 3. Section 08 7109: Thresholds.

1.2 SUBMITTALS

- A. Action Submittals
 - 1. Product Data:
 - a. Manufacturer's literature.
 - 2. Shop Drawings:
 - a. Show fabrication details, door elevations, head, jamb, and meeting stile details including full or partial gaskets.
 - 3. Samples:
 - a. Manufacturer's standard color selections for panel.
- B. Informational Submittals:
 - 1. Manufacturer Instructions:
 - a. Manufacturer's 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, cleaning, and maintenance instructions.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
 - 1. Verify doors were shipped on edge or in upright position as indicated on packaging by Manufacturer. Note specific doors shipped in other than on edge or upright position on bill of lading and contact Manufacturer.
- B. Storage And Handling Requirements:
 - 1. Store doors at project site on edge or in upright position and under cover in accordance with Manufacturer's instructions printed on carton.

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

1. Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories.
 - a. Chase Industries Inc, Cincinnati, OH www.chasedoors.com.
 - b. RubbAir Door, Ayer, MA www.rubbair.com.

B. Manufacturer Contact Information:

1. Dust-Proof Strikes:
 - a. Hager, St Louis, MO www.hagerhinge.com.
 - b. Ives, New Haven, CT www.iveshardware.com.
 - c. Rockwood, Manufacturing Co, Rockwood, PA www.rockwoodmfg.com.

C. Interior Doors:

1. Basis of Design Product:
 - a. Basis of design for this Project is Durulite Industrial Traffic Door by Chase Industries.
 - b. Equivalents: Category Four Approved Manufacturers: RubbAir Door.
2. Door Components:
 - a. Door Panel:
 - 1) Monolithic, one piece, hollow shell of high impact, cross-linked polyethylene with minimum wall thickness of **1/4 inch (6.4 mm)**, panel thickness of **1-7/8 inches (48 mm)**, and textured finish.
 - 2) Bottom, leading and back edges have integral molded keyways to accept gaskets.
 - 3) Color Quality Standard: Cloud Gray by Chase Industries.
 - b. Core: High density, foamed-in-place, non-CFC urethane-bonded to interior of shell providing R factor of 12 minimum.
 - c. Hinges:
 - 1) Upper:
 - a) Self-closing 'V' cam design with **1-3/8 inch (35 mm)** standard rise, **3/4 inch (19 mm)** low rise, 180 degree opening, and spring assist.
 - b) Roller assembly design shall allow up and down and back and forth adjustments to door.
 - c) Seal shall be black PVC with a flexible nylon reinforced vinyl skirt.
 - 2) Lower:
 - a) Pillow block design of ductile iron with UHMW sleeve and ductile iron lower hinge adapter with spring assist.
 - 3) Shaft:
 - a) **1-5/16 inch (3 mm)** diameter inserted with screws through tubular steel spine that is foamed-in-place during fabrication and runs full length of door.
 - d. Vision Panel:
 - 1) **16 inches (406 mm)** by **22-1/2 inches (572 mm)** by **/8 inch (3 mm)** thick polycarbonate with aluminum frame recessed **/8 inch (3 mm)** minimum from panel face.
 - 2) Minimum height from finish floor to bottom of viewing area shall **48 inch (1 200 mm)** maximum.
 - e. Gaskets:
 - 1) 60 to 80 durometer extruded black santoprene fitted into matching, pre-formed gasket key and held by friction. Include 'wings' which seal against rounded edges of door. Top seal is co-extruded PVC extrusion with flexible PVC gasket.
 - 2) Use blade-type at leading edge of door. Use bulb type at bottom and between back of door and jamb.

D. Exterior Doors:

1. Basis of Design Product:
 - a. Basis of design for this Project is Durulite 200 Postal-Security Door by Chase Industries.
 - b. Equivalents: Category Four Approved Manufacturers: RubbAir Door.
2. Door Components:
 - a. Door Panel:

- 1) Monolithic, one piece, hollow shell of high impact, cross-linked polyethylene with minimum wall thickness of **1/4 inch (6.4 mm)**, panel thickness of **1-7/8 inch (48 mm)**, and textured finish. Bottom, leading and back edges have integral molded keyways to accept gaskets.
 - 2) Color Quality Standard: Cloud Gray by Chase Industries.
 - b. Core: High density, foamed-in-place, non-CFC urethane-bonded to interior of shell providing R factor of 12 minimum.
 - c. Hinges:
 - 1) Upper: Self-closing 'V' cam design with **1-3/8 inch (35 mm)** standard rise, **3/4 inch (19 mm)** low rise, 180 degree opening, and spring assist. Roller assembly design shall allow up and down and back and forth adjustments to door. Seal shall be black PVC with a flexible nylon reinforced vinyl skirt.
 - 2) Lower: Pillow block design of ductile iron with UHMW sleeve and ductile iron lower hinge adapter with spring assist.
 - 3) Shaft: **1-5/16 inch (33.3 mm)** diameter inserted with screws through tubular steel spine that is foamed-in-place during fabrication and runs full length of door.
 - d. Vision Panel:
 - 1) 16 inches by **22-1/2 inches (572 mm)** by **1/8 inch (3 mm)** thick double-glazed polycarbonate with aluminum frame recessed **1/8 inch (3 mm)** minimum from panel face. Minimum height from finish floor to bottom of viewing area shall **48 inch (1 200 mm)** maximum.
 - 2) Three bars each window, space **7 inches (180 mm)** on center.
 - e. Gaskets:
 - 1) 60 to 80 durometer extruded black santoprene fitted into matching, pre-formed gasket key and held by friction. Include 'wings' which seal against rounded edges of door. Top seal is co-extruded PVC extrusion with flexible PVC gasket.
 - 2) Use blade-type at leading edge of door. Use bulb type at bottom and between back of door and jamb.
 - f. Security Hardware:
 - 1) Cane Bolts:
 - a) **5/8 inch (16 mm)** upper and lower cane bolts and **2 inch (50 mm)** diameter lock sleeves at each door.
 - 2) Dust-Proof Strikes:
 - a) Provide dust-proof strikes for lower cane bolts centered and attached to threshold.
 - b) Type Two Acceptable Products:
 - (1) Hager: 280X.
 - (2) Ives: DP2.
 - (3) Rockwood: 570.
- E. Fabrication:
1. Fabricate in factory to dimensions required to fit framed openings detailed on Contract Documents.
 2. Complete unit to be neat in appearance, free from defects and warping.

2.2 ACCESSORIES

- A. Black Polyethylene Spring Bumpers with **4 inch (100 mm)** projection and **42 inches (1 067 mm)** height.

2.3 SOURCE QUALITY CONTROL

- A. Tests And Inspections:
1. Tolerances: Width and height of each panel +/- **1/4 inch (6 mm)**.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification Of Conditions:
 - 1. Examine openings are ready to receive work and opening dimensions and clearances are as indicated on Contract Documents.
 - 2. Verify floor is level across entire width of door opening.
 - 3. Notify Architect of unsuitable conditions in writing.
 - a. Do not install doors until deficiencies in framed openings have been corrected.
 - b. Commencement of Work by installer is considered acceptance of substrate.

3.2 INSTALLATION

- A. All installation shall be in accordance with manufacturer's published recommendations.
 - 1. Do not install damaged components.
 - B. Coordinate sequence of installation with other work to avoid delays.
 - C. Install doors accurately in their respective frames with clearances necessary anchors, hardware and accessories as recommended by Manufacturer.
 - D. Thresholds:
 - 1. Exterior doors:
 - a. Suggested installation method:
 - 1) With doors in fully closed position, mark floor where cane bolt makes contact when lowered.
 - 2) Drill minimum 1 inch (25 mm) diameter x 2 inch (50 mm) deep hole at marked point for each door.
 - 3) Accurately cut thresholds to fit profile of door frame and center threshold over floor drilled holes.
 - 4) Drill minimum 1 inch (25 mm) diameter hole in threshold to align with holes drilled in concrete.
 - 5) Bed exterior threshold in specified sealant with floor and make watertight.
 - 6) Epoxy and tap dust-proof strike into place.
 - 7) Attach screws to threshold.
 - 8) Adjust lower cane bolt by setting canbolt lock collar so that lower cane bolt does not completely compress spring within strike.
- E. Sealants:
 - 1. Exterior Doors:
 - a. Apply in accordance with Section 07 9213 'Elastomeric Joint Sealant'.
 - b. Caulk joints between frames and walls, both interior and exterior to provide weather tight installation.

3.3 FIELD QUALITY CONTROL

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

3.4 ADJUSTING

- A. Clean and lubricate operating parts.

- B. Adjust to open and close smoothly and freely without binding.
- C. Check seals for proper fit.

3.5 CLEANING

- A. Clean surfaces soiled by work per Manufacturer recommendations.
- B. Waste Management:
 - 1. Upon completion and verification of performance of installation, remove rubbish and debris from site.

END OF SECTION

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

- A. Includes But Not Limited To:
 - 1. General requirements for finish hardware related to architectural wood doors.
 - 2. Includes salvage and reinstallation of existing doors and hardware as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 06 2024: 'Door, Frame, And Finish Hardware Installation' for installation of hardware.
 - 2. Section 08 0601: 'Hardware Group and Keying Schedules'.

1.2 REFERENCES

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

1.3 ADMINISTRATIVE REQUIREMENTS

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

1.4 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Manufacturer's cut sheets.
 - b. Two (2) copies of Manufacturer's installation, adjustment, and maintenance instructions for each piece of hardware. Include one (1) set in 'Operations And Maintenance Manual' and send one (1) set with hardware when delivered.
 - c. Copy of hardware schedule.
 - d. Written copy of keying system explanation.
 - 2. Shop Drawings:
 - a. Submit hardware schedule indicating hardware to be supplied.
 - b. Schedule shall indicate details such as proper type of strikeplates, spindle lengths, hand, backset, and bevel of locks, hand and degree opening of closer, length of kickplates, length

of rods and flushbolts, type of door stop, and other necessary information necessary to determine exact hardware requirements.

B. Closeout Submittals:

1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Operations and Maintenance Data:
 - 1) Manufacturer's installation, adjustment, and maintenance instructions for each piece of hardware.
 - b. Record Documentation:
 - 1) Manufacturers documentation:
 - a) Manufacturer's literature and/or cut sheets.
 - b) Include keying plan and bitting schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Storage And Handling Requirements:

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

PART 2 - PRODUCTS

2.1 SUPPLIERS

A. Existing Projects (Doors and Door Hardware):

1. USA Projects:
 - a. Category Three Approved Suppliers. See Section 01 6200 for definitions of Categories:
 - 1) Architectural Building Supply, Salt Lake City, UT www.cookandboardman.com:
 - a) Contact Information: Russ Farley: phone (800) 574-4369, fax 801-484-6817, or e-mail russf@absdoors.com.
 - 2) Beacon Metals Inc, Salt Lake City, UT www.beacon-metals.com:
 - a) Contact Information: Jared Butler: phone (801) 486-4884, cell (435) 216-2297, FAX 801-485-7647, or e-mail Jared@beacon-metals.com.
 - 3) Midwest D-Vision Solutions, Salt Lake City, UT www.mwdsutah.com.
 - a) Contact Information: Dan Mercer, office (801) 377-4355, cell (801) 618-9456, e-mail danm@mwdsutah.com.

2.2 FINISHES

A. Hardware Finishes:

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

2.3 FASTENERS

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

PART 3 - EXECUTION**3.1 PREPARATION**

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

END OF SECTION

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

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

PART 2 - PRODUCTS**2.1 MANUFACTURED UNITS**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Hager Companies, St Louis, MO www.hagerhinge.com.
 - b. Ives, New Haven, CT www.iveshardware.com.
 - c. McKinney, Scranton, PA www.mckinneyhinge.com.
 - d. PBB, Ontario, CA www.pbbinc.com.
 - e. Stanley (dormakaba Americas), Indianapolis IN www.stanleyhardwarefordoors.com/products/.
- B. Hinges:
 - 1. Doors:
 - a. Sizes:
 - 1) Non-Fire-Rated Doors:
 - a) 1-3/4 inch 44.5 mm non-fire-rated wood doors in wood frames: 4 inches by 4 inches (100 mm by 100 mm).
 - b) 1-3/8 inch 35 mm wood or metal doors: 3-1/2 inches by 3-1/2 inches (89 mm by 89 mm).
 - 2. Use non-removable pins on exterior opening doors.
 - 3. Hinges on exterior doors shall be solid brass, plated to achieve specified finish.
 - 4. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a. Interior:
 - 1) Hager: BB 1279.
 - 2) Ives: 5BBI.
 - 3) McKinney: TA 2714.
 - 4) MacPro / McKinney: MPB79.
 - 5) PBB: BB81.
 - 6) Stanley: FBB 179.

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

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SECTION 08 7103

SECURING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. Products Furnished But Not Installed Under This Section:
 - 1. Items for architectural wood or hollow metal doors.
 - a. Cylinders.
 - b. Exit devices.
 - c. Flush bolts.
 - d. Locksets and latchsets.
 - 2. Miscellaneous Items:
 - a. Chains.
 - b. Padlocks.
- B. Related Requirements:
 - 1. Section 08 3819: Canebolts and dust-proof strikes at Rigid Traffic Doors.
 - 2. Section 08 7101: Common Hardware Requirements.
 - 3. Miscellaneous padlocks by local Church FM Group.

1.2 REFERENCES

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

1.3 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

- A. Manufacturers:
 - 1. Manufacturer List:
 - a. Abus by Home Security, Commercial Security and Safety Lockout, Phoenix, AZ www.abus.com.
 - b. Best Locks by Stanley, Indianapolis IN www.stanleysecuritysolutions.com.
 - c. Hager, St Louis, MO www.hagerhinge.com.
 - d. Ives, New Haven, CT www.iveshardware.com.
 - e. Marks USA, Amityville, NY www.marksusa.com.

- f. Master Lock, Oak Creek, WI.
 - g. Precision Hardware, Romulus, MI www.precisionhardware.com.
 - h. Rockwood, Manufacturing Co, Rockwood, PA www.rockwoodmfg.com.
 - i. Sargent, New Haven, CT www.sargentlock.com.
 - j. Schlage, Colorado Springs, CO www.schlage.com.
 - k. Von Duprin, Indianapolis, IN www.vonduprin.com.
 - l. Yale Commercial Locks, Lenoir City, TN www.yalecommercial.com.
- B. General:
 - 1. Backsets shall be 2-3/4 inches (70 mm).
 - 2. Furnish lead shields where required.
- C. Flush Bolts:
 - 1. Rod length: 12 inch (300 mm) minimum.
 - 2. Type Two Acceptable Products:
 - a. Manual Flushbolts:
 - 1) Hager 282D.
 - 2) Ives FB458.
 - 3) Rockwood 555.
 - b. Equal as approved by Architect before installation. See Section 01 6200.
 - 3. Dust Proof Strike:
 - a. Floor and/or threshold.
 - b. Type Two Acceptable Products:
 - 1) Hager: 280X.
 - 2) Ives: DP2.
 - 3) Rockwood 570.
 - 4) Equal as approved by Architect before installation. See Section 01 6200.
- D. Keying Cores: Provide standard ASSA 719 cores for keyed locking devices provided under this Section.
- E. Locksets And Latchsets:
 - 1. Design Criteria:
 - a. Grade 2 Standard Duty Key-In Lever Cylindrical Lockset:
 - 1) ANSI/BHMA A156.02 Series 4000 Grade 2.
 - 2) Meet UL 3 hour fire rating.
 - 3) Meet ADA Compliant ANSI A117.1 Accessibility Code.
 - 4) Door Lever:
 - a) Meet California code for 1/2 inch (12.7 mm) or less return to door.
 - 2. Lever Operated:
 - a. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Grade 2 Standard Duty Key-In Lever Cylindrical Locksets:
 - a) 7K Series Best Lock with 15D Lever by Stanley standard cylinders - (I/C cores may be used when authorized by AEC).
 - b) 175 Series with American Lever by Marks USA.
 - c) 7 Line Series with L Lever by Sargent.
 - d) AL Series with Saturn (SAT) Lever by Schlage.
 - e) 5300LN Series with Augusta (AU) Lever by Yale.
- F. Exit Devices:
 - 1. Use operable lever trim.
 - 2. Provide labeled hardware where required by local code authority.
 - 3. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a. Apex Series by Precision.
 - b. 80 Series by Sargent.
 - c. 99 or 98 Series by Von Duprin.
 - d. 7100 Series by Yale.
- G. Exit Only Devices with Exit Alarm:
 - 1. Provide labeled hardware where required by local code authority.

2. Set device with 10 second delay before door opens. Alarm sounds immediately.
 3. Design Standard: 98EO-ALK Series by Von Duprin.
 4. Type One Acceptable Manufacturers. See Section 01 6200:
 - a. Detex.
 - b. Sargent.
 - c. Von Duprin.
- H. Padlocks:
1. Class Two Quality Standard: Abus 83 / 45 Series with cylinder to match locksets.
- I. Chains:
1. 3/16 inch (4.76 mm) diameter lightweight welded steel chain, case-hardened, zinc-plated, with flexible vinyl protective cover.
 2. Class Two Quality Standard: Master Lock No. 73 bike locking chain.

PART 3 - EXECUTION

3.1 CLOSE-OUT ACTIVITIES

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

END OF SECTION

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

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

1.2 SUBMITTALS

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

1.3 WARRANTY

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

PART 2 - PRODUCTS**2.1 MANUFACTURED UNITS**

- A. Manufacturers:
 - 1. Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories:
 - a. 8900 Series by Dorma Architectural Hardware, Reamstown, PA www.dorma.com/usa.
 - b. 1461 Series by LCN Closers, Princeton, IL www.lcnclosers.com.
 - c. 8501 Series by Norton Door Controls, Charlotte, NC www.nortondoorcontrols.com.
 - d. 1431 Series by Sargent, New Haven, CT www.sargentlock.com.
 - e. D-3550/D-3551 Series by Stanley (dormakaba Americas), Indianapolis IN www.stanleyhardwarefordoors.com/products/.
- B. Surface-Mounted Overhead Door Closers:
 - 1. Closers provided under this Section shall be from same Manufacturer.
 - 2. Provide parallel arms on closers unless door position in relation to adjacent wall requires otherwise. Provide covers.
 - 3. Door Closers shall allow for 180 degree opening as shown on Contract Documents:
 - a. Closers shall allow for 180 degree opening without engaging stop function. Wall stop or Floor stop is specified in Door Schedule and Section 08 7108, 'Stops And Holders'.
 - b. Closers shall have following features:
 - 1) Adjustable sweep speed.
 - 2) Adjustable backcheck.
 - 3) Non-handed, non-sized.
 - 4) Hold open arm function (Friction Hold Open) (Non-Fire-Rated Corridors).
 - 4. Door Closers on doors that swing 90 degree as shown on Contract Documents:

- a. Closers shall allow for 100 degree opening with engaging stop function.
- b. Closers shall have following features:
 - 1) Adjustable sweep speed.
 - 2) Adjustable backcheck.
 - 3) Non-handed, non-sized.

PART 3 - EXECUTION

3.1 INSTALLATION

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

3.2 ADJUSTING

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

END OF SECTION

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

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

PART 2 - PRODUCTS**2.1 MANUFACTURED UNITS**

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

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

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

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

PART 2 - PRODUCTS**2.1 MANUFACTURED UNITS**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Glynn-Johnson, Indianapolis, IN www.glynn-johnson.com.
 - b. Hager, St Louis, MO www.hagerhinge.com.
 - c. Ives, Wallingford, CT www.iveshardware.com.
 - d. Rockwood Manufacturing Co, Rockwood, PA www.rockwoodmfg.com.
 - e. Sargent, New Haven, CT (800) 906-6606 or (203) 562-2151 www.sargentlock.com.
- B. Stops:
 - 1. Use wall type stops unless indicated otherwise on Door Schedule.
 - 2. Provide model appropriate for substrate. Wall stops may be either cast or wrought.
 - 3. Type Two Acceptable Products:

	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.	Equal as approved by Architect before Installation. See Section 01 6200.			
- C. Door Stops And Holders:
 - 1. Type Two Acceptable Products:
 - a. Hager: 268F, 268S or 256S, 256W.
 - b. Ives: WS444, WS449, FS446, FS450.
 - c. Rockwood: 472, 473, 476, 477.
 - d. Equal as approved by Architect before Installation. See Section 01 6200.

PART 3 - EXECUTION**3.1 INSTALLATION**

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

END OF SECTION

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

- A. Products Furnished But Not Installed Under This Section:
 - 1. Acoustical seals.
 - 2. Smoke Gaskets.
 - 3. Sweep Strip (door bottom sweep).
 - 4. Thresholds (metal) where required for wood doors and hollow metal doors.
 - 5. Weatherstripping for exterior hollow metal doors.
 - 6. Door bottoms/door sweeps.
- B. Related Requirements:
 - 1. Section 08 3819: 'Rigid Traffic Doors' for security hardware.
 - 2. Section 08 7101: 'Common Finish Hardware Requirements' for general finish hardware requirements and Approved Suppliers.

1.2 REFERENCES

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

PART 2 - PRODUCTS**2.1 MANUFACTURED UNITS**

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

- 1) 13VDkB by NGP.
 - 2) 211DV by Pemko.
 - b. Door Bottom Shoe for Metal Door:
 - 1) 779S-A by Hager.
 - 2) 35EV by NGP.
 - 3) 217AV by Pemko.
 - c. Equal as approved by Architect before bidding. See Section 01 6200.
- C. Smoke Gaskets:
 - 1. Color as selected by Architect.
 - 2. Type One Acceptable Products:
 - a. 726 by Hager.
 - b. 5050 by NGP.
 - c. PK 55 by Pemko.
 - d. Equal as approved by Architect before bidding. See Section 01 6200.
- D. Sweepstrip (metal door bottom):
 - 1. Clear anodized aluminum with black neoprene insert.
 - 2. Reduce infiltration of air, wind, dust, rain, and snow.
 - 3. Meet UL requirements.
 - 4. For use with saddle thresholds.
 - 5. Type One Acceptable Products:
 - a. 750S CLR by Hager.
 - b. 198N A by NGP.
 - c. 321 CN by Pemko.
 - d. Equal as approved by Architect before bidding. See Section 01 6200.
- E. Thresholds:
 - 1. Type One Acceptable Products:
 - a. Design Criteria:
 - 1) Meet handicap accessibility requirements (ADA):
 - b. Interior Doors at Acoustic Seals, Approved Products:
 - 1) Carpet threshold (carpet to carpet):
 - a) 505S DBA by Hager.
 - b) 414 DKB by NGP.
 - c) 236 D by Pemko.
 - 2) Carpet threshold (carpet to concrete, wood, synthetic, or resilient flooring):
 - a) 417 DKB by NGP.
 - b) 174 D by Pemko.
 - 3) Saddle threshold:
 - a) 418S DBA by Hager.
 - b) 411 DKB by NGP.
 - c) 151 D by Pemko.
 - c. Out swinging metal exterior doors (exterior Utility Rooms only):
 - 1) 891 V by NGP.
 - 2) 185 V by Pemko.
 - d. Exterior Rigid Traffic Doors:
 - 1) Floor plate assembly threshold (concrete to concrete):
 - a) 445S by Hager.
 - b) 8143 by NGP.
 - c) 191 by Pemko.
 - e. Equals as approved by Architect before bidding. See Section 01 6200.
 - F. Weatherstripping:
 - 1. Type One 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 6200.
- d. Bottom (see Sweepstrip):

PART 3 - EXECUTION

3.1 INSTALLATION

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

END OF SECTION

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DIVISION 09: FINISHES

09 0500 COMMON WORK RESULTS FOR FINISHES

09 0503 FLOORING SUBSTRATE PREPARATION

09 2000 PLASTER AND GYPSUM BOARD

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

09 3000 TILING

09 3013 CERAMIC TILING

09 5000 CEILINGS

09 5113 ACOUSTICAL PANEL CEILINGS
09 5323 METAL ACOUSTICAL SUSPENSION ASSEMBLIES

09 6000 FLOORING

09 6513 RESILIENT BASE AND ACCESSORIES
09 6519 RESILIENT TILE FLOORING
09 6723 RESINOUS FLOORING SYSTEM
09 6816 SHEET CARPET: BACK CUSHION, DIRECT GLUE

09 7000 WALL FINISHES

09 7720 DECORATIVE FIBERGLASS REINFORCED WALL PANELS

09 9000 PAINTS AND COATINGS

09 9001 COMMON PAINTING AND COATING REQUIREMENTS
09 9112 EXTERIOR PAINTED FERROUS METAL
09 9113 EXTERIOR PAINTED GALVANIZED METAL
09 9114 EXTERIOR PAINTED CMU, CONCRETE, STUCCO
09 9122 INTERIOR PAINTED CMU
09 9123 INTERIOR PAINTED GYPSUM BOARD, PLASTER
09 9124 INTERIOR PAINTED METAL
09 9125 INTERIOR PAINTED WOOD
09 9324 INTERIOR CLEAR-FINISHED HARDWOOD
09 9413 INTERIOR TEXTURED FINISHING

END OF TABLE OF CONTENTS

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

- A. Includes But Not Limited To:
 - 1. Coordination and scheduling of Owner Furnished Field Testing for Alkalinity and Concrete Moisture Vapor Emission Rate (MVER) of concrete slab before flooring installation (except carpet) as described in Contract Documents.
 - 2. Preparing floor substrate to receive flooring as described in Contract Documents.
- B. Related Requirements:
 - 1. Pre-Installation conferences held jointly with Section 09 0503 as described in Administrative Requirements on Part 1 of this specification section.
 - 2. Section 01 1200: 'Multiple Contract Summary' for Owner Testing for Alkalinity and Concrete Moisture Vapor Emission Rate (MVER) of concrete before installation of flooring.
 - 3. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
 - 4. Section 03 3111: 'Cast-In-Place Structural Concrete' for installation tolerances for concrete slabs.

1.2 REFERENCES

- A. Association Publications:
 - 1. International Concrete Repair Institute: '*ICRI Concrete Slab Moisture Testing Program*' Rosemont, IL www.icri.org.
 - a. ICRI Certification: 'Concrete Slab Moisture Testing Technician, Tier 2, Grade 1'.
- B. Reference Standards:
 - 1. ASTM International:
 - a. ASTM F710-17, 'Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring'.
 - b. ASTM F1869-16a, 'Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride'.
 - c. ASTM F2170-18, 'Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes'.

1.3 ADMINISTRATIVE REQUIREMENTS

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

B. Scheduling:**1. Concrete Moisture Testing:****a. General Contractor Responsibility to provide:**

- 1) Maintain ambient temperatures and relative humidity conditions as specified in Field Conditions in Part 1 of this specification before Moisture Testing Agency will test for concrete moisture.
- 2) Notify Owner to contact Moisture Testing Agency when building is enclosed and temperature and relative humidity meet requirements for testing.
- 3) Provide access for and cooperate with Moisture Testing Agency.

b. Owner's Representative Responsibility to provide:**1) Provide following information to Moisture Testing Agency at time of notification:**

- a) Digital copy of floor plan(s).
- b) Indicate different flooring material areas and which rooms on floor plan(s) and finish schedule requiring additional tests if required.
- c) Digital copy of Specification Section 09 0503 (this specification) and Section 01 4523 'Testing And Inspecting Services' from Contract Documents for this Project.

2) Carpet Flooring:

- a) Carpet Installer at his/her discretion may test concrete slab for Alkalinity and Concrete Moisture Vapor Emission Rate (MVER) before installation of Owner Furnished carpet.
- b) If carpet area is tested, Installer to coordinate with Owner's Representative for following:
 - (1) Scheduling and coordination for maintain ambient temperatures and relative humidity conditions required before Moisture Testing of concrete moisture.
 - (2) Access to Building for concrete moisture testing.

c. Testing Agency will provide Moisture Testing for following flooring areas:**1) Resilient Tile Flooring:**

- a) Moisture Testing for Resilient Tile Flooring required.
- b) Moisture Testing and Testing Report requirements specified in Informational Submittals.
- c) See individual flooring section for additional scheduling requirements if required.

1.4 SUBMITTALS**A. Informational Submittals:****1. Certificates:****a. Concrete Slab Moisture Technician:**

- 1) Provide current ICRI 'Concrete Slab Moisture Testing Technician, Tier 2, Grade 1' Certification.

b. Certified Standard Moisture Testing Report:**1) Report to include following:**

- a) Available to Testing Agency from Owner's Representative:
 - (1) Project Name.
 - (2) Property Number.
- b) Test date.
- c) Executive summary.
- d) Certified Moisture and Alkalinity (pH) Test Report.
- e) Project floor plan.
- f) Project photographs including following information on each photograph:
 - (1) Site location.
 - (2) Test hole number.
 - (3) Serial number probe.
 - (4) Relative Humidity (RH), Alkalinity (pH) and temperature reading.
 - (5) Property number.
- g) Outlier Test (As specified in Field Quality Control Testing in Part 3 of this specification:
 - (1) Note test as Outlier Test for which hole number was conducted.
 - (2) Site location.
 - (3) Test hole number.

- (4) Serial number probe.
 - (5) Relative Humidity (RH), Alkalinity (pH) and temperature reading.
 - (6) Property number.
 - 2) At completion of testing, Testing Agency shall submit Concrete Moisture Test Report for each flooring system included for project to following:
 - a) One (1) copy to Owner's Representative.
 2. Special Procedure Submittals:
 - a. 'Concrete Moisture Testing Request and Proposal':
 - 1) Provided by Owner's Representative for each project to Testing Agency:
 - a) Testing Agency to fill out form with following information and return as instructed:
 - (1) Review request information.
 - (2) Add information as requested.
 - (3) Sign form.
 - (4) E-mail form back to Owner's Representative.
 - b. Certified Moisture Testing Report Distribution:
 - 1) Owner's Representative responsibilities after receiving Concrete Moisture Test Report:
 - a) Provide copies to following:
 - (1) One (1) copy to Architect.
 - (2) One (1) copy to Contractor.
 - 2) General Contractor responsibilities after receiving Concrete Moisture Test Report from Owner's Representative:
 - a) Provide copies to following:
 - (1) One (1) copy to Resilient Tile Flooring Manufacturer.
 - c. Moisture Testing Report Instructions:
- B. Qualification Statement:
 1. Concrete Slab Moisture Technician:
 - a. Provide Qualification documentation if requested by Architect or Owner.
- C. Closeout Submittals:
 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Record Documentation:
 - 1) Testing and Inspection Reports:
 - a) Testing Agency Testing Reports of Alkalinity and Concrete Moisture testing.

1.5 QUALITY ASSURANCE

- A. Testing and Inspection.
 1. Owner will provide Field Testing for Alkalinity and Concrete Moisture Vapor Emission Rate (MVER) of concrete slab before flooring (except carpet) installation as specified in Field Quality Control in Part 3 of this specifications:
 - a. See Section 01 1200: 'Multiple Contract Summary'.
 - b. See Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
 2. Type One Acceptable Testing Agency:
 - a. See 'Agreement Between Owner And Testing Agency For Testing And Inspection Services (U.S.)' or 'Agreement Between Owner And Testing Agency For Testing And Inspection Services (Canada)'.
 - 1) Equal as approved by Architect or Owner's Representative before bidding. See Section 01 6200.
 - b. Existing Projects.
 - 1) Flooring projects do not need to use Agreement Between Owner And Testing Agency listed in previous paragraph but Owner Testing Agency must:
 - a) Meet Testing Agency Testing requirements of this specifications including 'Concrete Slab Moisture Technician' Qualifications.
- B. Qualifications.
 1. Concrete Slab Moisture Technician:
 - a. ICRI 'Concrete Slab Moisture Testing Technician, Tier 2, Grade 1' Certification:

- 1) Certification includes three (3) hour education session, written exam, and field testing performance exam based on ASTM standards.
 - 2) Certification valid for period of five (5) years from date of testing completion.
- b. Provide documentation if requested by Owner.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Storage And Handling Requirements:

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

1.7 FIELD CONDITIONS

A. Ambient Conditions:

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

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION

3.1 PREPARATION

A. Flooring Preparation:

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

B. Carpet Accessories:

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

3.2 FIELD QUALITY CONTROL

A. Field Tests:

1. General:

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

2. Concrete Moisture and Alkalinity:

- a. Testing Agency will test interior concrete slabs before installation of floor coverings as directed by Architect and will include following:
 - 1) Interior concrete slab areas to be tested:
 - a) Section 03 3543 'Polished Concrete Finishing'.
 - 2) Standard Moisture Testing required of interior concrete slabs on grade:
 - a) General:
 - (1) Testing for concrete moisture shall be taken at concrete slab substrates scheduled to receive flooring as specified in Contract Drawings for complete flooring installation.
 - (2) Outlier Test: If one (1) test is abnormally different from other moisture tests, then additional test should be done. Outlier will be defined in this specification as moisture test that is at least fifteen (15) percent higher or lower than other tests at project building completed same day:
 - (a) Retesting should be done within **5 feet (1.50 m)** feet of original test hole.
 - (b) Contact Owner's Representative for the need to outlier test and additional testing fees will apply.
 - (3) Include required tests for carpeting and additional tests at each different type of flooring system included for project.
 - b) Deseret Industries:
 - (1) Test density is required where floor coverings will be installed. Include testing at each type of flooring system included for project. Following are minimum recommended tests required:
 - (a) Provide additional testing as directed by Architect if necessary. For existing buildings, adjust tests accordingly.
 - b. Approved Concrete Moisture Tests:
 - 1) Concrete Moisture Test (test used with Standard Moisture and Comprehensive Moisture Testing if included for project). See Section 01 6200:
 - a) Relative Humidity (RH) testing using in-situ probes in accordance with ASTM F2170 testing requirements:
 - (1) Check calibration of measuring instrument.
 - (2) Building ambient conditions are met before testing.
 - (3) Drill Hole:
 - (a) Drill and prepare test holes as per ASTM F2170 (correct hole-depth and hole diameter are required).
 - (b) Drill holes equal to forty (40) percent of slab's thickness for concrete slabs on grade and twenty (20) percent of slab's thickness for suspended concrete slabs (hole must be perpendicular (90 deg) to surface).
 - (4) Clean Hole:
 - (a) Follow Manufacturer's installation instructions for cleaning holes and inserting sensor.
 - (5) Insert Sensor:
 - (a) Follow Manufacturer's installation instructions for inserting sensor.
 - (6) Readings:
 - (a) Follow Manufacturer's installation instructions for taking readings.
 - (b) Two (2) hours after installation of sensor, RH reading will be recorded. (Two (2) hour read is in lieu of the seventy-two (72) hour ASTM standard)
 - (7) Future Testing:
 - (a) For future readings, replace protective cap by snapping it back into sensor.

- (8) Test Report shall be submitted as specified in Informational Submittals in Part 1 of this specification.
 - (a) For future readings, replace protective cap by snapping it back into sensor.
- b) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (1) Concrete moisture testing meter:
 - (a) Rapid RH 4.0 EX with Touch-n-Sense Technology and Rapid RH EX Smart Sensors by Wagner Meters, Rogue River, OR
www.wagnermeters.com.
- 2) Alkalinity Testing (pH) Test:
 - a) Testing shall be performed in accordance with ASTM F710.
 - b) Test with pH meter or pH paper.
 - c) Testing shall be taken at every location and at each time concrete moisture test is performed at those locations.
 - d) Clean floor to remove all oil, dirt, dust and any floor coating or sealer.
 - (1) Lightly grind, sand, or bead blasting. Do not remove more than **1/8 inch (3 mm)** of concrete.
 - (2) Removal of more than **1/8 inch (3 mm)** may give high pH reading.
 - (3) Failure to remove laitance will produce low, inaccurate pH reading.
 - e) Place several drops of water on clean surface, forming puddle approximately **1 inch (25 mm)**:
 - (1) Allow puddle to set for sixty (60) ± five (5) seconds, then dip pH paper or meter into water.
 - (2) Remove immediately and record test result.
 - f) Testing to be performed concurrently with concrete moisture testing.
 - g) Test Report shall be submitted as specified in Informational Submittals in Part 1 of this specification.

END OF SECTION

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

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

1.2 REFERENCES

- A. Association Publications:
 - 1. Steel Framing Industry Association (SFIA):
 - a. SFIA 'Technical Guide for Cold-Formed Steel Framing Products', www.sfia.net.
 - 2. Steel Stud Manufacturers Association (SSMA):
 - a. 2015 IBC - SSMA 'Product Technical Guide'.
- B. Definitions:
 - 1. Non-Structural Member: Member in steel-framed system that is not part of the gravity load resisting system, lateral force resisting system or building envelope.
- C. Reference Standards:
 - 1. American Iron and Steel Institute (AISI):
 - a. AISI S220-15, 'North American Specification For The Design Of Cold-Formed Steel Framing – Nonstructural Members'.
 - 2. ASTM International:
 - a. ASTM A653/A653M-15, 'Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process'.
 - b. ASTM A1003/A1003M-15, 'Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members'.
 - c. ASTM C645-18, 'Standard Specification for Nonstructural Steel Framing Members'.
 - d. ASTM C754-18, 'Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products'.
 - e. ASTM C1513-18, 'Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections'.
 - f. ASTM E119-18, 'Standard Test Methods for Fire Tests of Building Construction and Materials'.

1.3 ADMINISTRATIVE REQUIREMENTS

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

1.4 SUBMITTALS

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

1.5 QUALITY ASSURANCE

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

PART 2 - PRODUCTS

2.1 SYSTEMS

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

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

2.2 ACCESSORIES

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

PART 3 - EXECUTION

3.1 INSTALLATION

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

END OF SECTION

B L A N K P A G E

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

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

1.2 REFERENCES

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

8. Splay Wires: Wires installed at angle rather than perpendicular to grid.
9. Stiffening Brace: Used to prevent uplift of grid caused by wind pressure in exterior applications.

C. Reference Standards:

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

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

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

1.4 SUBMITTALS

A. Action Submittals:

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

B. Informational Submittals:

1. Certificates:

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

1.5 QUALITY ASSURANCE

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

1.6 DELIVERY, STORAGE, AND HANDLING

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

1.7 WARRANTY

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

PART 2 - PRODUCTS

2.1 SYSTEMS

- A. Manufacturers:
 1. Type One Acceptable Systems:
 - a. Drywall Grid by Armstrong World Industries, Lancaster, PA www.armstrongceilings.com.

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

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

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

3.3 FIELD QUALITY CONTROL

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

END OF SECTION

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

- A. Includes But Not Limited To:
 - 1. Furnish and install gypsum board as described in Contract Documents, except behind ceramic tile.
 - 2. Furnish and install acoustical sealants as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 07 9219: 'Acoustical Joint Sealants' for quality of acoustical sealants.
 - 2. Section 09 2216: 'Non-Structural Metal Framing'.
 - 3. Section 09 3013: 'Ceramic Tile' for installation of backerboard joint reinforcing.
 - 4. Section 09 9413: 'Interior Textured Finishing'.

1.2 REFERENCES

- A. Definitions:
 - 1. Accessories: Metal or plastic beads, trim, or moulding used to protect or conceal corners, edges, or abutments of the gypsum board construction.
 - 2. Drywall Primer: Paint material specifically formulated to fill the pores and equalize the suction difference between gypsum board surface paper and the compound used on finished joints, angles, fastener heads, and accessories and over skim coatings.
 - 3. Skim Coat: Either a thin coat of joint compound trowel applied, or a material manufactured especially for this purpose and applied in accordance with manufacturer's recommendations, over the entire surface.
 - 4. Texturing: Regular or irregular patterns typically produced by applying a mixture of joint compound and water, or proprietary texture materials including latex base texture paint, to a gypsum board surface previously coated with drywall primer.
- B. Reference Standards:
 - 1. ASTM International:
 - a. ASTM C11-16, 'Standard Terminology Relating to Gypsum and Related Building Materials and Systems'.
 - b. ASTM C475/C475M-15, 'Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board'.
 - c. ASTM C840-17, 'Standard Specification for Application and Finishing of Gypsum Board'.
 - d. ASTM C1002-16, 'Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs'.
 - e. ASTM C1047-14a, 'Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base'.
 - f. ASTM C1178/C1178M-13, 'Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel'.
 - g. ASTM C1396/C1396M-14a, 'Standard Specification for Gypsum Board'.
 - h. ASTM D4977/D4977M-03(2013), 'Standard Test Method for Granule Adhesion to Mineral Surfaced Roofing by Abrasion'.
 - i. ASTM D5420-16, 'Standard Test Method for Impact Resistance of Flat, Rigid Plastic Specimen by Means of a Striker Impacted by a Falling Weight (Gardner Impact)'.
 - j. ASTM E84-16, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.

- k. ASTM E119-16a, 'Standard Test Method for Fire Tests of Building Construction and Materials'.
- 2. Gypsum Association:
 - a. GA-214-15, 'Recommended Levels of Gypsum Board Finish'.
 - b. GA-216-16: 'Application and Finishing of Gypsum Panel Products'.
 - c. GA-600-15, 'Fire Reference Design Manual'.
 - d. GA-801-07, 'Handling and Storage of Gypsum Panel Products: A Guide for Distributors, Retailers, and Contractors'.
- 3. International Building Code (IBC) (2015 or latest approved version):
 - a. Chapter 25, 'Gypsum Board And Plaster'.
 - a. Plaster'.
- 4. Underwriters Laboratories, Inc.
 - a. UL 263: 'Test Method for Fire Tests of Building Construction and Materials' (14th Edition).
 - b. UL 723: 'Test for Surface Burning Characteristics of Building Materials; (10th Edition).

1.3 ADMINISTRATIVE REQUIREMENTS

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

1.4 SUBMITTALS

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

1.5 DELIVERY, STORAGE, AND HANDLING

- A. General:
 - 1. Following recommendations of GA-801 Guide for Handling and Storage of Gypsum Panel Products unless local, state or federal laws or agency rules differing from the recommendations shall take precedence.
- B. Delivery And Acceptance Requirements:
 - 1. Deliver materials in original packages, containers, or bundles bearing brand name, applicable standard designation, and Manufacturer's name.
- C. Storage And Handling Requirements:
 - 1. Store material under roof and keep dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack gypsum board flat to prevent sagging.

1.6 FIELD CONDITIONS

- A. Ambient Conditions:
 - 1. Comply with ASTM C840 or GA-216 requirements, whichever are more stringent:
 - a. Do not install interior products until installation areas are enclosed and conditioned.

- 1) Temperature shall be **50 deg F (10 deg C)** and **95 deg F (35 deg C)** maximum day and night during entire joint operation and until execution of Certificate of Substantial Completion.
- 2) Provide ventilation to eliminate excessive moisture.
- 3) Avoid hot air drafts that will cause too rapid drying.
- b. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Manufacturers:

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

B. Materials:

1. Interior Gypsum Board:
 - a. Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.
 - b. Impact Resistant:
 - 1) Complies with Type X requirements of ASTM C1396/C1396M (Section 5).
 - 2) Meet requirements of ASTM D4977 (Modified) for Surface Abrasion and ASTM D5420 (Gardner Impact Test) for Surface Indentation.
 - 3) Overall thickness: **5/8 inch (15.9 mm)**.
 - 4) Minimum **20 gauge (0.912 mm)** steel framing.
 - 5) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a) Hi-Impact XP Gypsum Board by National Gypsum.
 - b) Fiberock VHI (Very High Impact) Abuse-Resistant by USG.
 - c. Non-Fire-Rated Construction:
 - 1) Size:
 - a) Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.
 - 2) Class Two Quality Standard:
 - a) Board installed in areas accessible to public shall have the following:
 - (1) Meet requirements of ASTM C1396/C1396M (Section 5).
 - (2) Surface paper: Face paper suitable for painting.
 - (3) Long edges: Tapered edge.
2. Glass Mat Gypsum Tile Backer:
 - a. Product meeting requirements of ASTM C1178/C1178M.
 - b. **5/8 inch (15.9 mm)**.
 - c. Square edges.
 - d. Category Four Approved Manufacturer. See Section 01 6200 for definitions of Categories:
 - 1) DensShield Tile Backer by Georgia Pacific.
 - 2) GlasRoc Tilebacker by CertainTeed.

2.2 ACCESSORIES

A. Manufacturers:

1. Manufacturer Contact List:

- a. Kinetics Noise Control, Dublin, OH www.kineticsnoise.com.
 - b. Magnum Products, Lenaxa, KS www.levelcoat.com.
 - c. National Gypsum, Charlotte, NC www.nationalgypsum.com.
 - d. Soundproofing Co, San Marcos, CA www.soundproofing.org.
 - e. United States Gypsum Co, Chicago, IL www.usg.com.
 - f. Westpac Materials Inc, Orange, CA www.westpacmaterials.com.
 - g. Wm. Zinsser & Co, Somerset, NJ www.zinsser.com.
 2. Gypsum Board Mounting Accessories:
 - a. Furring Channels:
 - 1) Class Two Quality Standards. See Section 01 6200 for definitions:
 - a) Walls: Galvanized DWFC-25.
 - 2) Accessories as required by Manufacturer's fire tests to provide necessary fire ratings.
 - b. Corner And Edge Trim:
 - 1) Metal, paper-faced metal, paper-faced plastic, or solid vinyl meeting requirements of ASTM C1047. Surfaces to receive bedding cement treated for maximum bonding.
 - c. Control Joint:
 - 1) Bent zinc sheet with V-shaped slot, perforated flanges, covered with plastic tape meeting requirements of ASTM C1047.
 3. Joint Compound:
 - a. Best grade or type recommended by Board Manufacturer and meeting requirements of ASTM C475/C475M.
 - 1) Use Taping Compound for first coat to embed tape and accessories.
 - 2) Use Taping Compound or All-Purpose Compound for subsequent coats except final coat.
 - 3) Use Finishing Compound for final coat and for skim coat.
 4. Joint Reinforcing:
 - a. Paper reinforcing tape acceptable to Gypsum Board Manufacturer.
 5. Fasteners:
 - a. Bugle head screws meeting requirements of ASTM C1002:
 - 1) Gypsum Board:
 - a) Type S: For fastening gypsum board to steel framing and ceiling suspension members, of length to penetrate steel framing **3/8 inch (9.5 mm)** minimum.
 - 2) Glass Mat Gypsum Tile Backer:
 - a) Metal Framing:
 - (1) Light-gauge metal framing: Type S Hi-Lo, bugle or wafer head, self-tapping, rust resistant. Hi-Lo screws.
 - (2) Heavy-gauge metal framing: Type S-12 Hi-Lo, bugle or wafer head, rust resistant.
- B. Primer / Surfer On Surfaces To Receive Texturing:
 1. Type Two Acceptable Products:
 - a. Sheetrock First Coat by USG.
 - b. Prep Coat by Westpac Materials.
 - c. Level Coat by Magnum Products.
 - d. Equal as approved by Architect before bidding. See Section 01 6200.

PART 3 - EXECUTION

3.1 EXAMINATION

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

4. Commencement of Work by installer is considered acceptance of substrate.

3.2 INSTALLATION

- A. Interface With Other Work:
 1. Coordinate with Division 06 for location of backblocking for edges and ends of gypsum board and for blocking required for installation of equipment and building specialties.
 2. Do not install gypsum board until required blocking is in place.
- B. General: Install and finish as recommended in ASTM C840 or GA-216 unless specified otherwise in this Section.
- C. Mounting Accessories:
 1. Furring Channels: Apply with screws through flanges into each framing member.
- D. Interior Gypsum Board:
 1. General:
 - a. Install so trim and reinforcing tape are fully backed by gypsum board. No hollow spaces between pieces of gypsum board over **1/8 inch (3 mm)** wide before taping are acceptable.
 - b. Rout out backside of gypsum board to accommodate items that extend beyond face of framing, but do not penetrate face of gypsum board, such as metal door frame mounting brackets, etc.
 - c. On walls over **108 inches (2 700 mm)** high, apply board perpendicular to support
 - d. Butt edges in moderate contact. Do not force in place. Shim to level.
 - e. Leave facings true with joint, finishing flush. Vertical work shall be plumb and ceiling surfaces level.
 - f. Scribe work closely:
 - 1) Keep joints as far from openings as possible.
 - 2) If joints occur near an opening, apply board so vertical joints are centered over openings.
 - 3) No vertical joints shall occur within **8 inches (200 mm)** of external corners or openings.
 - g. Install board tight against support with joints even and true. Tighten loose screws.
 - h. Caulk perimeter joints in sound insulated rooms with specified acoustical sealant.
 2. Ceilings:
 - a. Apply ceilings first using minimum of two (2) men.
 - b. Use board of length to give minimum number of joints.
 - c. Apply board perpendicular to support.
 3. Fastening:
 - a. Apply from center of board towards ends and edges.
 - b. Apply screws **3/8 inch (9.5 mm)** minimum from ends and edges, **one inch (25 mm)** maximum from edges, and **1/2 inch (13 mm)** maximum from ends.
 - c. Spacing:
 - 1) Ends: Screws not over **7 inches (175 mm)** on center at edges where blocking or framing occurs.
 - 2) Wood Framed Walls And Ceilings: Screws **7 inches (175 mm)** on center in panel field.
 - 3) Metal Framed Walls: Screws **12 inches (300 mm)** on center in panel field.
 - d. Set screw heads **1/32 inch (0.8 mm)** below plane of board, but do not break face paper. If face is accidentally broken, apply additional screw **2 inches (50 mm)** away.
 - e. Screws on adjacent ends or edges shall be opposite each other.
 - f. Drive screws with shank perpendicular to face of board.
 4. Trim:
 - a. Corner Beads:
 - 1) Attach corner beads to outside corners.
 - a) Attach metal corner bead with staples spaced **4 inches (100 mm)** on center maximum and flat taped over edges of corner bead. Also, apply screw through edge of corner bead where wood trim will overlay corner bead.
 - b) Set paper-faced trim in solid bed of taping compound.

- b. Edge Trim: Apply where gypsum board abuts dissimilar material. Hold channel and 'L' trim back from exterior window and door frames **1/8 inch (3 mm)** to allow for caulking.
 - 5. Finishing:
 - a. General:
 - 1) Tape and finish joints and corners throughout building as specified below to correspond with final finish material to be applied to gypsum board. When sanding, do not raise nap of gypsum board face paper or paper-faced trim.
 - 2) First Coat:
 - a) Apply tape over center of joint in complete, uniform bed of specified taping compound and wipe with a joint knife leaving a thin coating of joint compound. If metal corner bead is used, apply reinforcing tape over flange of metal corner bead and trim so half of tape width is on flange and half is on gypsum board.
 - b) Completely fill gouges, dents, and fastener dimples.
 - c) Allow to dry and sand lightly if necessary to eliminate high spots or excessive compound.
 - 3) Second Coat:
 - a) Apply coat of specified joint compound over embedded tape extending **3-1/2 inches (88 mm)** on both sides of joint center. Use finishing compound only if applied coat is intended as final coat.
 - b) Re-coat gouges, dents, and fastener dimples.
 - c) Allow to dry and sand lightly to eliminate high spots or excessive compound.
 - 4) Third Coat: Apply same as second coat except extend application **6 inches (150 mm)** on both sides of joint center. Allow to dry and sand with fine sandpaper or wipe with damp sponge.
 - 5) Fourth Coat: Apply same as second coat except extend application **9 inches (425 mm)** on both sides of joint center. Allow to dry and sand with fine sandpaper or wipe with damp sponge.
 - a. Finishing Levels: Finish panels to levels indicated below and according to ASTM C840, GA-214 and GA-216:
 - 1) Gypsum Board Surfaces to Receive: 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'.
 - 2) Gypsum Board Surfaces to Receive: Smooth Gypsum Board Surfaces:
 - a) GA-214 Level 4: 'All and interior angles shall have tape embedded in joint compound and two separate coats of joint compound applied over all flat joints and one separate coat of joint compound applied over interior angles. Fastener heads and accessories shall be covered with three separate coats of joint compound. All joint compound shall be smooth and free of tool marks and ridges. Coat prepared surface with specified primer'.
- E. Glass Mat Gypsum Tile Backer:
 - 1. Apply glass mat gypsum tile backer to framing. Attach using specified fasteners spaced **6 inches (150 mm)** on center on edges and into all framing members. Drive screws flush with surface of board.
 - 2. Shim board to be plumb and flat or level and flat, depending on location.
 - 3. Apply reinforcing only at joints where abutting different materials.

3.3 FIELD QUALITY CONTROL

- A. Non-Conforming Work:
 - 1. Remove and replace panels that are wet, moisture damaged, and mold damaged.

- a. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
- b. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

3.4 CLEANING

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

END OF SECTION

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

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

1.2 REFERENCES

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

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

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

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

b. Grouts:

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

- 1) Cementitious Grout (CG): Mixture of hydraulic binding agents (e.g. portland cement), aggregates, inorganic and organic additives (e.g. latex polymers, moisture retention additive, etc...).
- 2) Reaction Resin Grout (RG): Single or multi-component mixture of synthetic resin, mineral fillers and organic additives in which curing occurs by chemical reaction – epoxy or urethane based products.
- 3) Class 1 (1): Grout has passed minimum pass level tests that are mandatory for cementitious grouts.
- 4) Class 2 (2): Cementitious grout has passed same tests as Class 1 and/or other applicable tests, but at higher pass levels.
- 5) Fast-Setting (F): Grout with accelerated cure time that must achieve minimum compressive strength requirements under normal conditions within twenty four (24) hours. This designation applies only to cementitious grouts (CG).

- 6) High Abrasion Resistance (A): Capability of grout to resist wear. This designation applies only to cementitious grouts (CG).
- 7) Reduced Water Absorption (W): Grout has lower water absorption rate than standard cementitious grout. This designation applies only to cementitious grouts (CG).
- 6. Latex/Polymer Modified Portland Cement Mortar: Latex/Polymer modified portland cement mortar is a mixture of portland cement, sand, and special latex/polymer additive that is used as a bond coat for setting tile.
- 7. Pavers: Unglazed porcelain or natural clay tile formed by dust-pressed method and similar to ceramic mosaics in composition and physical properties but relatively thicker with 6 inch - or more of facial area. (ASTM C242).
- 8. Sanded Cement Grout: Factory prepared mixture of cement, graded sand, and other ingredients to produce water-resistant, dense, uniformly colored material. Used for joints of 1/8 inch (3 mm) width or greater.
- 9. Static Coefficient of Friction (SCOF): Measures ratio of forces necessary to start two surfaces sliding (older measurement of friction replaced by dynamic coefficient of friction (DCOF)).
- 10. Unsanded Cement Grout: Factory prepared mixture of cement and additives that provide water retentivity. Used for joints of 1/8 inch (3 mm) or less.

C. Reference Standard:

- 1. American National Standards Institute:
 - a. ANSI A108/A118/A136.1, 'American National Standards Specifications for the Installation of Ceramic Tile', Version 2013.1 (compilation of standards):
 - 1) Installation Standards:
 - a) A108.01, 'General Requirements: Subsurfaces and Preparation by Other Trades'.
 - b) A108.02, 'General Requirements: Materials, Environmental, and Workmanship'.
 - c) A108.05, 'Installation of Ceramic Tile with Dry-Set Portland Cement Mortar of Latex-Portland Cement Mortar'.
 - d) A108.6, 'Installation of Tile with Chemical Resistant, Water Cleanable Tile-Setting and Grouting Epoxy'.
 - e) A108.10, 'Installation of Grout in Tilework'.
 - f) A108.17, 'Installation of Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone'.
 - 2) Material Specifications:
 - a) A118.1, 'Dry-Set Portland Cement Mortar'.
 - b) A118.3, 'Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive'.
 - c) A118.4, 'Latex Portland Cement Mortar'.
 - d) A118.6, 'Cement Grouts for Tile Installation'.
 - e) A118.7, 'High-Performance Polymer Modified Latex/Portland Cement Grouts for Tile Installation'.
 - f) A118.10, 'Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone Installations'.
 - g) A118.12, 'Crack Isolation Membranes for Thin-set Ceramic Tile and Dimension Stone Installations'.
 - b. ANSI A137.1, 'National Standard Specifications for Ceramic Tile'.
- 2. ASTM International:
 - a. ASTM A1064/A1064M-17, 'Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete'.
 - b. ASTM C144-11, 'Standard Specification for Aggregate for Masonry Mortar'.
 - c. ASTM C150/C150M-17, 'Standard Specification for Portland Cement'.
 - d. ASTM C206-14, 'Standard Specification for Finishing Hydrated Lime'.
 - e. ASTM C207-06(2011), 'Standard Specification for Hydrated Lime for Masonry Purposes'.
 - f. ASTM C242-15, 'Standard Terminology of Ceramic Whitewares and Related Products'.
 - g. ASTM C373-16, 'Standard Test Method for Water Absorption, Bulk Density, Apparent Porosity, and Apparent Specific Gravity of Fired Whiteware Products'.
 - h. ASTM C482--02(2014), 'Standard Test Method for Bond Strength of Ceramic Tile to Portland Cement Paste'.
 - i. ASTM C501-84(2015), 'Standard Test Method for Relative Resistance to Wear of Unglazed Ceramic Tile by the Taber Abraser'.
 - j. ASTM C648-04(2014), 'Standard Test Method for Breaking Strength of Ceramic Tile'.

- k. ASTM C847-14a, 'Standard Specification for Metal Lath'.
- 3. International Organization for Standardization:
 - a. ISO 13007-1-2013, ' Ceramic tiles - Grouts and adhesives - Part 1: Terms, definitions and specifications for adhesives'.
 - b. ISO 13007-2-2013, ' Ceramic tiles - Grouts and adhesives - Part 2: Test methods for adhesives'.
 - c. ISO 13007-3-2013, ' Ceramic tiles - Grouts and adhesives - Part 3: Terms, definitions and specifications for grouts'.
 - d. ISO 13007-4-2013, ' Ceramic tiles - Grouts and adhesives - Part 4: Test methods for grouts'.
- 4. Tile Council of North America:
 - a. TCNA F111-15, 'On-Ground or Above-Ground Concrete, Unbonded Mortar Bed, Ceramic Tile'.
 - b. TCNA F113-15, 'On-Ground or Above Ground Concrete, Ceramic Tile (Direct Bond w/Optional Membrane)'.
 - c. TCNA F115-15, 'On-Ground Concrete, Ceramic Tile, Epoxy or Furan Grout'.
 - d. TCNA F125a-15 'On Ground or Above Ground Concrete' – Crack Isolation Membrane – Ceramic Tile'.
 - e. TCNA W211-15, 'Masonry or Concrete, Bonded Mortar Bed, Ceramic Tile'.
 - f. TCNA W221-15, 'Solid Backing, Mortar Bed, Ceramic Tile'.
 - g. TCNA W244c-15, 'Wood or Metal Studs, Cement Backer Board, Ceramic Tile'.
 - h. TCNA W245-15, 'Wood or Metal Studs, Coated Glass Mat Water-Resistant Gypsum Backer Board, Ceramic Tile'.

1.3 ADMINISTRATIVE REQUIREMENTS

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

1.4 SUBMITTALS

- A. Action Submittals:
 - 1. Samples:
 - a. 24 inch (600 mm) square sample on specified tile backer showing all types of tile, grout, and colors specified in this Section.
- B. Informational Submittals:
 - 1. Certificates:
 - a. Master grade certificate.
 - 1) Conform to ANSI A137.1.
 - 2. Manufacturer's Instructions:
 - a. Provide instructions for installation of tile-setting materials.
 - 3. Source Quality Control Submittals:
 - a. Provide Manufacturer documentation indicating proposed materials will satisfy requirements for Manufacturer's Warranty.
 - 4. Qualification Statement. See Section 01 4301 for qualifications:
 - a. Installer:
 - 1) Provide Qualification documentation if requested by Architect or Owner.
- C. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:

- a. Operations and Maintenance Data:
 - 1) Cleaning and maintenance instructions.
- b. Warranty Documentation:
 - 1) Include copy of final, executed warranty.
- c. Record Documentation:
 - 1) Manufacturers Documentation:
 - a) Source Quality Control Submittal documentation showing materials will satisfy requirements for Manufacturer's Warranty.
 - b) Manufacturer's cut sheets of materials used in installed system.
 - c) Tile color and pattern selections.
- D. Maintenance Material Submittals:
 - 1. Extra Stock Materials:
 - a. Ten (10) paver tile and two (2) pieces of paver tile base.
 - b. Twenty-five (25) wall tile and five (5) pieces of cove base.

1.5 QUALITY ASSURANCE

- A. Source Of Materials:
 - 1. Provide materials obtained from one (1) source for each type and color of tile, grout, and setting materials for Manufacturer's system warranty.
- B. Qualifications:
 - 1. Installer: Requirements of Section 01 4301 applies, but not limited to following:
 - a. Minimum three (3) years' experience installing specified tile installations.
 - b. Minimum five (5) satisfactorily completed installations of comparable quality, scope, similar size, and complexity in past two (2) years before bidding.
 - c. Upon request, submit documentation.

1.6 DELIVERY, STORAGE, AND HANDLING

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

1.7 FIELD CONDITIONS

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

1.8 WARRANTY

- A. Manufacturer Warranty:

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

PART 2 - PRODUCTS

2.1 SYSTEMS

A. Manufacturers:

1. Manufacturer's Contact List:

- a. Ardex Engineered Cements, Aliquippa, PA www.ArdexAmericas.com.
 - 1) Contact Information: Don Richards (206) 979-0401
www.Don.richards@ArdexAmericas.com.
- b. Custom Building Products, Seal Beach, CA www.custombuildingproducts.com.
 - 1) Contact Information: John Gallup (206) 718.6024 johng@cbpmail.net.
- c. Dal-Tile Corp., Div. of Mohawk Industries, Dallas, TX www.daltile.com.
- d. Interceramic Inc., Garland, TX www.interceramic.com.
- e. Laticrete International Inc., Bethany, CT www.laticrete.com.
- f. Mapei Americas Headquarters, Deerfield Beach, FL www.mapei.com.
 - 1) Contact Information: Bart A. Wilde (801) 467-2060 www.bwilde@mapei.com.
- g. Merkrete, by Parex USA, Inc., Anaheim, CA www.merkrete.com.
 - 1) Contact Information: Andy Townes (505) 873-1181 andy.townes@parexusa.com.
- h. Schuler Systems L.P., Plattsburgh, NY www.schluter.com.

B. Category Two National Contract Suppliers. See Section 01 6200 for definitions of Categories:

1. Contact following suppliers to procure components of tile assembly:

- a. Daltile And Stone, Salt Lake City, UT:
 - 1) LDS Project Coordinators:
 - a) Russ Green and Larry McCleary, (801) 487-9901, cell (801) 301 1461, fax (801) 487-0345 larry.mccleary@daltile.com - www.daltileproducts.com or www.daltilegreenworks.com.
- b. Interceramic:
 - 1) LDS Project Coordinators:
 - a) First Contact: Diego Chavez, phone (214) 503-5433, fax (877) 551-1979 dichavez@interceramic.com.
 - b) Second Contact: Jose Valdez, phone (214) 503-5507, fax (877) 551-1979 jvaldez@interceramic.com.

C. Design Criteria:

1. General:

- a. Paver Tile: Standard grade porcelain tile, solid color throughout, graded in accordance with ANSI A137.1:
- b. Ceramic Tile:
 - 1) Tile shall be standard quality, white or off-white body, square or cushion edge, graded in accordance with ANSI A137.1.
 - 2) Square edge, white body, lug type wall tile. Field wall tile shall have two lugs on each edge to assure uniform joint, approximately 0.040 inch (one mm).
 - 3) External and internal corner pieces shall be standard grade.

2. Capabilities:

- a. Paver Tile:
 - 1) Water Absorption when tested in accordance with ASTM C373: 0.1 to 0.5 percent.
 - 2) Abrasive Wear Resistance when tested in accordance with ASTM C501: 275 minimum.
 - 3) Breaking Strength when tested in accordance with ASTM C648: 300 lbs minimum.
 - 4) Bond Strength when tested in accordance with ASTM C482: 200 psi minimum.

- 5) Coefficient of Friction: 0.42 minimum as measured by DCOF (Dynamic Coefficient of Friction) AcuTest method and requirements as per ANSI A137.1.

D. Description:

1. Paver Tile:
 - a. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Daltile.
 - b. Tile Sizes:
 - 1) Tile: 12 inches by 24 inches square.
 - c. Category Four Approved Color/Sheen:
 - 1) Daltile: Rhetoric Aristotle White RT05
2. Ceramic Tile:
 - a. Wall Tile:
 - 1) Walls: 3 inches by 6 inches
 - 2) Approved Colors:
 - a) Primary Accent Band Walls - Color No 1:
 - (1) Daltile Classic: Suede Gray 0182
 - b) Secondary Accent Color - Color 2:
 - (1) Daltile Classic: Galaxy 1469

E. Materials:

1. Paver Tile:
 - a. Category Four Approved Products. See Section 01 6200 for definition of Categories:
 - 1) Rhetoric by Daltile.
2. Wall Tile (Accent):
 - a. Category Four Approved Products. See Section 01 6200 for definition of Categories:
 - 1) Classic Color Wheel by Dal-Tile.
3. Mortar Bed:
 - a. Portland Cement: Meet requirements of ASTM C150/C150M, Type 1, designation shall appear on bag.
 - b. Hydrated Lime:
 - 1) Meet Requirements of one of following:
 - a) ASTM C206.
 - b) ASTM C207, Type S (designation shall appear on bag).
 - c. Sand: Clean, washed, well-graded, meeting requirements of ASTM C144 with gradation of 100 percent passing No. 8 sieve with not over five (5) percent passing No. 100 sieve.
 - d. Latex Additive; in lieu of all water:
 - 1) Design Criteria:
 - a) Meet material specification requirements of ANSI A118.4 or ANSI 118.11.
 - b) Meet ANSI installation specification requirements of ANSI A108.5.
 - c) Expansion joints complies with TCA method EJ171.
 - 2) Type Two Acceptable Products:
 - a) ARDEX: Ardex E 90 Mortar Admix.
 - b) CUSTOM: Thin-Set Mortar Admix.
 - c) LATICRETE: 4237 Latex Additive with 211 Powder.
 - d) MAPEI: Planicrete AC.
 - e) MERKRETE: 150 Latex Admixture.
4. Metal Trim:
 - a. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Tile / Carpet Junction: Schluter-RENO-AETK.
 - 2) Wall Tile Inside Corner Trim: Schluter-DILEX-EHK.
 - 3) Trim at Bottom Course of Wall Tile to Resinous Base: Schluter-SCHIENE.
5. Joint Sealants:
 - a. Interior Ceramic Tile Joints are furnished in Section 07 9213 and installed in Section 09 3013 'Ceramic Tiling' including the following:
 - 1) Ceramic and paver cove base inside corners.
 - 2) Ceramic and paver tile joints.
 - b. Standard color to closely match grout joints as selected by Architect:
6. Backer Board Joint Reinforcing: 2 inch (50 mm) wide glass fiber mesh tape.
7. Tile Setting Products:

- a. Use only products of same Manufacturer to validate warranty, unless otherwise acceptable to Ceramic Tile Supplier.
- b. Use only products that meet Mortar Manufacturer's twenty five (25) year system warranty requirements.
- c. Latex-Portland Cement Mortar For Floors:
 - 1) Design Criteria:
 - a) Meet ANSI material specification requirements of ANSI 118.4, ANSI 118.11, or ANSI A118.15.
 - b) Meet ANSI installation specification requirements of ANSI A108.4 or ISO material specification ISO13007 installation material specification and . C2ES1P2 performance requirements for adhesive.
 - 2) Category Four Approved Products. See Section 01 62 00 for definitions of Categories:
 - a) ARDEX: Ardex X77.
 - b) CUSTOM: Megalite Crack Prevention Mortar or FlexBond Premium Crack Prevention Thin-set Mortar (no additives needed).
 - c) LATICRETE: 254 Platinum Thinset.
 - d) MAPEI: Ultraflex 3.
 - e) MERKRETE: 735 Premium Flex.
- d. Latex/Polymer Modified Portland Cement Mortar For Walls:
 - 1) Design Criteria:
 - a) Meet ANSI material specification requirements of ANSI 118.4, ANSI 118.11, or ANSI A118.15.
 - b) Meet ANSI installation specification requirements of ANSI A108.4 or ISO material specification ISO13007 installation material specification and C2ES1P2 performance requirements for adhesive.
 - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) ARDEX: Ardex X77.
 - b) CUSTOM: Megalite Thin-Set Mortar or FlexBond Fortified Thin-Set Mortar.
 - c) LATICRETE: 254 Platinum Thinset.
 - d) MAPEI: Ultraflex 3.
 - e) MERKRETE: 735 Premium Flex.
- e. Wall Grout (Modified Polymer):
 - 1) Design Criteria:
 - a) Meet ANSI material specification requirements of ANSI A118.6 or ANSI A118.7.
 - b) Meet ANSI installation specification requirements of ANSI 108.10 or ISO material specification ISO13007 C2ES1P2.
 - 2) Color:
 - a) MAPEI: No. 115 Platinum
 - 3) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) MAPEI: Keracolor-U Unsanded Polymer-Modified Grout.

F. Mixes:

1. Mortar Beds:

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

* Optional

PART 3 - EXECUTION:

3.1 INSTALLERS

A. Acceptable Installers. See Section 01 4301:

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

3.2 EXAMINATION

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

3.3 PREPARATION

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

3.4 INSTALLATION

- A. Interface With Other Work:
 - 1. Grounds, anchors, plugs, hangers, door frames, electrical, mechanical, and other work in or behind tile shall be installed before tile work is started.
- B. Special Techniques:
 - 1. Install in accordance with following latest TCNA installation methods:
 - a. Framed Walls: TCNA W245 with waterproof membrane.
- C. Tolerances:
 - 1. Plane of Vertical Surfaces:
 - a. **1/8 inch in 8 feet (3 mm in 2.450 meters)** from required plane shall be plumb and true with square corners.
- D. General:
 - 1. Install tile in pattern indicated:
 - a. Align joints when adjoining tiles on floor, base, walls, and trim are same size.
 - b. Adjust to minimize tile cutting and to avoid tile less than half size.
 - c. Center and balance areas of tile if possible.
 - 2. Extend tile into recesses and under equipment and fixtures to form a complete covering without interruption:
 - 3. Maintain heights of tilework in full courses to nearest obtainable dimension where heights are given in **feet and inches (meters and millimeters)** and are not required to fill vertical spaces exactly.
 - 4. Install cut tile with cuts on outer edges of field:
 - a. Provide straight cuts that align with adjacent materials.
 - b. When possible, smooth cut edges of tile or use appropriate cutter or wet saw to produce smooth cuts.
 - c. Do not install tile with jagged or flaked edges.
 - 5. Terminate tile neatly at obstructions, edges, and corners, without disruption of pattern or joint alignment:
 - a. Fit tile closely where edges are to be covered by trim, escutcheons, or similar devices.
 - 6. Provide straight tile joints of uniform width, subject to variance in tolerance allowed in tile size:
 - a. Make joints smooth and even, without voids, cracks, or excess mortar or grout.
 - 7. Use a beating block and hammer or rubber mallet so faces and edges of individual tiles are flush and level with faces and edges of adjacent tiles, and to reduce lippage.

8. Accessories in tilework shall be evenly spaced, properly centered with tile joints, and level, plumb, and true to correct projection.
9. Leave finished installation clean and free of cracked, chipped, broken, unbonded, and otherwise defective tile work.

E. Application Of Mortar:

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

F. Application Of Grout:

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

G. Curing:

1. Keep installation at **65 to 85 deg F (18 to 30 deg C)** during first eight (8) hours of cure. Shade area completely from sun during this period.

H. Application of Joint Sealants:

1. Apply joint sealants after grout has cured:
 - a. This requires forty-eight (48) hours minimum.
2. Before applying sealant:
 - a. Remove spacers or ropes before applying joint sealants.
 - b. Apply backer rod and joint sealants at expansion joints.

3.5 FIELD QUALITY CONTROL

A. Non-Conforming Work:

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

3.6 CLEANING

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

3.7 PROTECTION

- A. Close to traffic areas where tile is being set and other tile work being done:
1. Keep closed until tile is firmly set.
 2. Before, during, and after grouting, keep area clean, dry, and free from foreign materials and airflow that will interfere with setting and curing of grout.
- B. After cleaning, provide protective covering and maintain conditions protecting tile work from damage and deterioration:
1. Where tiled surfaces will be subject to equipment or wheel traffic or heavy construction traffic, cover protective covering with **1/4 inch (6 mm)** hardboard, plywood, or similar material.

END OF SECTION

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

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

1.2 REFERENCES

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

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

C. Reference Standards:

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

1.3 SUBMITTALS

A. Action Submittals:

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

B. Informational Submittals:

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

C. Closeout Submittals:

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

- a. Warranty Documentation:
 - 1) Final, executed copy of Warranty.
 - b. Record Documentation:
 - 1) Manufacturers Documentation:
 - a) Manufacturer's literature.
 - b) Color and pattern selection.
- D. Maintenance Material Submittals:
- 1. Extra Stock Materials:
 - a. Provide Owner with two (2) cartons of each pattern and color used on Project for future use.
 - 1) Packaged with protective covering for storage and identified with appropriate labels.

1.4 QUALITY ASSURANCE

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

1.5 DELIVERY, STORAGE, AND HANDLING

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

1.6 FIELD CONDITIONS

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

1.7 WARRANTY

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

2.2 MATERIALS

- A. Acoustic Ceiling Panels:
 - 1. Description:
 - a. Color: White (surface factory-applied).
 - b. Composition: Water-felted mineral panels or cast 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; 0.84 minimum.
 - f. Sag Resistance: Resistance to sagging in high humidity conditions.
 - g. VOC: Low.
 - 3. Wide Face Design:
 - a. Design Criteria:
 - 1) Grid Face: 15/16 inch (24 mm).
 - 2) Size: 24 inch x 24 inch x 7/8" (610 mm x 610 mm x 22 mm).
 - b. Type One Acceptable Products. See Section 01 6200:
 - 1) Field verify to match existing ceiling tile material and finish.
 - 2) Fine Fissured item 1713 by Armstrong:
 - a) Grid System: Prelude XL Exposed Tee.
 - b) Edge Profile: Square Lay-in.
 - 3) Radar ClimaPlus Open Plan item 22320 by USG:
 - a) Grid System: DX/DXL Exposed Tee.
 - b) Edge Profile: Square.
 - 4) Equal as approved by Architect before bidding. See Section 01 6200.

PART 3 - EXECUTION**3.1 EXAMINATION**

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

3.2 PREPARATION

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

3.3 INSTALLATION

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

3.4 FIELD QUALITY CONTROL

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

3.5 CLEANING

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

END OF SECTION

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

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

1.2 REFERENCES

- A. Association Publications:
 - 1. The Ceilings & Interior Systems Construction Association (CISCA), 405 Illinois Avenue, 2B, St Charles IL. www.cisca.org.
 - a. '*Ceiling Systems Handbook*': Recommendations for direct hung acoustical tile and lay-in panel ceiling installation.
 - b. CISCA 0-2, '*Guidelines for Seismic Restraint for Direct-hung Suspended Ceiling Assemblies (zones 0-2)*' Covers Seismic Design Category C.
 - c. CISCA 3-4, '*Guidelines for Seismic Restraint for Direct-hung Suspended Ceiling Assemblies (zones 3-4)*' Covers Seismic Design Category D, E, and F.
 - d. '*Production Guide*': Practical reference for ceiling systems and estimating costs.
- B. Definitions:
 - 1. Ceiling Suspension System: System of metal members, designed to support a suspended ceiling, typically acoustical ceiling. Also may be designed to accommodate lighting fixtures or air diffusers.
 - 2. Clips: Several clip designs are available to suit applications such as fire resistance, wind uplift and impact. Fire-resistance rated designs have exact requirements, including mandatory use of hold down clips for acoustical panels or tiles weighing less than **1 lb per sq ft (4.9 kg per sq m)**. For rooms with significant air pressure differential from adjacent spaces, retention clips may be necessary to retain panels in place. Maintaining air pressure values may also require perimeter panel seals, typically closed cell foam gasket with adhesive on one side.
 - 3. Compression Post (Vertical Strut, Seismic Struts): Rigid member used to provide lateral force bracing of suspension system.
 - 4. Cross Runner, Cross Tee: Cross runner is secondary or cross beams of mechanical ceiling suspension system, usually supporting only acoustical tile. Cross tee is inserted into main runner to form different module sizes. In some suspension systems, however, cross runners also provide support for lighting fixtures, air diffusers and other cross runners.
 - 5. Exposed Grid System: Structural suspension system for lay-in ceiling panels. Factory-painted supporting members are exposed to view. Exposed tee surfaces may be continuous or have integral reveal. Reveals are typically formed as channel or rail profiles extending down from tee leg.
 - 6. Flange: Horizontal surface on face of tee, visible from below ceiling. Part of grid to which color cap is applied. Most grid system flanges are either **15/16 inch (24 mm)** or **9/16 inch (14 mm)**.

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

C. Reference Standards:

1. American Society of Civil Engineers/Structural Engineering Institute:
 - a. ASCE/SEI 7-10, 'Minimum Design Loads for Buildings and Other Structures' (Section 9, 'Earthquake Loads').
2. ASTM International:
 - a. ASTM A568/A568M-15, 'Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for'.
 - b. ASTM C635/C635M-13a, 'Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings'.
 - c. ASTM C636/C636M-13, 'Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels'.
 - d. ASTM A641/A641M-09a(2014), 'Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire'.
 - e. ASTM A653/A653M-15, 'Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process'.
 - f. ASTM A1008/A1008M-15, 'Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable'.
 - g. ASTM B117-11, 'Standard Practice for Operating Salt Spray (Fog) Apparatus'.
 - h. ASTM C635/C635M-13a, 'Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings'.
 - i. ASTM C636/C636M-13, 'Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels'.
 - j. ASTM D610-08(2012), 'Standard Practice for Evaluating Degree of Rusting on Painted Steel Surfaces'.
 - k. ASTM E580/E580M-14, 'Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions'.
3. International Building Code (IBC) (2009, 2012, or 2015 edition):
 - a. IBC 808.1.1.1, 'Suspended Acoustical Ceilings'.
4. International Code Council (ICC):
 - a. ICC/ESR-1222 (Reissued December 2013), 'USG Interiors, Inc'.
 - b. ICC/ESR-1308 (Reissued December 2014), 'Armstrong World Industries'.
5. Underwriters Laboratories / American National Standards Institute:
 - a. UL 263: 'Standard for Fire Test of Building Construction and Materials' (14th Edition).
 - b. UL 723, 'Standard for Safety Test for Surface Burning Characteristics of Building Materials' (10th Edition).

1.3 ADMINISTRATIVE REQUIREMENTS

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

1.4 SUBMITTALS

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

1.5 QUALITY ASSURANCE

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

1.6 DELIVERY, STORAGE, AND HANDLING

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

B. Storage And Handling Requirements:

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

1.7 WARRANTY**A. Manufacturer Warranty:**

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

PART 2 - PRODUCTS**2.1 SYSTEM****A. Manufacturers:****1. Type One Acceptable Manufacturers:**

- a. Grid Face: **15/16 inch**:
 - 1) Armstrong World Industries Co, Lancaster, PA www.armstrong.com.
 - 2) USG Interiors Inc, Chicago, IL www.usg.com.
 - 3) Equal as approved by Architect before bidding. See Section 01 6200.

B. Materials:**1. Grid:**

- a. Systems shall meet requirements of ASTM C635/C635M, Heavy Duty suspension system required for Seismic Design Categories D, E, or F.
- b. Exposed surfaces shall be finished with factory-applied white baked enamel.
- c. Meet requirements of ASTM D610 for red rust.
- d. Main runners and cross tees:
 - 1) All main beams and cross tees shall be commercial quality hot-dipped galvanized (galvanized steel, aluminum, or stainless steel) as per ASTM A653/A653M. Main beams and cross tees are double-web steel construction with type exposed flange design.
 - 2) Wide-face design - main runners and cross tees shall have **one inch (25 mm)** exposed face.

2. Performance Standards:

- a. DXL Systems by USG Interiors required for Seismic Design Categories D, E, or F.

3. Wire Hangers, Braces, and Ties:

- a. Zinc-Coated, carbon-steel wire meeting requirements of ASTM A641/A641M, Class 1 zinc coating, soft temper.
- b. Size:
 - 1) Standard size: **12 gauge (0.105 inch) (2.70 mm)** galvanized, soft annealed steel wire.
 - 2) Select wire diameter so its stress is less than yield when loaded at three (3) times hanger design load (ASTM C635/C635M), Table 1, 'Direct Hung') will be less than yield stress of wire, but provide not less than **12 gauge (0.105 inch) (2.70 mm)**.
- c. Protect with rust inhibitive paint.

4. Wall Molding: Channel section of cold-rolled electro-galvanized steel.**5. Edge Moldings and Trim: Metal or extruded aluminum of types and profiles indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations, including light fixtures, that fit type of edge detail and suspension system indicated. Provide moldings with exposed flange of same width as exposed runner.****6. Hold-down Clips: As required by UL to prevent lifting of panels under unusual draft conditions.****7. Seismic Joint Clip:**

- a. Required for Seismic Design Categories D, E, or F.
- b. Quality Standard Product:
 - 1) SJCG by Armstrong World Industries, Lancaster, PA www.armstrong.com.

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

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

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

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

3.3 FIELD QUALITY CONTROL

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

END OF SECTION

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

- A. Products Furnished But not Installed Under this Section:
 - 1. Resilient base as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 01 1200: 'Multiple Contract Summary': for resilient base and accessories excluded from Contract and furnished and Installed by Owner. This Section establishes quality of materials and installation for information of Contractor, Architect, and Owner's Representatives.
 - 2. Section 09 6519: 'Resilient Tile Flooring' for installation of resilient base and accessories.

1.2 REFERENCES

- A. Definitions:
 - 1. Flame Spread: Propagation of flame over a surface.
 - 2. Flame Spread Index: The numerical value assigned to a material tested in accordance with ASTM E84 or UL 723.
 - 3. Resilient Wall Base Classification:
 - a. Type:
 - 1) TS: Rubber, vulcanized thermoset.
 - 2) TP: Rubber, thermoplastic.
 - 3) TV: Vinyl, thermoplastic.
 - b. Group:
 - 1) Group 1: Solid (homogeneous).
 - 2) Group 2: Layered (multiple layers).
 - c. Styles:
 - 1) Style A: Straight.
 - 2) Style B: Cove.
 - 3) Style C: Butt-to.
 - 4. Smoke-Developed Index: The numerical value assigned to a material tested in accordance with ASTM E84 or UL 723.
- B. Reference Standards:
 - 1. ASTM International:
 - a. ASTM E84-18b, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
 - b. ASTM F1861-16, 'Standard Specification for Resilient Wall Base'.
 - 2. Underwriters Laboratories, Inc.:
 - a. UL 723: 'Standard for Safety Test for Surface Burning Characteristics of Building Materials'; (2010 - Tenth Edition).

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate completion of resilient base and accessories installation with other trades.
- B. Pre-Installation Conference:
 - 1. Participate in pre-installation conference as specified in Section 09 0503 and held jointly with Section 09 6813 and Section 09 6816 pre-installation conference.

1.4 SUBMITTALS

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

1.5 QUALITY ASSURANCE

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

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
 - 1. Materials shall be delivered in original, unopened packages with labels intact.
- B. Storage And Handling Requirements:
 - 1. Store materials in dry space protected from weather at not less than 55 deg F (12.8 deg C) or more than 85 deg F (29.4 deg C) or as per Manufacturer's recommendation.
 - 2. Materials from containers which have been distorted, damaged or opened prior to installation will be rejected.

1.7 FIELD CONDITIONS

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

PART 2 - PRODUCTS

2.1 OWNER-FURNISHED PRODUCTS

- A. Manufacturers:
 - 1. Category One Approved Manufacturers:
 - a. Roppe Corporation, Fostoria, Fostoria, OH www.roppe.com.
- B. Materials:
 - 1. Wall Base:
 - a. General:
 - 1) Size:
 - a) Minimum body thickness: 1/8 inch by 4 inch (3 mm by 100 mm).
 - b) Length: not less than normal.
 - 2) Corners:
 - a) Use preformed, molded external corners for both inside and outside corners.
 - b) Butt joint interior corners.
 - c) Corners must meet same height and thickness requirements as wall base.
 - b. Design Criteria:
 - 1) Meet requirements of ASTM F1861, Type TP or TS, Group 1 (solid), Style B (cove).
 - 2) Free from objectionable odors, blisters, cracks, and other defects affecting appearance or serviceability of rubber, and not containing fabric.

- 3) Style: Coved.
- c. Approved Colors:
 - 1) General:
 - a) Color pigments used shall be highly fade-resistant, insoluble in water, and resistant to light, alkali, and cleaning agents.
 - 2) Wall Base (all areas unless otherwise noted):
 - a) Dark Gray by Roppe.
- d. Category One Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Rubber Wall Base by Roppe.
- 2. Adhesive:
 - a. Use products recommended by Manufacturer for conditions of use.

PART 3 - EXECUTION

3.1 APPROVED INSTALLER

- A. Category One VMR Approved Installer. See Section 01 6200 for definitions of Categories:
 - 1. Flooring Services Inc., Sandy, UT www.flooringservices.com.
 - a. Contact Marie Davis, LDS Account Manager, office (801) 487-3600, cell (801) 631-9152 email marie@flooringservices.com.
 - 2. Same Installer for Section 09 6519 shall install Section 09 6513.

3.2 EXAMINATION

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

3.3 PREPARATION

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

3.4 INSTALLATION

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

3.5 FIELD QUALITY CONTROL

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

3.6 CLEANING

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

3.7 PROTECTION

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

END OF SECTION

SECTION 09 6519**RESILIENT TILE FLOORING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But Is Not Limited To:
 - 1. Coordination, sequencing, and scheduling of Owner-Furnished resilient tile flooring installation as described in contract documents.
 - a. Coordinate with Section 09 0503 for Testing Agency testing of Alkalinity and Concrete Moisture of concrete slab before Pre-Installation Conference.
 - b. Schedule Pre-Installation Conference.
 - c. Maintain Building Ambient Conditions including normal levels of humidity, lighting, heating, and air conditioning for acceptability for beginning floor preparation and carpet installation.
- B. Related Requirements:
 - 1. Section 01 1200: 'Multiple Contract Summary' for:
 - a. Resilient tile flooring is excluded from Contract and provided by Owner. This specification establishes quality of materials and installation for information of Contractor, Architect, and Owner's Representatives.
 - b. Alkalinity and Concrete Moisture of concrete slab.
 - 2. Section 01 3100: 'Project Management and Coordination' for pre-installation conference.
 - 3. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
 - 4. Section 03 3111: 'Cast-In-Place Structural Concrete' for provision of acceptable concrete substrate.
 - 5. Section 07 2616: 'Below Grade Vapor Retarders' for installation of below grade vapor retarder.
 - 6. Section 09 0503: 'Floor Substrate Preparation'.
- C. Products Installed But not Furnished Under this Section:
 - 1. Owner furnished Resilient Base and accessories as described in Contract Documents.
- D. Related Requirements:
 - 1. Section: 09 6513: 'Resilient Base And Accessories' for furnishing of Resilient Base.

1.2 REFERENCES

- A. Association Publications:
 - 1. American Concrete Institute, Farmington Hills, MI www.concrete.org. Abstracts of ACI Periodicals and Publications.
 - a. ACI 302.2R-06, *Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials* (August 15, 2006).
- B. Reference Standards:
 - 1. ASTM International:
 - a. ASTM F710-17, 'Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.'
 - b. ASTM F2170-18, 'Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.'

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:

1. Coordinate completion of flooring installation with other trades.
- B. Pre-Installation Conference:
 1. Participate in MANDATORY pre-installation conference specified in Section 09 0503 and may be held jointly with other flooring systems included in project.
 2. Schedule conference after substrate preparation and ONE (1) week minimum before installation of flooring system.
 3. In addition to agenda items specified in Section 01 3100, review following:
 - a. Review Testing Agency testing report of Alkalinity and Concrete Moisture of concrete slab.
 - 1) Follow Testing Agency report regarding Alkalinity and Concrete Moisture of concrete slab as specified in Section 09 0503 'Floor Substrate Preparation'.
 4. Review schedule for installation of resilient tile flooring and coordination with other trades.
 5. Review Flooring Manufacturer's installation conditions verification procedure and requirements.
 6. Review Building Ambient Conditions including normal levels of humidity, lighting, heating, and air conditioning for acceptability for beginning floor preparation and flooring installation.
 7. Review high moisture remediation options when high moisture exists based on moisture testing specified in Section 09 0503 'Flooring Substrate Preparation'.
- C. Sequencing:
 1. Testing Agency to provide testing for Alkalinity and Concrete Moisture as specified in Section 09 0503 'Floor Substrate Preparation' before Pre-Installation Conference.
 2. Manufacturer's high moisture remediation of concrete slab before installation of Resilient Tile Flooring.
 3. Installation of Resilient Tile and Resilient Base.
- D. Scheduling:
 1. Testing Agency to provide testing for Alkalinity and Concrete Moisture of concrete slab as specified in Section 09 0503 'Floor Substrate Preparation'.
 2. Notify Flooring Installer when Building Ambient Conditions requirements are met before installation of flooring system.

1.4 SUBMITTALS

- A. Action Submittals:
 1. Product Data:
 - a. Manufacturer's literature or cut sheet on each component of system.
 - b. Maintenance instructions.
 - c. Color and style selection.
- B. Closeout Submittals:
 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Record Documentation:
 - 1) Manufacturers documentation:
 - a) Manufacturer's literature.
 - b) Color and style selection.
 - 2) Testing and Inspection Reports:
 - a) Testing Agency Testing Reports of Alkalinity and Concrete Moisture testing.
- C. Maintenance Material Submittals:
 1. Extra Stock Materials:
 - a. Leave box of twenty (20) extra tile of each pattern and color used on Project with Owner.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
 1. Deliver materials in undamaged and unopened packaging or containers with Manufacturer's labels intact.

B. Storage And Handling Requirements:**1. Resilient Tile Flooring and Adhesive:****a. Product Acclimation:**

- 1) Materials should be present at jobsite for at least forty-eight (48) hours with ambient temperature between 65 deg F (18.3 deg C) to 85 deg F (29.4 deg C) for at least seventy-two (72) hour prior to installation or recommendations requirements of Manufacturer.

1.6 FIELD CONDITIONS**A. Ambient Conditions:****1. Building Conditions:**

- a. Conditions inside building shall be brought to levels to be normal at occupancy of building.
- b. Conditions include normal levels of humidity, lighting, heating, and air conditioning.

2. Concrete Slab:**a. General:**

- 1) Final determination as to whether or not, concrete slab is dry enough for flooring installation should be based on evaluating both Alkalinity and Concrete Moisture Vapor Emission Rate (MVER) testing as specified in Section 09 0503 'Floor Substrate Preparation'.

b. Alkalinity:

- 1) Do not install flooring if alkalinity of concrete surface exceeds pH level 9. Corrective procedures are required.

c. Concrete Moisture Vapor Emission Rate (MVER):

- 1) Testing conditions inside building shall be brought to same ambient temperature and relative humidity levels to be normal at occupancy of building. Conditions include normal levels of humidity, lighting, heating, and air conditioning.
- 2) Follow requirements specified in Section 09 0503 'Floor Substrate Preparation' before installation of resilient tile flooring.

3. Application:

- a. Maintain 65 deg F (18.3 deg C) 85 deg F (29.4 deg C) during installation of flooring or recommendation requirements of Manufacturer.

PART 2 - PRODUCTS**2.1 OWNER-FURNISHED PRODUCTS****A. Manufacturer:**

1. Category One Approved Manufactures. See Section 01 6200 for definitions of Categories.
 - a. Tandus Centiva., Dalton, GA www.tandus-centiva.com.

B. Materials:**1. Luxury Vinyl Tile (LVT):****a. Design Criteria:**

- 1) Classification: ASTM F1700 Class III Type B.
- 2) Total Thickness: 0.120 inch (3.0 mm).
- 3) Edge Treatment: Square (SE).
- 4) Meet Indoor Air Quality standards.
- 5) Size: 18 inch x 18 inch (45.72 cm x (45.72 cm).
- 6) Twenty-year Limited Commercial Wear Warranty.

b. Category One Approved Products. See Section 01 6200 for definitions of Categories:**1) Contour Series:**

- a) Classic Stone #ECL: Color Style: Ash Limestone #7107.
- b) Montage #CMT: Color Style: Red Oxide #7424.

2. Adhesives:

- a. Testing Results as testing for Alkalinity and Concrete Slab Moisture in Section 09 0503 is ninety (90) percent RH or less:
 - 1) Manufacture approved adhesive
- b. Testing Results as testing for Alkalinity and Concrete Slab Moisture in Section 09 0503 is ninety (90) percent RH or more:
 - 1) RollSmart Adhesive must be used.
3. Floor Finish:
 - a. Category One Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Carefree Matte Low Gloss Floor Finish by Sealed Air Diversey Care, Sturtevant, WI www.sealedair.com/diversey-care/diversey-care-products/carefree-matte-floor-finish.
 - 2) XL Matte Floor Finish by XL North, Fall River, MA www.xlnorth.com.

PART 3 - EXECUTION

3.1 APPROVED INSTALLER

- A. Category One Approved Installer. See Section 01 6200 for definitions of Categories:
 1. Flooring Services Inc., Sandy, UT www.flooringservices.com.
 - a. First Contact: Jason Rowley, LDS Account Manager, office (801) 487-3600 x 108, cell (801) 631-8382 email jason@flooringservices.com.
 - b. Second Contact: Marie Davis, LDS Account Manager, office (801) 487-3600, cell (801) 631-9152 email marie@flooringservices.com.

3.2 EXAMINATION

- A. Verification of Conditions:
 1. Resilient Tile Flooring:
 - a. Verify concrete surfaces are sufficiently cured and moisture content is within acceptable levels before beginning installation.
 - b. Verify ventilation requirements as specified in Field Conditions in Part 1 of this specification have been maintained before proceeding with applying flooring.
 2. Resilient Base And Accessories:
 - a. Inspect surfaces for conditions not suitable for installation. Surface to receive specified items shall be sound, clean, free from foreign matter, tightly nailed, and dry.
 - b. Notify Architect of unsuitable conditions in writing:
 - 1) Do not start work until defects are corrected.
 - c. Commencement of Work by installer is considered acceptance of substrate.

3.3 PREPARATION

- A. Surface Preparation:
 1. Resilient Tile Flooring:
 - a. Floor substrate prepared as specified in Section 09 0503.
 - b. Moisture vapor emission tests and alkalinity test of concrete slab has been performed.
 - c. Remedy cracks and minor irregularities in substrate in accordance with Manufacturer's recommendations.

3.4 INSTALLATION

- A. Resilient Tile Flooring:
 1. Lay tile symmetrically about center line of spaces to insure even borders, unless shown differently on Contract Drawings.
 2. Installation Method:
 - a. Lay tile quarter-turned.

- b. Shuffling:
 - 1) Shuffling tiles from same carton.
 - 2) Shuffling tiles from multiple cartons.
 - 3. Adhesive:
 - a. High moisture vapor emission testing results:
 - 1) RollSmart Adhesive is required. Apply Adhesive as per Manufacturer's written instructions.
 - 4. Floor Finish:
 - a. Follow Manufacturers written instructions for floor preparation and application.
- B. Resilient Base And Accessories:
- 1. Install in manner to produce smooth, even finished surfaces tightly jointed and accurately aligned.
 - 2. Fit specified items tightly. Use fillers where necessary. Fit neatly against projections, piping, electrical service outlets, etc.
 - 3. Secure specified items with specified adhesive. Cement substantially to vertical surfaces including rubber base to cabinet work base.
 - 4. Line up top and bottom lines of base throughout.
 - 5. Do not stretch base during installation.
 - 6. Roll until firm bond has been established. Leave level, free from buckles, cracks, and projecting edges.
 - 7. In wall runs longer than 12 inches (300 mm), install no lengths of base shorter than 12 inches (300 mm) long.

3.5 FIELD QUALITY CONTROL

- A. Field Tests:
- 1. Resilient Tile Flooring:
 - a. See Section 09 0503 'Flooring Substrate Preparation' for Field Testing for Alkalinity and Concrete Moisture of concrete slab.
- B. Non-Conforming Work:
- 1. Replace damaged materials at no additional cost to Owner.
 - 2. Damaged materials are defined as having cuts, gouges, scrapes or tears, and not fully adhered.

3.6 ADJUSTING

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

3.7 CLEANING

- A. General:
- 1. Adjacent Work:
 - a. Clean all exposed surfaces of adjoining areas of adhesive spatter before it sets.
- B. Resilient Tile Flooring:
- 1. Adhesive:
 - a. Any excess adhesive must be removed from tile surface.
 - b. Do not allow epoxy adhesive to dry on tile surface.
- C. Resilient Base And Accessories:
- 1. Clean all exposed surfaces of base of adhesive spatter before it sets in accordance with Manufacturer's cleaning instructions.
 - 2. Damp-mop surfaces to remove marks and soil.

3.1 PROTECTION

- A. Resilient Tile Flooring:
 - 1. Keep installation from heavy foot traffic or rolling loads for at least twenty-four (24) hours.
 - 2. Do not wash or apply finish to floor for minimum of forty-eight (48) hours after installation.
- B. Resilient Base And Accessories:
 - 1. Cover material.
 - 2. Keep traffic away until adhesive has set.

END OF SECTION

SECTION 09 6723**RESINOUS FLOORING SYSTEM****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Preparation of concrete surfaces to receive epoxy flooring mortar system as described in Contract Documents.
 - 2. Furnish and apply resinous flooring coating and resinous cove base with chemical resistance finish and specific texture as described in Contract Documents.
 - a. Application Method: Pin rake, flat trowel, squeegee, brush and/or roller.
- B. Related Requirements:
 - 1. Section 01 1200: 'Multiple Contract Summary' for Alkalinity and Concrete Moisture of concrete slab.
 - 2. Section 01 3100: 'Project Management and Coordination' for pre-installation conference.
 - 3. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
 - 4. Section 03 3111: 'Cast-In-Place Structural Concrete' for provision of acceptable concrete substrate.
 - 5. Section 07 2616: 'Below-Grade Vapor Retarders' for Installation of below grade vapor retarder.
 - 6. Section 09 0503: 'Floor Substrate Preparation' for:
 - a. Floor substrate preparation.
 - b. Field Testing for Alkalinity and Concrete Moisture of concrete slab.
 - c. Pre-installation conference for Sections under 09 6000 heading 'Flooring' held jointly with Section 09 9657.

1.2 REFERENCES

- A. Association Publications:
 - 1. American Concrete Institute, Farmington Hills, MI www.concrete.org. Abstracts of ACI Periodicals and Publications.
 - a. ACI 302.2R-06, *Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials* (August 15, 2006).
- B. Reference Standards:
 - 1. ASTM International:
 - a. ASTM C307-18, 'Standard Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacing'.
 - b. ASTM C413-18, 'Standard Test Method for Absorption of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes'.
 - c. ASTM C579-18, 'Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes'.
 - d. ASTM C580-18, 'Standard Test Method for Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes'.
 - e. ASTM D635-18, 'Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position'.
 - f. ASTM D638-14, 'Standard Test Method for Tensile Properties of Plastics'.
 - g. ASTM D695-15, 'Standard Test Method for Compressive Properties of Rigid Plastics'.
 - h. ASTM D790-17, 'Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials'.

- i. ASTM D2240-15, 'Standard Test Method for Rubber Property—Durometer Hardness'.
- j. ASTM D2794-93(2019), 'Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)'.
- k. ASTM D3359-17, 'Standard Test Methods for Measuring Adhesion by Tape Test'.
- l. ASTM D3363-05(2011), 'Standard Test Method for Film Hardness by Pencil Test'.
- m. ASTM D4060-14, 'Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser'.
- n. ASTM F2170-18, 'Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes'.
- 2. Military Specifications and Standards:
 - a. MIL-D-3134J, 'Deck Covering Materials'. (12-Sep-1989).

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate completion of flooring installation with other trades.
- B. Pre-Installation Conferences:
 - 1. Participate in MANDATORY pre-installation conference specified in Section 09 0503:
 - a. Schedule conference after substrate preparation and ONE (1) week minimum before installation of flooring system.
 - b. In addition to agenda items specified in Section 01 3100 and Section 09 0503, review following:
 - 1) Review Testing Agency testing report of Alkalinity and Concrete Moisture of concrete slab.
 - 2) Review high moisture remediation options when high moisture exists based on moisture testing specified in Section 09 0503 'Flooring Substrate Preparation'.
- C. Sequencing:
 - 1. Testing Agency to provide testing for Alkalinity and Concrete Moisture as specified in Section 09 0503: 'Floor Substrate Preparation' before Pre-Installation Conference.
 - 2. If high concrete moisture exists, Manufacturer's high moisture remediation of concrete slab before installation of Resinous System.
 - 3. Installation of Resinous Flooring System.
- D. Scheduling:
 - 1. Testing Agency to provide testing for Alkalinity and Concrete Moisture of concrete slab as specified in Section 09 0503 'Floor Substrate Preparation'.
 - 2. Notify Flooring Installer when Building Ambient Conditions requirements are met before installation of flooring system.

1.4 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Manufacturer's specifications on system and on individual components of system confirming physical properties, performance properties, and tests described in Part 2.
 - b. Manufacturer's application instructions and recommendations.
 - c. Material Safety Data Sheets for all components.
 - d. Maintenance procedures and instructions.
 - 2. Samples:
 - a. **6 inch (150 mm)** minimum square samples applied to rigid backing in color and textures specified.
 - 3. Mockups: Apply mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

- a. Construct one 25 sq.ft. mock-up of each type and color of resinous flooring in location acceptable to Architect/Engineer to demonstrate aesthetic, and slip resistance/ floor texture effects, set quality standards for materials and execution, complying with manufacturer's instructions.
 - b. Sign off from Architect, Owner/Owners agent, General Contractor on aesthetic and texture for slip resistance must be complete before installation of flooring system.
 - c. Upon acceptance, mock-up shall serve as a minimum standard of quality for the balance of the work of this Section. Mock-up shall be left in place for the duration of the work.
 - d. Approved mockups will not become part of the completed work.
- B. Informational Submittals:
1. Field Qualify Control Submittals:
 - a. Copies of Manufacturer's packing slips, tagged for this specific job, along with calculations signed by an officer of Manufacturer demonstrating that quantities of materials furnished for Project are adequate to achieve specified coverage and mil thickness.
 2. Qualification Statements:
 - a. Authorized Installer certificate or letter from Manufacturer.
- C. Closeout Submittals:
1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Warranty Documentation:
 - 1) Final, executed copies of Installer Workmanship Warranty and Manufacturer's Material Warranty.
 - b. Record Documentation:
 - 1) Manufacturers documentation:
 - a) Manufacturer's literature.
 - 2) Testing and Inspection Reports:
 - a) Testing Agency Testing Reports of Alkalinity and Concrete Moisture testing.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Requirements of Section 01 4301 applies, but is not limited to following:
1. Installer shall be experienced in applying resinous flooring systems similar in material, design, and extent to those indicated for this Project.
 - a. Installer shall have completed at least 10 projects of similar size and complexity.
 2. Installer shall be certified and trained as a preferred or approved applicator by Manufacturer, qualified by the Manufacturer to apply the resinous flooring systems indicated.
- B. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, through one source from a single manufacturer, with not less than ten years of successful experience in manufacturing and installing principal materials described in this section. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.
- C. Manufacturer Field Technical Service Representatives: Resinous flooring manufacture shall retain the services of Field Technical Service Representatives who are trained specifically on installing the system to be used on the project.
1. Field Technical Services Representatives shall be employed by the system manufacturer to assist in the quality assurance and quality control process of the installation and shall be available to perform field problem solving issues with the installer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
1. Primary system materials shall be delivered to job site in manufacturer's undamaged, unopened containers. Each container shall be marked with:

- a. Product name(s) and/or Number(s).
 - b. Manufacturer's name and address.
 - c. Component designation (A, B, etc.).
 - d. Product mix ratio.
 - e. Health and safety information.
 - f. CHEMTREC Emergency Response Information.
 - g. Manufacturer's directions for storage and mixing with other components.
2. Deliver materials to jobsite in mix ratio sized containers to provide simple means of verifying mix ratio.

B. Storage And Handling Requirements:

1. Store materials to prevent deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects. Store materials in temperature controlled environment 65 deg F to 85 deg F and out of direct sunlight.
2. Refer to MSDS sheet before use. All applicable federal, state, local and particular plant safety guidelines must be followed during handling and installation and cure of materials.
3. Keep resins, hardeners, and solvents separated from each other and away from sources of ignition.

1.7 FIELD CONDITIONS

A. Ambient Conditions:

1. Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.
2. Close spaces to traffic during resinous flooring application and for 24 hours after application unless manufacturer recommends a longer period.
3. Temperature:
 - a. Maintain material and substrate temperature between 65 and 85 deg F during resinous flooring application and for not less than 72 hours after application.
 - b. Applications on concrete substrate should occur while temperature is falling to lessen off gassing.
 - c. Material should not be applied in direct sunlight, if possible.
 - d. Protect materials from freezing.
4. Air Movement:
 - a. Provide sufficient air movement necessary through area of application to prevent surface condensation during installation.
5. Illumination:
 - a. Provide 50-foot candles minimum of illumination of work area during installation of system.
 - b. It is preferred that permanent lighting be in place and working during installation of flooring system. If permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.
6. Concrete Slab:
 - a. General:
 - 1) Concrete substrate shall be properly cured for a minimum of 30 days. A vapor barrier must be present for concrete subfloors on or below grade.
 - 2) Final determination as to whether or not a concrete slab is dry enough for flooring installation should be based on evaluating both Alkalinity and Concrete Moisture Vapor Emission Rate (MVER) testing.
 - b. Alkalinity:
 - 1) Do not install sheet carpeting if alkalinity of concrete surface exceeds pH level 9. Corrective procedures are required.
 - c. Concrete Moisture Vapor Emission Rate (MVER):
 - 1) Testing conditions inside building shall be brought to same ambient temperature and relative humidity levels to be normal at occupancy of building. Conditions include normal levels of humidity, lighting, heating, and air conditioning.

- 2) Do not install resinous flooring if moisture vapor emission rate (MVER) of concrete slab relative humidity (RH) exceeds 75% as per ASTM F2170. Corrective procedures are required.

1.8 WARRANTY

- A. Manufacturer Warranty:
 1. Provide Manufacturer's two (2) year limited system warranty for the following:
 - a. Manufacturer's warranty to be free from defects in materials and factory workmanship.
 - b. Manufacturer's warranty against mold/mildew, and bacterial growth.
- B. Installer Workmanship Warranty:
 1. Written two (2) 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.

PART 2 - PRODUCTS

2.1 SYSTEM

- A. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. Obtain secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from manufacturer recommended in writing by manufacturer of primary materials.
- B. Manufacturer:
 1. Category Four Approved Product. See Section 01 6200 for definitions of Categories.
 - a. Sika Corporation, 201 Polito Drive, Lyndhurst, NJ 07071.
 - b. Contact: Business Development Manager – Erik Correll, 303-242-2367, correll.erik@us.sika.com.
- C. Resinous Flooring System Materials:
 1. Category Three Approved Products. See Section 01 6200 for definitions of Categories:
 - a. Sikafloor® PurCem® SLB+ by Sika Corporation
 - 1) DecoDur Flake FX, Color: Pumicite
 2. Description:
 - a. Phthalate free, water dispersed polyurethane based/cement and aggregate screed.
 3. Design Criteria:
 - a. Flammability: Self-extinguishing according to ASTM D635.
 4. System Characteristics:
 - a. Color and Pattern: DecoDur Flake – FX, Color: Pumicite
 - b. Wearing Surface: Sikadur 510 LPL
 - c. Overall System Thickness: ¼"
 5. System Components: Manufacturer's standard components that are compatible with each other and as follows:
 - a. Primer:
 - 1) No primer required.
 - b. Mortar Base:
 - 1) Material design basis: Sikafloor®-22 NA PurCem.
 - 2) Resin: Polyurethane.
 - 3) Formulation Description: Polyurethane/cement and aggregate technology.
 - 4) Application Method: Screed rake and trowel.
 - c. Broadcast:
 - 1) Material Basis: Sika 508 Aggregate.
 - 2) Color: See above.
 - 3) Finish: Broadcast to rejection.

- d. Receiver Coat:
 - 1) Material design basis: Sikafloor® 264 Thixo.
 - 2) Color: See above – choose color to manufacturer's standards
 - 3) Resin: Epoxy.
 - 4) Formulation Description: two component, 100% solids epoxy.
 - 5) Finish: Smooth.
 - 6) Number of Coats: One (1) @10-12 mils.
 - e. Broadcast:
 - 1) Material Basis: Sika Decorative Flake
 - 2) Color: see above, 1/8"
 - 3) Finish: Broadcast into 264 receiver coat until rejection.
 - f. Topcoat:
 - 1) Material design basis: Sikafloor®-510 LPL.
 - 2) Color: Clear.
 - 3) Resin: Polyaspartic.
 - 4) Formulation Description: Two component, UV stable, polyaspartic.
 - 5) Finish: Textured for slip resistance.
 - 6) Number of Coats: One (1) @12 mils.
 - g. Topcoat: Sand between topcoats to knock down any standing flake
 - 1) Material design basis: Sikafloor®-510 LPL.
 - 2) Color: Clear.
 - 3) Resin: Polyaspartic.
 - 4) Formulation Description: High solids, aliphatic, polyurethane.
 - 5) Finish: Textured for slip resistance.
 - 6) Number of Coats: One (1) to meet required texture.
- D. Resinous Cove Base Materials:
- 1. Category Three Approved Products. See Section 01 6200 for definitions of Categories:
 - a. Sikafloor® 293 by Sika Corporation
 - 1) Color and Pattern: DecoDur Flake – FX, Color: Pumicite
 - 2. Description
 - a. Vertical grade, three component, solid color, water dispersed polyurethane cement and aggregate mortar used for detailing, vertical and coving
 - 3. System Characteristics:
 - a. Color and Pattern: Select from Manufacturers Standards. Refer to finish schedule for colors.
 - b. Wearing Surface: Standard Finish.
 - c. Overall System Thickness: Cove base of 1" radius and 4" high with compatible termination strip/sealant. Cant and Curb – as existing.
 - 4. System Components: Manufacturer's standard components that are compatible with each other and as follows:
 - a. Primer:
 - 1) Material design basis: Sika 161
 - 2) Resin: Epoxy
 - 3) Number of Coats: One (1) @ 8-10 mils.
 - b. Mortar Base:
 - 1) Material design basis: Sika 293 mixed with 508 aggregates.
 - 2) Formulation Description: Epoxy.
 - c. Broadcast Flake:
 - 1) Broadcast flake into wet mortar base.
 - 2) Second application of 293 resin, without 508 aggregate, and broadcast flake.
 - d. Topcoat:
 - 1) Material design basis: Sikafloor®-510 LPL.
 - 2) Color: Clear
 - 3) Resin: Epoxy.
 - 4) Formulation Description: Two component, UV stable, wear resistant polyaspartic.
 - 5) Finish: Two coats to achieve smooth finish.
- E. Patching and Fill Material:

1. Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.
- F. Components listed above are the basis of design intent; all submittals will be compared to this standard including resin chemistry, color, wearing surface, thickness, and installation procedures, including number of coats. Contractor shall be required to comply with all the requirements of the Specifications and all the components required by the Specifications, whether such products are specifically listed above.

PART 3 - EXECUTION

3.1 INSTALLERS

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

3.2 EXAMINATION

- A. Verification Of Conditions:
 1. Verify concrete surfaces are sufficiently cured and moisture content is within acceptable levels before beginning installation.
 2. Verify that there are no leaks from pipes or other sources are present in areas where flooring system is to be installed.
- B. Evaluation And Assessment:
 1. Visit jobsite before beginning work of this Section and evaluate condition of substrate. Examine substrates for undulation, cleanliness, holes, cracks, and soundness. Be certain concrete surfaces are sufficiently cured and moisture content is within acceptable levels before beginning installation.
 2. Conduct tests of substrate necessary to be satisfied that substrate meets requirements for satisfactory installation of system.
 3. Provide written acceptance and approval of substrate to Architect before beginning installation. If substrate is defective, notify Architect in writing with recommendations for remediation. Following actions may be required:
 - a. Protruding surface defects shall be removed by mechanical abrasion.
 - b. Patch holes and other voids in substrate with approved materials.
 - c. Remove surface contaminants mechanical abrasion or other approved methods, including curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.
 4. Notify Architect/General Contractor/Owner/Owner's representative if surfaces are not acceptable. Do not begin surface preparation or application until unacceptable conditions have been corrected.

3.3 PREPARATION

- A. Protection Of In-Place Conditions:
 1. Protect surrounding substrates and surfaces during surface preparation and system installation. Repair damage at no additional cost to Owner.
- B. Surface Preparation:
 1. Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry substrate for resinous flooring application.
 2. Verify that floor drains are set at proper elevation in relation to finish elevation of flooring system.

3. Surface must be clean, sound and dry. Remove dust, laitance, grease, curing compounds bond inhibiting impregnations, waxes and any other contaminants. All projections, rough spots, etc. should be dressed off to achieve a level surface prior to the application.
4. Do not apply to substrate treatments for moisture, repair, or leveling not of the same Manufacturer.
5. Concrete: Shall be cleaned and prepared to achieve laitance-free and contaminant-free, open textured surface by shot blasting or equivalent mechanical means. A minimum CSP level four (4) to be achieved and evidenced prior to application of primer coat.
6. Chemical Surface Preparation: Chemical surface preparation (acid etching) is unacceptable and will void Manufacturer's warranty.
7. Control joints and cracks: Provide repair and treatment of control joints and surface cracks utilizing manufacturer's standard materials and installation details.
8. Patching and Filling: Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.
9. Control Joint Treatment: Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written instructions.

3.4 APPLICATION

- A. General:
 1. Apply each component of resinous flooring and resinous cove system in compliance with Manufacturer's submitted, written installation instructions. Adhere to mixing and installation methods, recoat windows, cure times, and environmental restrictions.
 2. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum inter-coat adhesion.
 3. Follow Manufacturer's written recommendations on terminations and connections to walls, drains, doorways, columns and floor-to-floor transitions.
 4. Do not apply while ambient and substrate temperatures are rising.
 5. Apply resinous flooring with care to ensure that no laps, voids, or other marks or irregularities are visible, and with an appearance of uniform color, sheen and texture, all within limitations of materials and areas concerned.
- B. Expansion and Isolation Joint Treatment: At substrate expansion and isolation joints, comply with resinous flooring manufacturer's written instructions.
- C. Curing: Cure resinous flooring materials in compliance with manufacturer's directions, taking care to prevent contamination during stages of application and prior to completion of curing process. Close area of application for a minimum of 18 hours.
- D. Cove Base: Install integral 4 inch high cove base with one inch radius coves at floor to wall joints.
- E. Clean spills and smudges from adjacent surfaces, as installation proceeds, using Manufacturer's approved methods and cleaning materials.

3.5 FIELD QUALITY CONTROL

- A. Field Tests:
 1. See Section 09 0503 'Flooring Substrate Preparation' for Field Testing for Alkalinity and Concrete Moisture of concrete slab.
 2. Before application of seal coats, Architect may have independent Testing Agency take one inch diameter cores of system at locations determined by Architect and Owner.
- B. Field Inspections:
 1. Retain empty containers in which primary materials were received at job site for verification by Architect that sufficient materials were used to provide coverage and thickness specified.

C. Non-Conforming Work:

1. Replace or add additional flooring material to areas not meeting specified thickness.
2. Repair test core locations.
3. Correctional and repair procedures shall be at no additional cost to Owner.
4. Restore damage and wear during other phases of construction to original conditions without additional cost to Owner.

3.6 CLEANING**A. General:**

1. Clean up mixing and application equipment immediately after use as per Manufacturer's recommendations.
2. Clean spills and smudges from adjacent surfaces, as installation proceeds, using Manufacturer's approved methods and cleaning materials.

B. Waste Management:

1. Safe and proper disposal of excess materials shall be done in accordance with applicable federal, state, and local codes.

3.7 PROTECTION

- A. Protect installed flooring system from damage and wear during other phases of construction until Substantial Completion using temporary covering adequate to prevent damage. Temporary covering shall comply with manufacturer's recommendations for protective materials and method of application. Remove temporary covering just before final inspection.

END OF SECTION

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SECTION 09 6723**RESINOUS FLOORING SYSTEM****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Preparation of concrete surfaces to receive epoxy flooring mortar system as described in Contract Documents.
 - 2. Furnish and apply resinous flooring coating and resinous cove base with chemical resistance finish and specific texture as described in Contract Documents.
 - a. Application Method: Pin rake, flat trowel, squeegee, brush and/or roller.
- B. Related Requirements:
 - 1. Section 01 1200: 'Multiple Contract Summary' for Alkalinity and Concrete Moisture of concrete slab.
 - 2. Section 01 3100: 'Project Management and Coordination' for pre-installation conference.
 - 3. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
 - 4. Section 03 3111: 'Cast-In-Place Structural Concrete' for provision of acceptable concrete substrate.
 - 5. Section 07 2616: 'Below-Grade Vapor Retarders' for Installation of below grade vapor retarder.
 - 6. Section 09 0503: 'Floor Substrate Preparation' for:
 - a. Floor substrate preparation.
 - b. Field Testing for Alkalinity and Concrete Moisture of concrete slab.
 - c. Pre-installation conference for Sections under 09 6000 heading 'Flooring' held jointly with Section 09 9657.

1.2 REFERENCES

- A. Association Publications:
 - 1. American Concrete Institute, Farmington Hills, MI www.concrete.org. Abstracts of ACI Periodicals and Publications.
 - a. ACI 302.2R-06, *Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials* (August 15, 2006).
- B. Reference Standards:
 - 1. ASTM International:
 - a. ASTM C307-18, 'Standard Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacing'.
 - b. ASTM C413-18, 'Standard Test Method for Absorption of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes'.
 - c. ASTM C579-18, 'Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes'.
 - d. ASTM C580-18, 'Standard Test Method for Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes'.
 - e. ASTM D635-18, 'Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position'.
 - f. ASTM D638-14, 'Standard Test Method for Tensile Properties of Plastics'.
 - g. ASTM D695-15, 'Standard Test Method for Compressive Properties of Rigid Plastics'.
 - h. ASTM D790-17, 'Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials'.

- i. ASTM D2240-15, 'Standard Test Method for Rubber Property—Durometer Hardness'.
 - j. ASTM D2794-93(2019), 'Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)'.
 - k. ASTM D3359-17, 'Standard Test Methods for Measuring Adhesion by Tape Test'.
 - l. ASTM D3363-05(2011), 'Standard Test Method for Film Hardness by Pencil Test'.
 - m. ASTM D4060-14, 'Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser'.
 - n. ASTM F2170-18, 'Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes'.
2. Military Specifications and Standards:
- a. MIL-D-3134J, 'Deck Covering Materials'. (12-Sep-1989).

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
- 1. Coordinate completion of flooring installation with other trades.
- B. Pre-Installation Conferences:
- 1. Participate in MANDATORY pre-installation conference specified in Section 09 0503:
 - a. Schedule conference after substrate preparation and ONE (1) week minimum before installation of flooring system.
 - b. In addition to agenda items specified in Section 01 3100 and Section 09 0503, review following:
 - 1) Review Testing Agency testing report of Alkalinity and Concrete Moisture of concrete slab.
 - 2) Review high moisture remediation options when high moisture exists based on moisture testing specified in Section 09 0503 'Flooring Substrate Preparation'.
- C. Sequencing:
- 1. Testing Agency to provide testing for Alkalinity and Concrete Moisture as specified in Section 09 0503: 'Floor Substrate Preparation' before Pre-Installation Conference.
 - 2. If high concrete moisture exists, Manufacturer's high moisture remediation of concrete slab before installation of Resinous System.
 - 3. Installation of Resinous Flooring System.
- D. Scheduling:
- 1. Testing Agency to provide testing for Alkalinity and Concrete Moisture of concrete slab as specified in Section 09 0503 'Floor Substrate Preparation'.
 - 2. Notify Flooring Installer when Building Ambient Conditions requirements are met before installation of flooring system.

1.4 SUBMITTALS

- A. Action Submittals:
- 1. Product Data:
 - a. Manufacturer's specifications on system and on individual components of system confirming physical properties, performance properties, and tests described in Part 2.
 - b. Manufacturer's application instructions and recommendations.
 - c. Material Safety Data Sheets for all components.
 - d. Maintenance procedures and instructions.
 - 2. Samples:
 - a. 12 inch (150 mm) minimum square samples applied to rigid backing in color and textures specified.
 - 3. Mockups: Apply mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

- a. Construct one 25 sq.ft. mock-up of each type and color of resinous flooring in location acceptable to Architect/Engineer to demonstrate aesthetic, and slip resistance/ floor texture effects, set quality standards for materials and execution, complying with manufacturer's instructions.
 - b. Sign off from Architect, Owner/Owners agent, General Contractor on aesthetic and texture for slip resistance must be complete before installation of flooring system.
 - c. Upon acceptance, mock-up shall serve as a minimum standard of quality for the balance of the work of this Section. Mock-up shall be left in place for the duration of the work.
 - d. Approved mockups will not become part of the completed work.
- B. Informational Submittals:
1. Field Qualify Control Submittals:
 - a. Copies of Manufacturer's packing slips, tagged for this specific job, along with calculations signed by an officer of Manufacturer demonstrating that quantities of materials furnished for Project are adequate to achieve specified coverage and mil thickness.
 2. Qualification Statements:
 - a. Authorized Installer certificate or letter from Manufacturer.
- C. Closeout Submittals:
1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Warranty Documentation:
 - 1) Final, executed copies of Installer Workmanship Warranty and Manufacturer's Material Warranty.
 - b. Record Documentation:
 - 1) Manufacturers documentation:
 - a) Manufacturer's literature.
 - 2) Testing and Inspection Reports:
 - a) Testing Agency Testing Reports of Alkalinity and Concrete Moisture testing.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Requirements of Section 01 4301 applies, but is not limited to following:
1. Installer shall be experienced in applying resinous flooring systems similar in material, design, and extent to those indicated for this Project.
 - a. Installer shall have completed at least 10 projects of similar size and complexity.
 2. Installer shall be certified and trained as a preferred or approved applicator by Manufacturer, qualified by the Manufacturer to apply the resinous flooring systems indicated.
- B. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, through one source from a single manufacturer, with not less than ten years of successful experience in manufacturing and installing principal materials described in this section. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.
- C. Manufacturer Field Technical Service Representatives: Resinous flooring manufacture shall retain the services of Field Technical Service Representatives who are trained specifically on installing the system to be used on the project.
1. Field Technical Services Representatives shall be employed by the system manufacturer to assist in the quality assurance and quality control process of the installation and shall be available to perform field problem solving issues with the installer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
1. Primary system materials shall be delivered to job site in manufacturer's undamaged, unopened containers. Each container shall be marked with:

- a. Product name(s) and/or Number(s).
 - b. Manufacturer's name and address.
 - c. Component designation (A, B, etc.).
 - d. Product mix ratio.
 - e. Health and safety information.
 - f. CHEMTREC Emergency Response Information.
 - g. Manufacturer's directions for storage and mixing with other components.
2. Deliver materials to jobsite in mix ratio sized containers to provide simple means of verifying mix ratio.

B. Storage And Handling Requirements:

1. Store materials to prevent deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects. Store materials in temperature controlled environment 65 deg F to 85 deg F and out of direct sunlight.
2. Refer to MSDS sheet before use. All applicable federal, state, local and particular plant safety guidelines must be followed during handling and installation and cure of materials.
3. Keep resins, hardeners, and solvents separated from each other and away from sources of ignition.

1.7 FIELD CONDITIONS

A. Ambient Conditions:

1. Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.
2. Close spaces to traffic during resinous flooring application and for 24 hours after application unless manufacturer recommends a longer period.
3. Temperature:
 - a. Maintain material and substrate temperature between 65 and 85 deg F during resinous flooring application and for not less than 72 hours after application.
 - b. Applications on concrete substrate should occur while temperature is falling to lessen off gassing.
 - c. Material should not be applied in direct sunlight, if possible.
 - d. Protect materials from freezing.
4. Air Movement:
 - a. Provide sufficient air movement necessary through area of application to prevent surface condensation during installation.
5. Illumination:
 - a. Provide 50-foot candles minimum of illumination of work area during installation of system.
 - b. It is preferred that permanent lighting be in place and working during installation of flooring system. If permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.
6. Concrete Slab:
 - a. General:
 - 1) Concrete substrate shall be properly cured for a minimum of 30 days. A vapor barrier must be present for concrete subfloors on or below grade.
 - 2) Final determination as to whether or not a concrete slab is dry enough for flooring installation should be based on evaluating both Alkalinity and Concrete Moisture Vapor Emission Rate (MVER) testing.
 - b. Alkalinity:
 - 1) Do not install sheet carpeting if alkalinity of concrete surface exceeds pH level 9. Corrective procedures are required.
 - c. Concrete Moisture Vapor Emission Rate (MVER):
 - 1) Testing conditions inside building shall be brought to same ambient temperature and relative humidity levels to be normal at occupancy of building. Conditions include normal levels of humidity, lighting, heating, and air conditioning.

- 2) Do not install resinous flooring if moisture vapor emission rate (MVER) of concrete slab relative humidity (RH) exceeds 75% as per ASTM F2170. Corrective procedures are required.

1.8 WARRANTY

- A. Manufacturer Warranty:
 1. Provide Manufacturer's two (2) year limited system warranty for the following:
 - a. Manufacturer's warranty to be free from defects in materials and factory workmanship.
 - b. Manufacturer's warranty against mold/mildew, and bacterial growth.
- B. Installer Workmanship Warranty:
 1. Written two (2) 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.

PART 2 - PRODUCTS

2.1 SYSTEM

- A. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. Obtain secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from manufacturer recommended in writing by manufacturer of primary materials.
- B. Manufacturer:
 1. Category Four Approved Product. See Section 01 6200 for definitions of Categories.
 - a. Sika Corporation, 201 Polito Drive, Lyndhurst, NJ 07071.
 - b. Contact: Business Development Manager – Erik Correll, 303-242-2367, correll.erik@us.sika.com.
- C. Resinous Flooring System Materials:
 1. Category Three Approved Products. See Section 01 6200 for definitions of Categories:
 - a. Sikafloor® PurCem® SLB+ by Sika Corporation
 - 1) DecoDur Flake FX, Color: Pumicite
 2. Description:
 - a. Phthalate free, water dispersed polyurethane based/cement and aggregate screed.
 3. Design Criteria:
 - a. Flammability: Self-extinguishing according to ASTM D635.
 4. System Characteristics:
 - a. Color and Pattern: DecoDur Flake – FX, Color: Pumicite
 - b. Wearing Surface: Sikadur 510 LPL
 - c. Overall System Thickness: 1/4 inch
 5. System Components: Manufacturer's standard components that are compatible with each other and as follows:
 - a. Primer:
 - 1) No primer required.
 - b. Fillers:
 - 1) Material design basis: Sikafloor®-22 NA PurCem and Sikafloor®-24 NA PurCem.
 - 2) Resin: Polyurethane.
 - 3) Formulation Description: Polyurethane/cement and aggregate technology.
 - 4) Application Method: Screed rake and trowel.
 - c. Mortar Base:
 - 1) Material design basis: Sikafloor®-22 NA PurCem.
 - 2) Resin: Polyurethane.
 - 3) Formulation Description: Polyurethane/cement and aggregate technology.

- 4) Application Method: Screed rake and trowel.
 - d. Broadcast:
 - 1) Material Basis: Sika 508 Aggregate.
 - 2) Color: See above.
 - 3) Finish: Broadcast to rejection.
 - e. Receiver Coat:
 - 1) Material design basis: Sikafloor® 264 Thixo.
 - 2) Color: See above – choose color to manufacturer's standards
 - 3) Resin: Epoxy.
 - 4) Formulation Description: two component, 100% solids epoxy.
 - 5) Finish: Smooth.
 - 6) Number of Coats: One (1) @10-12 mils.
 - f. Broadcast:
 - 1) Material Basis: Sika Decorative Flake
 - 2) Color: see above, 1/8 inch
 - 3) Finish: Broadcast into 264 receiver coat until rejection.
 - g. First Topcoat:
 - 1) Material design basis: Sikafloor®-510 LPL.
 - 2) Color: Clear.
 - 3) Resin: Polyaspartic.
 - 4) Formulation Description: Two component, UV stable, polyaspartic.
 - 5) Finish: Textured for slip resistance.
 - 6) Number of Coats: One (1) @12 mils.
 - h. Additional Topcoats: Sand between topcoats to knock down any standing flake
 - 1) Material design basis: Sikafloor®-510 LPL.
 - 2) Color: Clear.
 - 3) Resin: Polyaspartic.
 - 4) Formulation Description: High solids, aliphatic, polyurethane.
 - 5) Finish: Textured for slip resistance.
 - 6) Number of Coats: as necessary to meet required texture.
- D. Resinous Cove Base Materials:
- 1. Category Three Approved Products. See Section 01 6200 for definitions of Categories:
 - a. Sikafloor® 293 by Sika Corporation
 - 1) Color and Pattern: DecoDur Flake – FX, Color: Pumicite
 - 2. Description
 - a. Vertical grade, three component, solid color, water dispersed polyurethane cement and aggregate mortar used for detailing, vertical and coving
 - 3. System Characteristics:
 - a. Color and Pattern: Select from Manufacturers Standards. Refer to finish schedule for colors.
 - b. Wearing Surface: Standard Finish.
 - c. Overall System Thickness: Cove base of 1" radius and 6" high with compatible termination strip/sealant. Cant and Curb – as existing.
 - 4. System Components: Manufacturer's standard components that are compatible with each other and as follows:
 - a. Primer:
 - 1) Material design basis: Sika 161
 - 2) Resin: Epoxy
 - 3) Number of Coats: One (1) @ 8-10 mils.
 - b. Mortar Base:
 - 1) Material design basis: Sika 293 mixed without 508 aggregates.
 - 2) Formulation Description: Epoxy.
 - 3) Cabosil may be mixed in for reinforcing and thickening as needed.
 - c. Broadcast Flake:
 - 1) Broadcast flake into wet mortar base.
 - 2) Second application of 293 resin, without 508 aggregate, and broadcast flake.
 - d. Topcoat:
 - 1) Material design basis: Sikafloor®-217 Thixo Lite (first topcoat)

- 2) Material design basis: Sikafloor®-510 LPL (subsequent topcoats)
 - 3) Color: Clear
 - 4) Resin: Epoxy.
 - 5) Formulation Description: Two component, UV stable, wear resistant polyaspartic.
 - 6) Finish: Multiple coats (minimum of two coats) as required to achieve uniform, smooth finish.
- E. Patching and Fill Material:
1. Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.
 2. Sikafloor®-22 NA PurCem for areas thicker than 1/8 inch
 3. Sikafloor®-24 NA PurCem for areas thinner than 1/8 inch
- F. Components listed above are the basis of design intent; all submittals will be compared to this standard including resin chemistry, color, wearing surface, thickness, and installation procedures, including number of coats. Contractor shall be required to comply with all the requirements of the Specifications and all the components required by the Specifications, whether such products are specifically listed above.

PART 3 - EXECUTION

3.1 INSTALLERS

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

3.2 EXAMINATION

- A. Verification Of Conditions:
1. Verify concrete surfaces are sufficiently cured and moisture content is within acceptable levels before beginning installation.
 2. Verify that there are no leaks from pipes or other sources are present in areas where flooring system is to be installed.
- B. Evaluation And Assessment:
1. Visit job site before beginning work of this Section and evaluate condition of substrate. Examine substrates for undulation, cleanliness, holes, cracks, and soundness. Be certain concrete surfaces are sufficiently cured and moisture content is within acceptable levels before beginning installation.
 2. Conduct tests of substrate necessary to be satisfied that substrate meets requirements for satisfactory installation of system.
 3. Provide written acceptance and approval of substrate to Architect before beginning installation. If substrate is defective, notify Architect in writing with recommendations for remediation. Following actions may be required:
 - a. Protruding surface defects shall be removed by mechanical abrasion.
 - b. Patch holes and other voids in substrate with approved materials.
 - c. Remove surface contaminants mechanical abrasion or other approved methods, including curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.
 4. Notify Architect/General Contractor/Owner/Owner's representative if surfaces are not acceptable. Do not begin surface preparation or application until unacceptable conditions have been corrected.

3.3 PREPARATION

- A. Protection Of In-Place Conditions:
 - 1. Protect surrounding substrates and surfaces during surface preparation and system installation. Repair damage at no additional cost to Owner.
- B. Surface Preparation:
 - 1. Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry substrate for resinous flooring application.
 - 2. Verify that floor drains are set at proper elevation in relation to finish elevation of flooring system.
 - 3. Surface must be clean, sound and dry. Remove dust, laitance, grease, curing compounds bond inhibiting impregnations, waxes and any other contaminants. All projections, rough spots, etc. should be dressed off to achieve a level surface prior to the application.
 - 4. Do not apply to substrate treatments for moisture, repair, or leveling not of the same Manufacturer.
 - 5. Concrete: Shall be cleaned and prepared to achieve laitance-free and contaminant-free, open textured surface by shot blasting or equivalent mechanical means. A minimum CSP level four (4) to be achieved and evidenced prior to application of primer coat.
 - 6. Chemical Surface Preparation: Chemical surface preparation (acid etching) is unacceptable and will void Manufacturer's warranty.
 - 7. Control joints and cracks: Provide repair and treatment of control joints and surface cracks utilizing manufacturer's standard materials and installation details.
 - 8. Grinding:
 - a. Grind off high points in the concrete slab greater than 1/8 inch in height over 4 foot area.
 - 9. Patching and Filling:
 - a. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.
 - b. Fill areas over 1/8 inch deep with Sikafloor®-22 NA PurCem or Sikafloor®-24 NA PurCem material prior to base coat installation.
 - 1) Broadcast over patched areas as required for adhesion of base coat application.
 - c. Areas with less than 1/8 inch variation can be leveled with a second application of the base coat materials with thickness varied to produce leveling effect.
 - 10. Control Joint Treatment: Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written instructions.

3.4 APPLICATION

- A. General:
 - 1. Apply each component of resinous flooring and resinous cove system in compliance with Manufacturer's submitted, written installation instructions. Adhere to mixing and installation methods, recoat windows, cure times, and environmental restrictions.
 - 2. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum inter-coat adhesion.
 - 3. Follow Manufacturer's written recommendations on terminations and connections to walls, drains, doorways, columns and floor-to-floor transitions.
 - 4. Do not apply while ambient and substrate temperatures are rising.
 - 5. Apply resinous flooring with care to ensure that no laps, voids, or other marks or irregularities are visible, and with an appearance of uniform color, sheen and texture, all within limitations of materials and areas concerned.
- B. Broadcast Flakes:
 - 1. Color broadcast flakes are to be broadcast to achieve full coverage.
 - a. Cove base areas in particular may require more than one broadcast to achieve full coverage.
 - 2. After broadcast, color flakes may require sanding to remove sharp projecting edges and achieve the required finish.
 - a. Cove base vertical areas in particular may require sanding.

- C. Topcoats:
 - 1. A minimum of two topcoats shall be applied to the floor and cove base systems. Additional coats shall be applied as required to produce the required uniform smooth finish.
 - 2. Acceptable finished surface will resemble a medium orange peel texture.
- D. Expansion and Isolation Joint Treatment: At substrate expansion and isolation joints, comply with resinous flooring manufacturer's written instructions.
- E. Curing: Cure resinous flooring materials in compliance with manufacturer's directions, taking care to prevent contamination during stages of application and prior to completion of curing process. Close area of application for a minimum of 18 hours.
- F. Cove Base: Install integral 6 inch high cove base with one inch radius coves at floor to wall joints.
- G. Clean spills and smudges from adjacent surfaces, as installation proceeds, using Manufacturer's approved methods and cleaning materials.

3.5 FIELD QUALITY CONTROL

- A. Field Tests:
 - 1. See Section 09 0503 'Flooring Substrate Preparation' for Field Testing for Alkalinity and Concrete Moisture of concrete slab.
 - 2. Before application of seal coats, Architect may have independent Testing Agency take one inch diameter cores of system at locations determined by Architect and Owner.
- B. Field Inspections:
 - 1. Retain empty containers in which primary materials were received at job site for verification by Architect that sufficient materials were used to provide coverage and thickness specified.
- C. Non-Conforming Work:
 - 1. Replace or add additional flooring material to areas not meeting specified thickness.
 - 2. Repair test core locations.
 - 3. Correctional and repair procedures shall be at no additional cost to Owner.
 - 4. Restore damage and wear during other phases of construction to original conditions without additional cost to Owner.

3.6 CLEANING

- A. General:
 - 1. Clean up mixing and application equipment immediately after use as per Manufacturer's recommendations.
 - 2. Clean spills and smudges from adjacent surfaces, as installation proceeds, using Manufacturer's approved methods and cleaning materials.
- B. Waste Management:
 - 1. Safe and proper disposal of excess materials shall be done in accordance with applicable federal, state, and local codes.

3.7 PROTECTION

- A. Protect installed flooring system from damage and wear during other phases of construction until Substantial Completion using temporary covering adequate to prevent damage. Temporary covering shall comply with manufacturer's recommendations for protective materials and method of application. Remove temporary covering just before final inspection.

END OF SECTION

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

- A. Section Includes But Is Not Limited To:
 - 1. Coordination, sequencing, and scheduling installation of Owner-Furnished carpet, carpet base, carpet accessories, leveling compounds as described in Contract Documents and including following:
 - a. Maintain Building Ambient Conditions including normal levels of humidity, lighting, heating, and air conditioning for acceptability for beginning floor preparation and carpet installation.
 - b. Protection of carpet after installation of carpeting as required.
- B. Related Requirements:
 - 1. Section 01 1200: 'Multiple Contract Summary' for carpet and carpet base excluded from Contract and furnished and installed by Owner. This Section establishes quality of materials and installation for information of Contractor, Architect, and Owner's Representatives.
 - 2. Section 03 3111: 'Cast-In-Place Structural Concrete' for provision of acceptable concrete substrate.
 - 3. Section 09 0503: 'Flooring Substrate Preparation' for:
 - a. Floor substrate preparation.
 - b. Pre-installation conference for Sections under 09 6000 heading 'Flooring'.
 - 4. Section 09 6513: 'Resilient Base And Accessories' for resilient base.

1.2 REFERENCES

- A. Association Publications:
 - 1. The Carpet and Rug Institute (CRI), Dalton, GA www.carpet-rug.org. Standard for Installation Specification of Commercial Carpet:
 - a. CRI Indoor Air Quality (IAQ):
 - 1) CRI Green Label Plus Certification.
- B. Reference Standards:
 - 1. The Carpet and Rug Institute (CRI):
 - a. CRI 104, 'Standard For Installation of Commercial Carpet' (Sept 2015).
 - b. CRI TM-102, 'School Carpet Minimum Average Specifications'.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate completion of carpet installation with other trades.
- B. Pre-Installation Conference:
 - 1. Participate in MANDATORY pre-installation conference as specified in Section 09 0503.
 - 2. Schedule pre-installation conference before installation of flooring system.
 - 3. Conference may be held at project site or another convenient site. Participants may also attend by video or audio conference if approved by Project Manager.
 - 4. Schedule conference after substrate preparation and ONE (1) week before installation of flooring system.
 - 5. In addition to agenda items specified Section 01 3100 and Section 09 0503, review following:
 - a. Review Owner's Representative schedule for furnishing and installation carpet.

- b. Review Flooring Manufacturer's installation conditions verification procedure and requirements.
 - c. Review Building Ambient Conditions including normal levels of humidity, lighting, heating, and air conditioning for acceptability for beginning floor preparation and carpet installation.
 - d. Review cleaning and disposal requirements.
 - e. Review protection requirements of carpet after installation of carpeting.
- C. Scheduling:
 - 1. Notify Flooring Installer when Building Ambient Conditions requirements are met before installation of flooring system.
 - 2. Notify Owner's Representative to coordinate installation of carpet.

1.4 SUBMITTALS

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

1.5 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. All products provided will meet requirements of all federal, state, and local codes having jurisdiction.
 - 2. Label meeting Federal Labeling Requirements, as stated in Textile Products Identification Act under Federal Trade Commission, shall be attached to certification samples and products delivered.
- B. Qualifications: Section 01 4301 applies, but is not limited to following:
 - 1. Carpet Installer Qualifications:
 - a. Certified CFI Master or Contract II grade installer or FCIB certified.
 - b. Not less than five (5) years of experience in installation of commercial carpet tile of type, quantity and installation methods similar to work of this section.
 - c. Qualified and approved by Carpet Manufacturer.
 - 2. Carpet Manufacturer Qualifications:
 - a. Not less than five (5) years of production experience, whose published literature clearly indicates general compliance of products with requirements of this section.
 - b. Category One Approved Carpet Manufacturers:
 - 1) Approval subject to agreement process approval.

1.6 DELIVERY, STORAGE, AND HANDLING

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

1.7 FIELD CONDITIONS

- A. Ambient Conditions:
 - 1. Building Conditions:
 - a. Conditions inside building shall be brought to levels to be normal at occupancy of building. Conditions include normal levels of humidity, lighting, heating, and air conditioning. (HVAC must be in operation thru out carpet installation):
 - 1) Carpet installation is not to begin until HVAC system is operational and following conditions are maintained for at least forty-eight (48) hours before, during and seventy-two (72) hours after completion:
 - a) Carpet is to be installed when indoor temperature is between 65° - 95° F (18° - 35° C) with maximum relative humidity of 65%.
 - b) Substrate surface temperature should not be less than 65° F (18° C) at time of installation.
 - c) Do not allow temperature of indoor carpeted areas to fall below 50° F (10° C), regardless of age of installation.
 - 2) Maintain fresh air ventilation after installation for seventy-two (72) hours minimum or until lingering odors are gone.
 - 2. Concrete Slab:
 - a. General:
 - 1) Do not install carpet over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive.

1.8 WARRANTY

- A. Manufacturer Warranty:
 - 1. Provide Carpet Manufacturer's standard Warranty which includes following:
 - a. Warranty shall cover defects in installation, workmanship, and installation materials.
 - b. Warranty includes specific workmanship warranties for delamination, edge raveling, fuzzing, pilling, and other textural changes which can be controlled through proper manufacturing (no fraying, zippering, delamination, edge raveling, fuzzing, pilling in carpet is acceptable for any reason).
 - c. Warranty terms will include inspection of defective area within fifteen (15) days of receipt of written notice from Owner and completion of corrective work within forty-five (45) days, unless other arrangements are made in writing with Owner on case-by-case basis.
 - d. Carpet defect or installation defect:

- 1) Carpet Manufacturer may use any reasonable means to cure first three (3) breaches of warranty affecting an area of carpeting bounded by natural breaks such as doorways, ('affected carpet area'). Such cure must preserve as uniform a blended appearance, acceptable to Carpet Manufacturer and Owner, as exists throughout Installation Site at time of breach.
- 2) If carpet defect or installation defect continues to appear after three (3) separate notices for correction from Owner, replace carpet where defects have occurred.
- e. If Carpet Manufacturer follows installation requirements of Section 09 0503 'Floor Substrate Preparation' Carpet Manufacture accepts liability of carpet installation for said given time as outlined in Special Warranty regardless of any climate or condition changes affecting RH levels of floor substrate.
2. Special Warranty:
 - a. Sheet Carpeting:
 - 1) General:
 - a) Appearance Retention to be provided with Special Warranty requirements if not already included in Standard Warranty.
 - 2) Bishop's Storehouse, Deseret Industries:
 - a) Office Areas:
 - (1) Owner Carpet Program Product: Provide fifteen (15) year minimum or Carpet Manufacturer's better Warranty on carpet system.
 - b) Retail Space:
 - (1) Owner Carpet Program Product: Provide ten (10) year minimum or Carpet Manufacturer's better Warranty on carpet system.

PART 2 - PRODUCTS

2.1 OWNER-FURNISHED PRODUCTS

- A. Category One Approved Manufacturers. See Section 01 6200 for definitions of Categories:
 1. Materials supplied for carpet installation shall be complete package from specified Carpet Manufacturer:
 - a. Tandus Centiva., Dalton, GA www.tandus-centiva.com.
 - 1) Contact Information: Tracy Riddle - cell (801) 580-5147 fax (866) 861-7522
Tracy.Riddle@Tarkett.com.
- B. Materials:
 1. Carpet:
 - a. Category One Approved Manufacturer and Color / Patterns. See Section 01 6200 for definitions of Categories:
 - 1) Tandus Centiva: Style: 04346 Ensign II, Color: DI 86172.
 - 2) Field verify to match existing and current DI Standard
 2. Carpet Base:
 - a. 4-1/2 inch (115 mm) wide base without cushion backing:
 - 1) Top edge of base serged with 1-1/4 inch (32 mm) polyester binding fabric.
 - 2) Roll edges of binding fabric under and sew along top edge of carpet cove base.
 - b. Category One Approved Products, Style, and Color. See Section 01 6200 for definitions of Categories:
 - 1) Tandus Centiva: Style: 04346 Ensign II, Color: DI 86172.
 - 2) Field verify to match existing and current DI Standard

2.2 ACCESSORIES

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

PART 3 - EXECUTION

3.1 APPROVED INSTALLER

- A. Category One Approved Installer. See Section 01 6200 for definitions of Categories:
 - 1. Flooring Services Inc., Sandy, UT www.flooringservices.com.
 - a. Contact Marie Davis, Account Manager, office (801) 487-3600, cell (801) 631-9152 email marie@flooringservices.com.

3.2 EXAMINATION

- A. Verification of Conditions:
 - 1. Verify required ambient conditions inside building for required normal levels of humidity, lighting, heating, and air conditioning have been maintained for at least forty-eight (48) hours before and during carpet installation and seventy-two (72) after installation of carpet.
- B. Evaluation And Assessment:
 - 1. Carpet Areas:
 - a. Variation In Grade:
 - 1) Plus or minus **1/8 inch (3 mm)** in any **10 foot (3 meter)** of floor slab and distance between high point and low point of slab of **1/2 inch (13 mm)**.
 - b. Testing Procedure:
 - 1) Place ends of straightedge on **3/8 inch (10 mm)** high shims.
 - 2) Floor is satisfactory if **1/4 inch (6 mm)** diameter steel rod rolled under straightedge will not touch anywhere along **10 foot (3 meter)** length and **1/2 inch (13 mm)** diameter steel rod will not fit under straightedge anywhere along **10 foot (3 meter)** length.
 - c. Notify Owner's Representative in writing if floor surface is not acceptable to install carpet:
 - 1) Do not lay carpet over unsuitable surface. Commencing installation constitutes acceptance of floor and approval of existing conditions.

3.3 PREPARATION

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

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

3.4 INSTALLATION

A. Carpet:

1. General:

- a. Install carpet and carpet base in accordance with 'CRI Carpet Installation Standard' and Manufacturer's written instructions supplied with product.
- b. Adhesion of carpet cushion (or secondary backing) to floor substrate and adhesion of carpet primary and secondary backings shall be continuous on floor surface so there are no bubble, ridges, or any separation of carpet from backings or backing from floor substrate caused by failure of carpet, backings or cushion, and adhesives as a system.
- c. Install carpet under edge of metal thresholds where possible. Use specified carpet accessories at exposed edges.

2. Seaming Requirements:

- a. Seal seams in accordance with Carpet Manufacturer's instructions and according to CRI Carpet Installation Standard (2009) as applicable. Seam carpet base only at inside corners.
- b. No seam separation in carpet and no more observable seams from any standing position than that which is unavoidable using best seaming materials and practices available at time of installation.
- c. Lay rooms parallel to respective Corridors. Seam to permit best use of available carpet.
- d. Quarter turning allowed only at cross-Corridors longer than **24 feet (7.315 m)**.
- e. Use single or double seams at doorways (single seams preferred). Run nap of pieced carpet in same direction.

B. Carpet Base:

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

3.5 FIELD QUALITY CONTROL

A. Field Inspections:

1. Carpeting:

- a. Unacceptable carpet after installation shall include but not be limited to:
 - 1) Delaminating carpet from backings.
 - 2) Fiber loss less than specified.
 - 3) Edge raveling.
 - 4) Fuzzing of carpet fibers.
 - 5) Pilling of carpet fibers.
 - 6) Appearance retention less than control samples attached to Agreement.
 - 7) Dye bleeding.
 - 8) Zippering fibers in carpet.
 - 9) Color streaking.
 - 10) Irregular tufts of fiber.
- b. Unacceptable workmanship shall include but not be limited to:
 - 1) Improper floor preparation before installation.

- 2) Failure of adhesive to completely adhere carpet to floor resulting in bubbles, ridges, or ripples where carpet has separated from floor.
- 3) Seams that do not comply with specified requirements:
 - a) Raveled or untrimmed seams.
 - b) Seams not sealed, level, straight, or even.
 - c) Open seams.
 - d) Seams visibly open when viewed by Project Manager from standing position.
- 4) Sequence rolls, commercial match issues created by rolls being installed out of sequence will require correction or replacement.
- 5) Failure to properly install carpet next to walls and door frames to eliminate gaps or puckering of carpet.
- 6) Use of unspecified carpet.
- 7) Carpet base ends not finished to terminate at door frames or vertical trim shall have 45 degree angle 'birdsmouth' finish.
- 8) Adhesive exposed on carpet, on carpet base, beyond edges of carpet base, and on other surfaces of building.
- 9) Carpet base that is not scribed to fit against floor with no gaps.
- 10) Carpet base attached by means other than acceptable carpet base adhesive.

B. Non-Conforming Work:

1. Carpeting:

a. Basis of Acceptable Carpeting: Source Quality Control Testing:

- 1) Carpet products not meeting Design Criteria and Source Quality Control Testing of this specification will be considered unacceptable carpeting.

b. Unacceptable Carpeting:

- 1) Unacceptable carpeting will be rejected and shall be repaired or replaced at no additional cost to Owner. Owner's Representative will determine reasonable location of acceptable transition points for removal of unacceptable carpet. Minimum replacement size shall be:
 - a) Between nearest existing seams.
 - b) Between natural transition points or 12 feet (3.6 meters) of running length.

3.6 ADJUSTING

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

3.7 CLEANING

A. General:

1. Carpeting:

a. Carpet Installer's Responsibility:

- 1) Remove any soiling and/or staining from carpet.
- 2) Remove excessive adhesive with manufacturer recommended adhesive removers.

B. Damage to building:

1. Carpeting:

a. Carpet Installer's Responsibility:

- 1) Carpet Installer responsible for cleaning and repair of all damaged surfaces to their original condition from carpet installation.

C. Waste Management:

1. Contractor's Responsibility:

- a. Provide adequate waste receptacles (dumpsters) and dispose of Owner Furnished materials from building and property as specified in Section 01 7400.

2. Carpet Installer's Responsibility:

- a. All work areas are to be kept clean, clear and free of debris at all times.

- b. Disposal of rubbish, wrapping paper, scraps, and trimmings in provided dumpster(s).

3.8 PROTECTION

A. Protection of Carpeting:

1. Contractor's Responsibility:

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

END OF SECTION

SHEET CARPETING DESIGN CRITERIA (Back Cushion, Direct Glue)

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Design Criteria Requirements of Owner-Furnished carpet and carpet base as specified in Section 09 6816: 'Sheet Carpeting' in contract documents of Church Specifications:
 - a. Design Criteria Requirements are not included in Project Manual Specifications for site adapted Church Projects.
- B. Related Requirements:
 - 1. Section 09 6813: 'Tile Carpeting'.
 - 2. Section 09 6816: 'Sheet Carpeting'.

1.2 REFERENCES

- A. Association Publications:
 - 1. The Carpet and Rug Institute (CRI), Dalton, GA www.carpet-rug.org. Standard for Installation Specification of Commercial Carpet:
 - a. CRI Indoor Air Quality (IAQ):
 - 1) CRI Green Label Plus Certification.
- B. Definitions:
 - 1. Adhesive: Substance that dries to film capable of holding materials together by surface attachment.
 - 2. Antimicrobial: Chemical treatment added to carpet or reduce growth of common bacteria, fungi, yeast, mold and mildew.
 - 3. Appearance Retention: Ability of a fabric to retain its original aesthetics, color, and construction integrity.
 - 4. Backing: Materials comprising back of carpet as opposed to carpet pile or face.
 - a. Tufted carpets: (1) Primary backing, woven or nonwoven fabric in which pile yarn is inserted by tufting needles. (2) Secondary backing, Fabric laminated to back of carpet to reinforce and increase dimensional stability.
 - b. Woven carpets: Backings are 'construction yarns' comprising chain warp, stuffer warp, and shot or fill, which are interwoven with face yarn during carpet fabric formation.
 - 5. Backing Fabric: Fabric into which pile yarn is inserted or reinforcing layer that is adhered to reverse side of fabric.
 - 6. Bonding Agent (Backcoating): Application of latex or adhesive to back of carpet to anchor tufts usually followed immediately by addition of secondary backing material such as nonwoven polypropylene or poly-urethane attached cushion.
 - 7. Carpet: Heavy fabric used to cover floor and made from variety of fibers.
 - 8. Change In Surface Appearance: Cumulative change in surface appearance between unexposed and exposed specimens due to crushing, loss of tuft definition, and matting.
 - 9. Colorfastness: Ability of fiber or carpet to retain color when exposed to (1) ultraviolet light, (2) crocking (wet or dry) and (3) atmospheric conditions.
 - 10. Commercial Match: Matching of colors with acceptable tolerance, or with color variation that is barely detectable to naked eye.
 - 11. Crockfastness: Resistance of transfer of colorant from surface of colored yarn or fabric to another surface, or to an adjacent area of same fabric, principally by rubbing.
 - 12. Crushing: Collapsing of pile yarns, resulting in carpet matting and loss of resilience due to traffic.
 - 13. Delamination: Form of deterioration of tufted carpet in which primary back and face yarns separate from secondary back.

14. Density: Amount of pile yarn per area of carpet or closeness of tufts. Higher density carpet improves resistance to crushing and matting.
15. Dimensional Stability: Ability of carpet to retain its size and shape once installed.
16. Face Weight: Total weight of face (above backing) yarns in carpet.
17. Fiber: Fundamental unit of carpet made from nylon, polyester, cotton, acrylics, wool, and recycled material.
18. Flammability: Procedures that have been developed for assessing flame resistance of carpets.
19. Foot Traffic Classification: Process that classifies areas of intended use and minimum carpeting texture appearance for particular areas of use established for each application based on level of expected foot traffic in specific areas. Classifications are Moderate, Heavy and Severe.
20. Fuzzing: Fluffy particles appear on carpet surfaces caused by fibers that loosen because of weak twist or snags.
21. Lightfastness: Degree of resistance of dyed textile materials to color destroying influence of sunlight.
22. Loss of Tuft Definition: Bursting, opening, and untwisting of pile yarn and/or decrimping of fibers in surface pile of pile yarn floor covering.
23. Matting: Loss of pile definition of a textile floor covering due to entanglement and compression of pile fibers.
24. Modification Ratio: Ratio between circumference of inner core of multi lobar fiber's cross section, and circumference of circle drawn around outer edges of fibers cross sections' outer lobes or tips.
25. Pile: Visible surface of carpet, consisting of yarn tufts in loop and/or cut configuration. Sometimes called face or nap.
26. Relative Humidity (RH) Testing: Testing of concrete slabs is defined as ratio of actual amount of water vapor present in volume of air at given temperature to maximum amount that air could hold at that temperature, expressed as percentage.
 - a. Relative Humidity test method covers quantitative determination of percent relative humidity in concrete slabs for field or laboratory tests.
 - b. Moisture test results indicate moisture condition of slab only at time of test.
27. Resilience: Ability of carpet to spring back to its original texture and thickness after being walked on or compressed weight of furniture.
28. Soil Resistance: Ability of carpet fiber to resist dry soil and maintain its original appearance after intermittent or restorative cleanings.
29. Soiling: Occurs when dirt particles build up in carpet fibers.
30. Stain Resistance: Ability of carpet fiber to resist absorption of stain and maintain its original appearance.
31. Texture: Visual and tactile surface characteristics of carpet pile, including such aesthetic and structural elements.
32. Tile: Carpet module usually 18 inch x 18 inch or 24 inch x 24 inch (450 mm x 450 mm or 600 mm x 600 mm) in size. Extremely dense construction with heavy reinforced backing.
33. Tuft: Cluster of yarns drawn through fabric and projecting from surface in form of cut yarns or loops.
34. Tuft Bind: Force (usually measured in pounds) required to pull tuft from carpet backing.
35. Tufted Carpet: Carpet produced by tufting machine instead of loam.
36. Twist: Winding of yarn around itself. More twist improves carpet performance (especially in cut pile).
37. Woven Carpet: Carpet produced on a loom through weaving process by which lengthwise (warp) yarns and widthwise (weft or filling) yarns are interlaced to form fabric.
38. Woven: Interlacing strands of fiber into yarn forms woven carpet.
39. Yarn: Fibers that are twisted together to form a continuous strand.

C. Reference Standards:

1. American Association of Textile Chemists and Colorists (AATCC):
 - a. Test Method:
 - 1) AATCC 16.3-2014, 'Colorfastness to Light: Xenon-Arc'.
 - 2) AATCC 107-2013, 'Colorfastness to Water'.
 - 3) AATCC 134-2011, 'Electrostatic Propensity of Carpets'.
 - 4) AATCC 165- 2013, 'Colorfastness to Crocking: Textile Floor Coverings--Crockmeter Method'.
 - 5) AATCC 174-2011, 'Antimicrobial Activity Assessment of Carpets'.
 - 6) AATCC 175-2013, 'Stain Resistance: Pile Floor Coverings'.

2. ASTM International:
 - a. ASTM D1335-17, 'Standard Test Method for Tuft Bind of Pile Yarn Floor Coverings'.
 - b. ASTM D2646-18, 'Standard Test Methods for Backing Fabric Characteristics of Pile Yarn Floor Coverings'.
 - c. ASTM D3676-13, 'Standard Specification for Rubber Cellular Cushion Used for Carpet or Rug Underlay'.
 - d. ASTM D3936-17, 'Standard Test Method for Resistance to Delamination of the Secondary Backing of Pile Yarn Floor Covering'.
 - e. ASTM D5116-17, 'Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions From Indoor Materials/Products'.
 - f. ASTM D5252-15, 'Standard Practice for the Operation of the Hexapod Drum Tester'.
 - g. ASTM D5848-10, 'Standard Test Method for Mass Per Unit Area of Pile Yarn Floor Coverings'.
 - h. ASTM D6962-17, 'Standard Practice for Operation of a Roller Chair Tester for Pile Yarn Floor Coverings'.
 - i. ASTM D7330-15, 'Standard Test Method for Assessment of Surface Appearance Change in Pile Floor Coverings Using Standard Reference Scales'.
 - j. ASTM E648-17a, 'Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source'.
 - k. ASTM E662-17a, 'Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials'.
3. British Spill Test:
 - a. Test with protocol but not standardized test (Developed several years ago by West End Medical Association in Great Britain and since has been adopted by several U.S. Manufactures).
4. International Organization for Standardization (ISO).
 - a. ISO 2551:1981, 'Machine-made textile floor coverings - Determination of dimensional changes due to the effects of varied water and heat conditions'.
5. National Fire Protection Association (NFPA):
 - a. NFPA (Fire) 253, 'Standard Method of Test for Critical Radiant Flux of Floor Covering Systems using a Radiant Heat Energy Source' (2015 Edition).
6. The Carpet and Rug Institute (CRI):
 - a. CRI 104, 'Standard For Installation of Commercial Carpet' (Sept 2015).
 - b. CRI TM-101, 'Assessment of Carpet Surface Appearance Change using the CRI Reference Scales'.
 - c. CRI TM-102, 'School Carpet Minimum Average Specifications'.

1.3 SUBMITTALS

- A. Informational Submittals:
 1. Test And Evaluation Reports:
 - a. Provide Source Quality Control testing as specified in this specification if requested by Owner.
 2. Sustainable Design Submittals:
 - a. Provide documentation for compliance of Product Data for Credit EQ 4.3 if requested by Owner:
 - 1) For carpet and cushion, documentation indicating compliance with testing and product requirements of CRI's "Green Label Plus" program.

1.4 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 1. All products provided will meet requirements of all federal, state, and local codes having jurisdiction.
 2. Label meeting Federal Labeling Requirements, as stated in Textile Products Identification Act under Federal Trade Commission, shall be attached to certification samples and products delivered.

PART 2 - PRODUCTS

2.1 OWNER-FURNISHED PRODUCTS

- A. Category One Approved Manufacturers. See Section 01 6200 for definitions of Categories:
 - 1. Materials supplied for carpet installation shall be complete package from specified Carpet Manufacturer:
 - a. Lees, Division of Mohawk Carpets, Glasgow, VA:
 - 1) Contact Information: Help Line (800) 523-5555 or (801) 397-5626.
 - b. Mannington Commercial Carpets, Calhoun, GA:
 - 1) Contact Information: Help Line Voice Mail (800) 241-2262, ext 8045 or Mannington Installation Services, email lds@mannington.com or (855) 466-2664.
 - c. Tandus Centiva: Dalton, GA www.tandus-centiva.com.
 - 1) Contact Information: Tracy Riddle - cell (801) 580-5147 fax (866) 861-7522
Tracy.Riddle@Tarkett.com.
- B. Design Criteria:
 - 1. General:
 - a. Commercial Match:
 - 1) Colors, texture and pile of any product selected as carpet standard or custom designed specifically for Owner needs to be consistent in appearance.
 - 2) When new carpet is installed next to existing carpet, two pieces need to be within tolerance acceptable as commercial match (Two shade variations maximum).
 - 3) Regardless of reason, if commercial match is not achievable, existing carpet needs to be replaced to acceptable breaking point approved by Owner's Representative.
 - 4) If changes in supply chains or unforeseen circumstances require standard pattern to be re-engineered, new carpet must be made close to original as possible.
 - 5) New product must be approved by Owner.
 - b. Compatibility:
 - 1) Materials supplied for carpet installation shall be complete package from specified Carpet Manufacturer. Do not mix items from material packages of different carpet Manufacturers.
 - 2) Provide carpet, seam sealers, adhesives, and other related materials that are compatible with one another and with substrates under conditions of service and application.
 - c. Tested Products:
 - 1) New technology and products not allowed unless pre-approved by Owner.
 - 2. Carpet Material Requirements:
 - a. Carpet Backing:
 - 1) Broadloom - Attached Cushion.
 - a) Manufacturer's preference that meets or exceeds specification and life cycle warranty expectation.
 - b. Cushion Thickness:
 - 1) Attached cushion thickness shall be 0.10 inch minimum when tested in accordance with ASTM D3676.
 - c. Fiber:
 - 1) Meetinghouse, Mission Office, and O&M / R&I:
 - a) Antron Lumina and/or Legacy only.
 - 2) CES, S&I Module, and O&M / R&I:
 - a) Institute:
 - (1) Antron Lumina and/or Legacy only.
 - b) Seminary:
 - (1) Antron Lumina and/or Legacy only.
 - c) Antron Lumina and/or Legacy only.
 - 3) Bishop's Storehouse, Deseret Industries:
 - a) Office Areas:
 - (1) Antron Lumina and/or Legacy only.
 - b) Retail Space:
 - (1) Antron Lumina and/or Legacy only.

- d. Life Expectancy (Sheet Carpeting):
 - 1) Meetinghouse, Mission Office, and O&M / R&I: twenty (20) years minimum.
 - 2) CES, S&I Module, and O&M / R&I:
 - a) Institute: twenty-five (25) years minimum.
 - b) Seminary: twenty-five (25) years minimum.
 - 3) Bishop's Storehouse, Deseret Industries:
 - a) Office Areas: fifteen (15) years minimum.
 - b) Retail Space: ten (10) years minimum.
- e. Modification Ratio:
 - 1) Meetinghouse, Mission Office, and O&M / R&I: 1.5 or less.
 - 2) CES, S&I Module, and O&M / R&I:
 - a) Institute: 1.5 or less.
 - b) Seminary: 1.5 or less.
 - 3) Bishop's Storehouse, Deseret Industries:
 - a) Office Areas: 1.5 or less.
 - b) Retail Space: 1.5 or less.
- f. Pile Yarn Floor Construction:
 - 1) Meet standard for average pile yarn weight tested under ASTM D5848.
 - a) Carpet will retain eighty-five (85) percent of these amounts at end of the warranty period.
- 3. Carpet Physical Performance:
 - a. Appearance Retention Requirements:
 - 1) Foot Traffic Classification and Testing Requirements:
 - a) Severe Traffic Criteria:
 - (1) Carpet is to be tested in accordance to ASTM D5252 with an Actionbac secondary backing meeting short term cycles (4000) grading scale of 3.5 and long-term cycles (12000) grading scale of 3.5 with appearance retention measured according.
 - (2) Carpet needs to be able to maintain 3.5 rating for eighty-five (85) percent of its warranty expected life cycle in accordance to ASTM D7330.
 - 2) Severe Traffic:
 - a) Meetinghouse, Mission Office, and O&M / R&I.
 - b) CES, S&I Module, and O&M / R&I.
 - c) Bishop's Storehouse, Deseret Industries:
 - (1) Office Areas.
 - (2) Retail Space.
 - b. British Spill Test:
 - 1) Carpet must pass British Spill Test (formally known as the National Health Service Patient Area Requirement for the United Kingdom, Method E: Part 2):
 - a) Test involves controlled spilling of blue dyed liquid from 1-meter (39 inches) height onto carpet product.
 - b) Spill is allowed to stand for period of twenty-four (24) hours, after which cuts are made through carpet in area of spill to establish whether there was penetration into or through carpet composite.
 - c. Colorfastness:
 - 1) Colorfastness to Crocking: AATCC 165:
 - a) Color transfer Class 4 minimum, wet and dry, when tested as specified.
 - 2) Colorfastness to Light: AATCC 16.3:
 - a) Not less than 4 after 40 AFU (AATCC fading units). Colorfastness to Light, Xenon-Arc (60 AFU) (AATCC Fading Unit).
 - 3) Colorfastness to Water: AATCC 107:
 - a) Color transfer Class 4 minimum, AATCC Transference Scale (only yarn dyed carpets) (grade change in color and staining).
 - d. Compression Resistance and Compression Set Attached Cushion:
 - 1) Minimum CLD of 7 lb per cu in (0.194 kg per cu cm) at 25 percent deflection, and maximum compression set of 10 percent after 50 percent constant compression when tested in accordance with ASTM D3676 with modification to allow recovery at 158 deg F (70 deg C) instead of room temperature for thirty (30) minutes.
 - e. Critical Radiant Flux (CRF):

- 1) Meet requirements of ASTM E648 Standard Test Method - Minimum Class 1 Critical Radiant Flux (CRF) of 0.45 watts/cm² or greater when tested in accordance with flooring radiant panel test using ASTM E648 Standard Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source as the test method.
- f. Delamination:
 - 1) Resistance to Delamination (Actionbac secondary backing): Not less than 3.5 lbf/in (15 N/mm) when tested in accordance with ASTM D3936.
 - 2) Resistance to Delamination (Attached Cushion): Not less than 15,000 cycles when tested in accordance with ASTM D6963.
- g. Dimensional Stability:
 - 1) 0.2 percent or less when tested in accordance with ISO 2551, 'Dimensional Stability (Aachen Test)'.
- h. Dry Breaking Strength:
 - 1) Not less than 100 lbs (445 N) when tested in accordance with ASTM D2646.
- i. Electrostatic Propensity of Carpets:
 - 1) Electrostatic shock propensity with maximum 3.5 kV when tested in accordance with AATCC 134, 'Step Method'.
- j. Flammability and Smoke Resistant:
 - 1) Smoke Density:
 - a) Smoke density generated from carpet and backing must not exceed 450 when tested in the flaming mode using ASTM E662, 'Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials'.
 - or
 - b) NFPA 258, 'Standard Research Test Method for Determining Smoke Generation of Solid Materials as test methods'.
- k. Indoor Air Quality (IAQ):
 - 1) CRI Test Program ASTM D5116.
 - 2) Method for determination of VOC emitted from carpet using specific sorbent tube and thermal desorption/gas chromatography as per ASTM 7339.
 - 3) Carpet, adhesives, and seam sealers shall be VOC compliant as certified with CRI Indoor Air Quality Carpet Testing Program Green Label Plus or tested for compliance to meet the CRI IAQ Carpet Testing Program requirements and criteria as per ASTM D5116 CRI Test Program.
- l. Soil Resist Treatment:
 - 1) Minimum average of 350 ppm fluorine on the pile fiber when 3 separate tests are conducted in accordance with CRI TM-102 test method.
 - 2) Installed carpet shall exhibit stain resisting ability equal to or exceeding that of any other premium carpet available at time of manufacture allowing removal of most foreign substances using generally accepted cleaning procedures and more aggressive cleaning procedures for stubborn stains without leaving any more visible stain and/or change in color than the most stain resistant premium carpet available at time of manufacture.
- m. Stain Resistance:
 - 1) Minimum stain resistance rating of 8 when tested in accordance with AATCC 175, 'Stain Resistance: Pile Floor Coverings'.
- n. Tuff Bind (dry):
 - 1) Not less than 10 lbs (45 N) when tested in accordance with ASTM D1335.

2.2 SOURCE QUALITY CONTROL

- A. Tests:
 1. Carpet:
 - a. Appearance Retention Rating:
 - 1) Hexapod Test Method: ASTM D5252.
 - 2) Grading: ASTM D7330.
 - b. Antimicrobial Activity: AATCC 174.
 - c. British Spill Test: Test Protocol.
 - d. Colorfastness:

- 1) Crocking: AATCC 165.
- 2) Light: AATCC 16.3.
- 3) Water: AATCC 107.
- e. Delamination: ASTM D3936 and ASTM D6962.
- f. Dimensional Stability: ISO 2551.
- g. Dry Breaking Strength: ASTM 2646.
- h. Electrostatic Propensity of Carpets: AATCC 134.
- i. Flame and Smoke Resistant. Provide carpet complying with ratings as indicated for following:
 - 1) Flooring Radiant Panel Test (Critical Radiant Flux), ASTM E648, NFPA 253.
 - 2) Smoke Density Test: ASTM E662.
- j. Indoor Air Quality:
 - 1) ASTM 7339.
 - 2) Indoor Air Quality: CRI Test Program ASTM D5116.
- k. Pile Yarn Weight: ASTM D5848.
- l. Soil Resist Treatment: CRI TM-102.
- m. Stain Resistance: AATCC 175.
- n. Turf Bind: ASTM D1335.
2. Attached Backing:
 - a. Carpet Backing: ASTM D3676.
 - b. Compression Resistance (constant deflection): ASTM D3676.
 - c. Compression Set (constant force): ASTM D3676.
 - d. Cushion Density: ASTM D3676.
 - e. Cushion Thickness: ASTM D3676.

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

- A. Field Tests:
 1. Carpet Manufacturer is responsible that concrete slab Alkalinity and Concrete Moisture Vapor Emission Rate (MVER) Testing for each Project is within Carpet Manufacturer's acceptable levels.
- B. Field Inspections:
 1. Carpeting:
 - a. Unacceptable carpet after installation shall include but not be limited to:
 - 1) Delaminating carpet from backings.
 - 2) Fiber loss less than specified.
 - 3) Edge raveling.
 - 4) Fuzzing of carpet fibers.
 - 5) Pilling of carpet fibers.
 - 6) Appearance retention less than control samples attached to Agreement.
 - 7) Dye bleeding.
 - 8) Zippering fibers in carpet.
 - 9) Color streaking.
 - 10) Irregular tufts of fiber.
 - b. Unacceptable workmanship shall include but not be limited to:
 - 1) Improper floor preparation before installation.
 - 2) Failure of adhesive to completely adhere carpet to floor resulting in bubbles, ridges, or ripples where carpet has separated from floor.
 - 3) Seams that do not comply with specified requirements:
 - a) Raveled or untrimmed seams.
 - b) Seams not sealed, level, straight, or even.
 - c) Open seams.
 - d) Seams visibly open when viewed by Project Manager from standing position.
 - 4) Sequence rolls, commercial match issues created by rolls being installed out of sequence will require correction or replacement.

- 5) Failure to properly install carpet next to walls and door frames to eliminate gaps or puckering of carpet.
- 6) Use of unspecified carpet.
- 7) Carpet base ends not finished to terminate at door frames or vertical trim shall have 45 degree angle 'birdsmouth' finish.
- 8) Adhesive exposed on carpet, on carpet base, beyond edges of carpet base, and on other surfaces of building.
- 9) Carpet base that is not scribed to fit against floor with no gaps.
- 10) Carpet base attached by means other than acceptable carpet base adhesive.

C. Non-Conforming Work:

1. Carpeting:

a. Basis of Acceptable Carpeting: Source Quality Control Testing:

- 1) Carpet products not meeting Design Criteria and Source Quality Control Testing of this specification will be considered unacceptable carpeting.

b. Unacceptable Carpeting:

- 1) Unacceptable carpeting will be rejected and shall be repaired or replaced at no additional cost to Owner. Owner's Representative will determine reasonable location of acceptable transition points for removal of unacceptable carpet. Minimum replacement size shall be:
 - a) Between nearest existing seams.
 - b) Between natural transition points or 12 feet (3.6 meters) of running length.

END OF SECTION

SECTION 09 7720**DECORATIVE FIBERGLASS REINFORCED WALL PANELS (FRP)****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install decorative fiberglass reinforced wall panels (FRP) and trim in custodian rooms as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 09 2900: 'Gypsum Board'.
 - 2. Section 09 6513: 'Resilient Base And Accessories' for base.
 - 3. Section 09 6816: 'Sheet Carpeting' for installation of resilient base and accessories.
 - 4. Section 22 4216: 'Commercial Lavatories And Sinks' for furnishing and installation of Wall Guards at service sink attached to FRP panels.

1.2 REFERENCES

- A. Association Publications:
 - 1. U.S. Department of Health and Human Services:
 - a. U.S. Public Health Service:
 - 1) Food and Drug Administration (FDA):
 - a) Food Code, '2013 Recommendations of the United States Public Health Service Food and Drug Administration'.
- B. Reference Standards:
 - 1. American National Standards Institute / National Electrical Manufacturers Association:
 - a. ANSI/NEMA LD 3-2005, 'High-Pressure Decorative Laminates (HPDL)'.
 - 2. ASTM International:
 - a. ASTM D256-18b, 'Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics'.
 - b. ASTM D570-98(2018), 'Standard Test Method for Water Absorption of Plastics'.
 - c. ASTM D638-14, 'Standard Test Method for Tensile Properties of Plastics'.
 - d. ASTM D790-17, 'Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials'.
 - e. ASTM D2583-13a, 'Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor'.
 - f. ASTM D5319-17, 'Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels'.
 - g. ASTM E84-18b, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
 - 3. Underwriters Laboratories, Inc.:
 - a. UL 723: 'Standard for Safety Test for Surface Burning Characteristics of Building Materials'; (11th Edition - 2018).

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate completion of resilient base and accessories installation with other trades.

1.4 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Manufacturer's literature or cut sheet for panel and adhesive.
 - b. Color and pattern selection.
 - 2. Sample:
 - a. Physical panel showing applied color selected.
 - b. Exposed molding and trim showing each type, finish, and color.
- B. Informational Submittals:
 - 1. Manufacturer Instructions:
 - a. Provide written instructions for following:
 - 1) Storage and handling requirements and recommendations.
 - 2) Preparation and installation instructions.
 - 3) Cleaning and maintenance instructions.
 - 2. Qualification Statement:
 - a. Installer:
 - 1) Provide Qualification documentation if requested by Architect or Owner.
- C. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Operations and Maintenance Data:
 - 1) Cleaning and maintenance instructions.
 - b. Warranty Documentation:
 - 1) Final, executed copy of Warranty.
 - c. Record Documentation:
 - 1) Manufacturers documentation:
 - a) Manufacturer's literature or cut sheet.
 - b) Color and pattern selection.

1.5 QUALITY ASSURANCE

- A. 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.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
 - 1. Materials shall be delivered in original, unopened packages with labels intact.
- B. Storage And Handling Requirements:
 - 1. Follow Manufacturer's instructions and precautions for storage of materials.
 - 2. Store panels and trim lying flat surface off of floor.

1.7 FIELD CONDITIONS

- A. Ambient Conditions:
 - 1. Building Conditions:
 - a. Conditions inside building shall be brought to levels to be normal at occupancy of building.

- 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.

1.8 WARRANTY

A. Manufacturer Warranty:

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

PART 2 - PRODUCTS

2.1 SYSTEM

A. Manufacturers:

1. Type One 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: 3.1×10^5 psi as per ASTM D790. (217.9 kilogram-force/square millimeter).
 - b) Flexural Strength: 1.0×10^4 psi as per ASTM D790. (7.0 kilogram-force/square millimeter).
 - c) Tensile Strength: 7.0×10^3 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 Molding with integral color:
 - a) White.
- h. Outside Corner Guard (Include if shown on Contract Drawings):
 - 1) Rigid Extruded PVC with integral color.
 - a) White.
- i. Base Molding:
 - 1) Resilient Base as specified and installed in Section 09 6513: 'Resilient Base And Accessories'.

2.2 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-250 Clear Silicone Sealant.
or
 - b. Marlite Brand MS-251 White Silicone Sealant.

PART 3 - EXECUTION

3.1 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.
 - 2. Repair defects prior to installation:
 - a. Level wall surfaces to panel manufacturer's requirements. Remove protrusions and fill indentations.

3.2 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.

3.3 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

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SECTION 09 9001**COMMON PAINTING AND COATING REQUIREMENTS****PART 1 - GENERAL****1.1 SUMMARY**

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

1.2 REFERENCES

- A. Definitions:
1. Damage Caused By Others: Damage caused by individuals other than those under direct control of Painting Applicator (MPI(a), PDCA P1.92).
 2. Gloss Levels:
 - a. Specified paint gloss level shall be defined as sheen rating of applied paint, in accordance with following terms and values, unless specified otherwise for a specific paint system.

Gloss Level '1'	Traditional matte finish - flat	0 to 5 units at 60 degrees to 10 units maximum at 85 degrees.
Gloss Level '2'	High side sheen flat - 'velvet-like' finish	10 units maximum at 60 degrees and 10 to 35 units at 85 degrees.
Gloss Level '3'	Traditional 'eggshell-like' finish	10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees.
Gloss Level '4'	'Satin-like' finish	20 to 35 units at 60 degrees and 35 units minimum at 85 degrees.
Gloss Level '5'	Traditional semi-gloss	35 to 70 units at 60 degrees.
Gloss Level '6'	Traditional gloss	70 to 85 units at 60 degrees.
Gloss Level "7"	High gloss	More than 85 units at 60 degrees.

3. Properly Painted Surface:
 - a. Surface that is uniform in appearance, color, and sheen and free of foreign material, lumps, skins, runs, sags, holidays, misses, strike-through, and insufficient coverage. Surface free of drips, spatters, spills, and overspray caused by Paint Applicator. Compliance will be determined when viewed without magnification at a distance of **5 feet (1.50 m)** minimum under normal lighting conditions and from normal viewing position (MPI(a), PDCA P1.92).
 4. Latent Damage: Damage or conditions beyond control of Painting Applicator caused by conditions not apparent at time of initial painting or coating work.
- B. Reference Standards:
1. The latest edition of the following reference standard shall govern all painting work:
 - a. MPI(a), 'Architectural Painting Specification Manual' by Master Painters Institute (MPI), as issued by local MPI Accredited Quality Assurance Association having jurisdiction.

1.3 ADMINISTRATIVE REQUIREMENTS

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

1.4 SUBMITTALS

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

1.5 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approval:

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

B. Qualifications:

1. Applicator: Requirements of Section 01 4301 applies, but not limited to following:
 - a. Minimum five (5) years experience in painting installations.
 - b. Minimum five (5) satisfactorily completed projects of comparable quality, similar size, and complexity in past three (3) years before bidding.
 - c. Maintain qualified crew of painters throughout duration of the Work.
 - d. Upon request, submit documentation.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery And Acceptance Requirements:

1. Deliver specified products in sealed, original containers with Manufacturer's original labels intact on each container.
2. Deliver amount of materials necessary to meet Project requirements in single shipment.

B. Storage And Handling Requirements:

1. Store materials in single place.
2. Keep storage area clean and rectify any damage to area at completion of work of this Section.
3. Maintain storage area at **55 deg F (13 deg C)** minimum.

1.7 FIELD CONDITIONS

A. Ambient Conditions:

1. Perform painting operations at temperature and humidity conditions recommended by Manufacturer for each operation and for each product for both interior and exterior work.
2. Apply painting systems at lighting level of 540 Lux (50 foot candles) minimum on surfaces to be painted.
 - a. Inspection of painting work shall take place under same lighting conditions as application.
 - b. If painting and coating work is applied under temporary lighting, deficiencies discovered upon installation of permanent lighting will be considered latent damage as defined in MPI Manual, PDCA P1-92.

PART 2 - PRODUCTS

2.1 SYSTEMS

A. Performance:

1. Design Criteria:
 - a. Provide materials for use within each coating system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - b. All materials, preparation and workmanship shall conform to requirements of 'Architectural Painting Specification Manual' by Master Painters Institute (MPI).
 - c. All paint manufacturers and products used shall be as listed under Approved Product List section of MPI Painting Manual.

- d. Provide Premium Grade systems (2 top coats) as defined in MPI Architectural Painting Specification Manual, except as otherwise indicated.
 - e. Where specified paint system does not have Premium Grade, provide Budget Grade.
 - f. Provide products of same manufacturer for each coat in coating system.
 - g. Where required to meet LEED (Leadership in Energy and Environmental Design) program requirements, use only MPI listed materials having an "L" rating designation.
 - h. Color Levels:
 - 1) Color Level II:
 - a) Number and placement of interior and exterior paint colors and gloss levels shall be as defined by Color Level II from MPI Manual, PDCA P3-93 as modified in following paragraph.
 - b) No more than one paint color or gloss level will be selected for same substrate within designated interior rooms or exterior areas.
- B. Materials:
- 1. Materials used for any painting system shall be from single manufacturer unless approved otherwise in writing by painting system manufacturers and by Architect. Include manufacturer approvals in Product Data submittal.
 - 2. Linseed oil, shellac, turpentine, and other painting materials shall be pure, be compatible with other coating materials, bear identifying labels on containers, and be of highest quality of an approved manufacturer listed in MPI manuals. Tinting color shall be best grade of type recommended by Manufacturer of paint or stain used on Project.

PART 3 - EXECUTION

3.1 APPLICATORS

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

3.2 EXAMINATION

- A. Verification Of Conditions:
- 1. Directing applicator to begin painting and coating work will indicate that substrates to receive painting and coating materials have been previously inspected as part of work of other Sections and are complete and ready for application of painting and coating systems as specified in those Sections.
- B. Pre-Installation Testing:
- 1. Before beginning work of this Section, examine, and test surfaces to be painted or coated for adhesion of painting and coating systems.
 - 2. Report in writing to Architect of conditions that will adversely affect adhesion of painting and coating work.
 - 3. Do not apply painting and coating systems until party responsible for adverse condition has corrected adverse condition.
- C. Evaluation And Assessment:
- 1. Report defects in substrates that become apparent after application of primer or first finish coat to Architect in writing and do not proceed with further work on defective substrate until such defects are corrected by party responsible for defect.

3.3 PREPARATION

- A. Protection Of In-Place Conditions:

1. Protect other finish work and adjacent materials during painting. Do not splatter, drip, or paint surfaces not intended to be painted. These items will not be spelled out in detail but pay special attention to the following:
 - a. Do not paint finish copper, bronze, chromium plate, nickel, stainless steel, anodized aluminum, or monel metal except as explicitly specified.
- B. Surface Preparation:
 1. Prepare surfaces in accordance with MPI requirements and requirements of Manufacturer for each painting system specified, unless instructed differently in Contract Documents. Bring conflicts to attention of Architect in writing.
 2. Fill minor holes and cracks in wood surfaces to receive paint or stain.
 3. Surfaces to be painted shall be clean and free of loose dirt. Clean and dust surfaces before painting or finishing.
 4. Do no exterior painting while surface is damp, unless recommended by Manufacturer, nor during rainy or frosty weather. Interior surfaces shall be dry before painting. Moisture content of materials to be painted shall be within tolerances acceptable to Paint Manufacturer.
 5. Sand woodwork smooth in direction of grain leaving no sanding marks. Clean surfaces before proceeding with stain or first coat application.

3.4 APPLICATION

- A. Interface With Other Work:
 1. Coordinate with other trades for materials and systems that require painting before installation.
 2. Schedule painting and coating work to begin when work upon which painting and coating work is dependent has been completed. Schedule installation of pre-finished and non-painted items, which are to be installed on painted surfaces, after application of final finishes.
- B. Paint or finish complete all surfaces to be painted or coated as described in Contract Documents, including but not limited to following items.
 1. Finish casework and wood trims that are specified to be installed under Section 06 2001 and that are not called out to be factory-or shop-finished. Back prime wood elements to be installed against concrete or masonry or that may be subjected to moisture.
 2. Paint mechanical, electrical, and audio/visual items that require field painting as indicated in Contract Documents. These include but are not limited to:
 3. Metal reveals at ceiling access doors.
 4. Paint inside of chases in occupied spaces flat black for 18 inches (450 mm) or beyond sightline, whichever is greater.
- C. Apply sealant in gaps 3/16 inch (5 mm) and smaller between two substrates that are both to be painted or coated. Sealants in other gaps furnished and installed under Section 07 9213.
- D. On wood to receive a transparent finish, putty nail holes in wood after application of stain using natural colored type to match wood stain color. Bring putty flush with adjoining surfaces.
- E. In multiple coat paint work, tint each succeeding coat with slightly lighter color, but approximating shade of final coat, so it is possible to check application of specified number of coats. Tint final coat to required color.
- F. Spread materials smoothly and evenly. Apply coats to not less than wet and dry film thicknesses and at spreading rates for specified products as recommended by Manufacturer.
- G. Touch up suction spots after application of first finish coat.
- H. Paint shall be thoroughly dry and surfaces clean before applying succeeding coats.
- I. Use fine sandpaper between coats as necessary to produce even, smooth surfaces.
- J. Make edges of paint adjoining other materials or colors clean, sharp, and without overlapping.

K. Finished work shall be a 'Properly Painted Surface' as defined in this Section.

3.5 FIELD QUALITY CONTROL

A. Non-Conforming Work:

1. Correct deficiencies in workmanship as required to leave surfaces in conformance with 'Properly Painted Surface,' as defined in this Section.
2. Correction of 'Latent Damage' and 'Damage Caused By Others,' as defined in this Section, is not included in work of this Section.

3.6 CLEANING

A. General:

1. As work proceeds and upon completion of work of any painting Section, remove paint spots from floors, walls, glass, or other surfaces and leave work clean, orderly, and in acceptable condition.

B. Waste Management:

1. Remove rags and waste used in painting operations from building each night. Take every precaution to avoid danger of fire.
2. Paint, stain and wood preservative finishes and related materials (thinners, solvents, caulking, empty paint cans, cleaning rags, etc.) shall be disposed of subject to regulations of applicable authorities having jurisdiction.
3. Remove debris caused by work of paint Sections from premises and properly dispose.
4. Retain cleaning water and filter out and properly dispose of sediments.

END OF SECTION

ATTACHMENTS**PART 4 - PAINT COLOR SCHEDULE**

- A. Related Requirements:
 - 1. Section 09 9123 'Interior Painted Gypsum Board-Plaster'.
 - 2. Section 09 9124 'Interior Painted Metal'.
 - 3. Section 09 9125 'Interior Wood Paint'.
 - 4. Section 09 9324 'Interior Clear-Finished Hardwood'.
- B. Category Four Colors. See Section 01 6200 for definitions of Categories:
 - 1. Interior:
 - a. Interior Walls in all other rooms except listed above: Color '1': SW 7005 Pure White by Sherwin Williams. (See Section 09 9122 for CMU walls and Section 09 9123 for Gypsum Board, Plaster).
 - b. Interior Door Frames, Railings, and Bale Bollards: SW 7065 Argos by Sherwin Williams. (See Section 09 9124):
 - c. Interior Clear Finished Wood (See Section 09 9324):
 - 1) Match other interior clear finished wood building elements.

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SECTION 09 9112**EXTERIOR PAINTED FERROUS METAL****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Preparing and painting new exterior ungalvanized iron and steel surfaces as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 09 9001: 'Common Painting And Coating Requirements':
 - a. Pre-installation conference for Sections under 09 9000 heading 'Paints and Coatings'.
 - b. 'Attachment: Paint Color Schedule' for Deseret Industries Projects.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conferences:
 - 1. Participate in pre-installation conference as specified in Section 09 9001.

PART 2 - PRODUCTS**2.1 SYSTEM**

- A. Manufacturers:
 - 1. Category Four Approved Products and Manufacturers. See Section 01 6200 for definitions of Categories:
 - a. Products listed in edition of MPI Approved Product List current at time of bidding and later are approved.
- B. Description:
 - 1. New Surfaces: Use MPI(a) EXT 5.1M Waterborne Light Industrial Coating system.
- C. Design Criteria:
 - 1. Systems specified are in addition to prime coats provided under other Sections of Project Manual.
 - 2. Finish Requirements: Use MPI Premium Grade finish requirements for work of this Section.
 - 3. Gloss / Sheen Level Required: Gloss Level 5.
- D. Materials:
 - 1. All paints and coatings.
 - a. Primer Coat: MPI Product 107, 'Primer, Rust-Inhibitive, Water Based'.
 - b. Finish Coats: MPI Product 163, 'Light Industrial Coating, Exterior, Water Based, Semi-Gloss (MPI Gloss Level 5).
 - 2. Traffic signage:
 - a. Green Performance Standard:
 - 1) Primer Coat: MPI Product 101, 'Primer, Epoxy, Anti-Corrosive, for Metal'.
 - 2) Finish Coats: MPI Product 77, 'Epoxy, Gloss (MPI Gloss Level 5).

PART 3 - EXECUTION

3.1 APPLICATION

- A. General: See appropriate paragraphs of Section 09 9001.
- B. New Surfaces: Clean metal to be painted of rust, mill scale, grease, oil, and welding spatters, burrs, flux, slag, and fume. If all traces of rust cannot be removed, apply rust blocker recommended by Paint Manufacturer before applying primer coat.

END OF SECTION

SECTION 09 9113**EXTERIOR PAINTED GALVANIZED METAL****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Preparing and painting new exterior exposed galvanized metal surfaces as Described in Contract Documents.
- B. Related Requirements:
 - 1. Section 09 9001: 'Common Painting And Coating Requirements':
 - a. Pre-installation conference for Sections under 09 9000 heading 'Paints and Coatings'.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conferences:
 - 1. Participate in pre-installation conference as specified in Section 09 9001.

PART 2 - PRODUCTS**2.1 SYSTEM**

- A. Manufacturers:
 - 1. Category Four Approved Products and Manufacturers. See Section 01 6200 for definitions of Categories.
 - a. Products listed in edition of MPI Approved Product List current at time of bidding and later are approved, providing they meet VOC requirements in force where Project is located.
- B. Description:
 - 1. Handrails And Exposed Miscellaneous Structural Steel:
 - a. New Surfaces: Use MPI(a) EXT 5.3D Pigmented Polyurethane Finish system.
 - 2. All Other:
 - a. New Surfaces: Use MPI(a) EXT 5.3H Latex Finish system.
- C. Performance:
 - 1. Design Criteria:
 - a. New Surfaces: MPI Premium Grade finish requirements.
 - b. Gloss / Sheen Level Required: Gloss Level 5.
- D. Materials:
 - 1. Polyurethane:
 - a. Vinyl Wash Primer Coat: MPI Product 80: 'Primer, Vinyl Wash'.
 - b. Finish Coats:
 - 1) Epoxy MPI Product 101: 'Primer, Epoxy, Anti-Corrosive, for Metal'.
 - 2) Polyurethane MPI Product 72: 'Polyurethane, Two-Component, Pigmented, Gloss (MPI Gloss Level 6-7)'.
 - 2. Latex:
 - a. Waterborne Primer Coat: MPI Product 134: 'Primer, Galvanized, Water Based'.
 - b. Finish Coats: MPI Product 11: 'Latex, Exterior Semi-Gloss (MPI Gloss Level 5)'.

PART 3 - EXECUTION**3.1 APPLICATION**

- A. General: See appropriate paragraphs of Section 09 9001.
- B. New Surfaces:
 - 1. Clean 'passivated' or 'stabilized' galvanized steel as specified in SSPC-SP1.
 - 2. After removal of 'passivated' or 'stabilized' coating or for surfaces without coating, clean surfaces to be painted with mineral spirits or product recommended by Paint Manufacturer. Change to clean rags or wiping cloths regularly to reduce possibility of re-contamination of surface.
 - 3. Apply prime coat.
 - 4. Apply finish coats.

END OF SECTION

SECTION 09 9114**EXTERIOR PAINTED CMU, CONCRETE, STUCCO****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Preparing and painting new exterior masonry, concrete, and stucco surfaces as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 09 9001: 'Common Painting And Coating Requirements':
 - a. Pre-installation conference for Sections under 09 9000 heading 'Paints and Coatings'.
 - b. 'Attachment: Paint Color Schedule' for Deseret Industries Projects.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conferences:
 - 1. Participate in pre-installation conference as specified in Section 09 9001.

PART 2 - PRODUCTS**2.1 SYSTEM**

- A. Manufacturers:
 - 1. Category Four Approved Products and Manufacturers. See Section 01 6200 for definitions of Categories:
 - a. Products listed in edition of MPI Approved Product List current at time of bidding and later are approved, providing they meet VOC requirements in force where Project is located.
- B. Description:
 - 1. Concrete:
 - a. New Surfaces: Use MPI(a) EXT 3.1A Latex Finish system.
 - 2. Stucco:
 - a. New Surfaces: Use MPI(a) EXT 3.1A Latex Finish system.
 - 3. CMU:
 - a. New Surfaces: Use MPI(a) EXT 4.2A Latex Finish system.
- C. Performance:
 - 1. Finish Requirements:
 - a. New Surfaces: MPI Premium Grade finish requirements.
 - b. Gloss / Sheen Level Required: Gloss Level 1.
- D. Materials:
 - 1. Block Filler, New CMU Only: MPI Product 4: 'Block Filler, Latex, Interior/Exterior'.
 - 2. Finish Coats: MPI Product 10: 'Latex, Exterior Flat (MPI Gloss Level 1-2)'.
 - 3. Accent Stripe: MPI Product 164: 'Light Industrial Coating, Exterior, Water Based, Gloss (MPI Gloss Level 6)'.

PART 3 - EXECUTION**3.1 PREPARATION**

- A. Except for steam cured products, cure cement type surfaces from 60 to 90 days in accordance with Paint Manufacturer's recommendations before painting.

3.2 APPLICATION

- A. General: See appropriate paragraphs of Section 09 9001.
- B. New Surfaces:
 - 1. 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.
 - 2. Completely cover voids in masonry block.
 - 3. Roll after spraying if necessary to eliminate pinholing.

END OF SECTION

SECTION 09 9122**INTERIOR PAINTED CMU****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Preparing and painting new interior CMU walls as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 09 9001: 'Common Painting And Coating Requirements':
 - a. Pre-installation conference for Sections under 09 9000 heading 'Paints and Coatings'.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conferences:
 - 1. Participate in pre-installation conference as specified in Section 09 9001.
 - a. 'Attachment: Paint Color Schedule' for Deseret Industries Projects.

PART 2 - PRODUCTS**2.1 SYSTEM**

- A. Manufacturer:
 - 1. Category Four Approved Products and Manufacturers. See Section 01 6200 for definitions of Categories:
 - a. Products listed in edition of MPI Approved Product List current at time of bidding and later are approved, providing they meet VOC requirements in force where Project is located.
- B. Description:
 - 1. New Surfaces:
 - a. Use MPI(a) INT 4.2D Latex Finish system.
- C. Performance:
 - 1. Design Criteria:
 - a. New Surfaces: MPI Premium Grade finish requirements.
 - b. Gloss / Sheen Level Required: Gloss Level 5.
- D. Materials:
 - 1. Block Filler, Over New Masonry Only: MPI Product 4: 'Block Filler, Latex, Interior/Exterior'.
 - 2. Finish Coats: MPI Product 141: 'Latex, Interior, High Performance Architectural, Semi-Gloss (MPI Gloss Level 5)'.

PART 3 - EXECUTION**3.1 APPLICATION**

- A. General: See appropriate paragraphs of Section 09 9001.

END OF SECTION

SECTION 09 9123**INTERIOR PAINTED GYPSUM BOARD, PLASTER****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Preparing, priming, and finish painting new interior gypsum board and plaster surfaces as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 09 2900: 'Gypsum Board' for:
 - a. Priming new interior gypsum board surfaces to receive sheet wall covering system or texturing.
 - b. Pre-installation conference.
 - 2. Section 09 9001: 'Common Painting And Coating Requirements':
 - a. Pre-installation conference for Sections under 09 9000 heading 'Paints and Coatings'.
 - b. 'Attachment: Paint Color Schedule' for Deseret Industries Projects.
 - 3. Section 09 9413: 'Interior Textured Finishing' for textured finishes.

1.2 ADMINISTRATIVE REQUIREMENTS

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

PART 2 - PRODUCTS**2.1 SYSTEM**

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

2) Remaining Painted Surfaces: Gloss Level 5.

D. Materials:

1. Primers:
 - a. MPI Product 50, 'Primer Sealer, Latex, Interior'.
2. Finish Coats:
 - a. Rest Rooms And Custodial Rooms:
 - 1) Buildings with only Gypsum Board surfaces in rooms:
 - a) MPI Product 115, 'Epoxy-Modified Latex, Interior, Gloss (MPI Gloss Level 6)'.
 - b. Remaining Painted Surfaces:
 - 1) MPI Product 141, 'Latex, Interior, High Performance Architectural, Semi-Gloss (MPI Gloss Level 5)'.

PART 3 - EXECUTION**3.1 APPLICATION**

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

END OF SECTION

SECTION 09 9124**INTERIOR PAINTED METAL****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Preparing and painting new interior metal surfaces as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 05 5871: 'Metal Brackets'.
 - 2. Section 09 9001: 'Common Painting And Coating Requirements':
 - a. Pre-installation conference for Sections under 09 9000 heading 'Paints and Coatings'.
 - b. 'Attachment: Paint Color Schedule' for Deseret Industries Projects.
 - 3. Section 23 0553: 'I. D. For HVAC Piping And Equipment' for field painting requirements of HVAC piping and equipment.

1.2 ADMINISTRATIVE REQUIREMENTS

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

PART 2 - PRODUCTS**2.1 SYSTEM**

- A. Manufacturers:
 - 1. Category Four Approved Products and Manufacturers. See Section 01 6200 for definitions of Categories.
 - a. Products listed in edition of MPI Approved Product List current at time of bidding and later are approved, providing they meet VOC requirements in force where Project is located.
- B. Description:
 - 1. Ferrous Metal:
 - a. New Surfaces: Use MPI(a) INT 5.1B Waterborne Light Industrial Finish system.
 - 2. Galvanized Metal:
 - a. New Surfaces: Use MPI(a) INT 5.3J Latex Finish system
 - 3. Aluminum:
 - a. New Surfaces: Use MPI(a) INT 5.4E Waterborne Light Industrial Finish system.
- C. Performance:
 - 1. Design Requirements:
 - a. New Surfaces: MPI Premium Grade finish requirements.
 - b. Gloss / Sheen Level Required: Gloss Level 5.
- D. Materials:
 - 1. Primers:
 - a. Ferrous Metal: MPI Product 107, 'Primer, Rust-Inhibitive, Water Based'.
 - b. Galvanized Metal: MPI Product 134: 'Primer, Galvanized, Water Based'.

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

PART 3 - EXECUTION

3.1 APPLICATION

- A. General:
 - 1. See appropriate paragraphs of Section 09 9001.
 - 2. Systems specified are in addition to prime coats furnished under other Sections.
- B. New Surfaces: Remove rust spots by sanding and immediately spot prime. If all traces of rust cannot be removed, apply rust blocker recommended by Paint Manufacturer before applying full primer coat.

END OF SECTION

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

- A. Includes But Not Limited To:
 - 1. Preparing and painting new woodwork and wood floors not requiring transparent finish, as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 09 9001: 'Common Painting And Coating Requirements':
 - a. Pre-installation conference for Sections under 09 9000 heading 'Paints and Coatings'.
 - b. 'Attachment: Paint Color Schedule' for Deseret Industries Projects.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conferences:
 - 1. Participate in pre-installation conference as specified in Section 09 9001.

PART 2 - PRODUCTS**2.1 SYSTEM**

- A. Manufacturers:
 - 1. Category Four Approved Products and Manufacturers. See Section 01 6200 for definitions of Categories:
 - a. Products listed in edition of MPI Approved Product List current at time of bidding and later are approved, providing they meet VOC requirements in force where Project is located.
- B. Description:
 - 1. Systems:
 - a. All Other:
 - 1) New Surfaces: Use MPI(a) INT 6.3T or U Latex Finish system.
- C. Performance:
 - 1. Design Criteria:
 - a. New Surfaces: MPI Premium Grade finish requirements.
 - b. Gloss / Sheen Level Required: Gloss Level 5.
- D. Materials:
 - 1. Wood Floors:
 - a. Moderate to heavy traffic: MPI Product 77, 'Epoxy, Gloss'.
 - 2. Woodwork:
 - a. Primer Coat: MPI Product 39, 'Primer, Latex, for Interior Wood' or MPI Product 45, 'Primer Sealer, Alkyd, Interior'.
 - b. Finish Coats: MPI Product 153, 'Light Industrial Coating, Interior, Water Based, Semi-Gloss (MPI Gloss Level 5)'.

PART 3 - EXECUTION

3.1 APPLICATION

- A. General: See appropriate paragraphs of Section 09 9001.
- B. Interface With Other Work:
 - 1. Where back-priming is required, apply one (1) coat of primer.
- C. New Surfaces:
 - 1. Spot prime nail holes, cracks, and blemishes before and after puttying.
 - 2. Apply stain blocker or other product recommended by Paint Manufacturer to knots before applying primer coat.

END OF SECTION

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

- A. Includes But Not Limited To:
 - 1. Preparing and finishing of new interior clear finished hardwood as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 06 2210: 'Miscellaneous Wood Trim'.
 - 2. Section 06 4512: 'Architectural Woodwork Wood Trim'.
 - 3. Section 09 9001: 'Common Painting And Coating Requirements':
 - a. Pre-installation conference for Sections under 09 9000 heading 'Paints and Coatings'.
 - b. 'Attachment': Paint Color Schedule' for Deseret Industries Projects.

1.2 REFERENCES

- A. Reference Standards:
 - 1. Kitchen Cabinet Manufacturers Association / American National Standards Institute:
 - a. ANSI/KCMA A161.1-2000 (R2005) 23-Jan-2001 'Recommended Performance and Construction Standards for Kitchen and Vanity Cabinets.'

1.3 ADMINISTRATIVE REQUIREMENTS

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

1.4 SUBMITTALS

- A. Action Submittals:
 - 1. Samples:
 - a. Interior Hardwood for Transparent Finish:
 - 1) Requirements for samples are specified in Related Requirement Sections listed above.
 - b. Design Criteria:
 - 1) Sample will be used as performance standard for evaluating finish provided.
- B. Informational Submittals:
 - 1. Test And Evaluation Reports:
 - a. Before beginning finish work, submit Finish Manufacturer's literature or certification that finish material meets requirements of ANSI / KCMA A161.1.

PART 2 - PRODUCTS**2.1 SYSTEM**

- A. Materials:

1. Design Criteria:
 - a. See appropriate paragraphs of Section 09 9001.
2. Stain: MPI 90, 'Stain, Semi-Transparent, for Interior Wood'.
3. Clear Finish Coats:
 - a. Field Finished:
 - 1) Chemcraft International Inc:
 - a) First, Second, And Third Coats: 20 Sheen Opticlear Pre-Catalyzed Lacquer.
 - 2) ICI Dulux / Trinity:
 - a) First Coat: ICE Vinyl Sanding Sealer.
 - b) Second And Third Coats: ICI Pre-Catalyzed Lacquer.
 - 3) Lilly / Valspar:
 - a) First, Second, And Third Coats: 20 Sheen Pre-Catalyzed Lacquer 587E208.
 - 4) Sherwin-Williams:
 - a) First Coat: T67F3 Vinyl Sealer.
 - b) Second And Third Coats: T77F38 Sherwood Pre-Catalyzed Lacquer DRE.
 - b. Mill Finished: Architectural Woodwork finished in a mill may use one (1) coat of Vinyl Sealer and two (2) coats of Conversion Varnish or three (3) coats of Conversion Varnish from one (1) of the approved Finish Manufacturers, as recommended by Finish Manufacturer.
 - c. Products meeting testing requirements for finishes of ANSI / KCMA A161.1 may be used upon approval of submission by Architect before use. See Section 01 6200.
4. Color:
 - a. Design Criteria:
 - 1) Finish to match Owner selected sample.
 - b. LDS 110.
 - 1) Performance standard: Owner provided sample.
 - a) Contact Information: Nancy Black (801) 240-2431 BlackNL@ldschurch.org, Meetinghouse Facilities Department.
 - 2) Field verify to match existing wood stain on project.

PART 3 - EXECUTION

3.1 APPLICATION

- A. General:
 1. See appropriate paragraphs of Section 09 9001.
 2. Sand entire exposed surface of item to be finished lightly with 120 to 150 non-stearated sandpaper and clean before applying dye or stain.
 3. Apply stain in accordance with Manufacturer's recommendations and as necessary to attain correct color.
 4. Scuff sand with 220 non-stearated sandpaper between application of application stain and first finish coat.
 5. If wood is finished before installation, finish cut ends and other unfinished, exposed surfaces same as previously finished surfaces after installation of wood.
- B. Where back-priming is required, apply one coat of finish material.

END OF SECTION

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

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

1.2 REFERENCES

- A. Definitions:
 - 1. Drywall Texture: Compound rolled, sprayed, or troweled onto sheetrock after taping and floating of joints is complete. Uses same material as joint compound, but thinned down with water and applied to wall surface:
 - a. Smooth - Smooth application of texture over sheetrock wall that feathers out sheetrock joints, and creates even, non-textured wall.

1.3 ADMINISTRATIVE REQUIREMENTS

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

1.4 QUALITY ASSURANCE

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

PART 2 - PRODUCTS**2.1 SYSTEM**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. National Gypsum, Charlotte, NC www.nationalgypsum.com.
 - b. U S Gypsum Co, Chicago, IL www.usg.com.
- B. Materials:
 - 1. Class Two Quality Standards: See Section 01 6200.

- a. ProForm Perfect Spray EM/HF by National Gypsum.
- b. Sheetrock Wall & Ceiling Texture by U S Gypsum.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Location:
 - 1. Walls:
 - a. Smooth Texture. [Field verify to match existing]
 - 2. Ceilings:
 - a. Smooth Texture. [Field verify to match existing]

END OF SECTION

DIVISION 10: SPECIALTIES

10 1000 INFORMATION SPECIALTIES

- 10 1116 FIXED MARKERBOARDS
- 10 1495 MISCELLANEOUS INTERIOR SIGNAGE

10 2000 INTERIOR SPECIALTIES

- 10 2113 METAL TOILET COMPARTMENTS
- 10 2118 DRESSING COMPARTMENTS: FITTING ROOMS
- 10 2613 CORNER GUARDS
- 10 2616 BUMPER GUARDS
- 10 2813 COMMERCIAL TOILET ACCESSORIES
- 10 2814 BABY-CHANGING STATION

END OF TABLE OF CONTENTS

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SECTION 10 1116**FIXED MARKERBOARDS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Installed But Not Supplied Under This Section:
 - 1. Markerboard units: Visual Display Board.
 - 2. Salvaged existing boards to be reinstalled as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 01 6400: Owner will furnish new Markerboards. PART 2 of this Section establishes quality of materials for information of Contractor, Architect, and Owner's Representatives.
 - 2. Section 06 2001: 'Common Finish Carpentry Requirements' for installation.
 - 3. Section 09 2216: 'Non-Structural Metal Framing' for blocking in metal stud framed walls for markerboards.

1.2 REFERENCES

- A. Association Publications:
 - 1. Porcelain Enamel Institute, Inc., Norcross, GA www.porcelainenamel.com.
 - a. PEI-1002, *Manual and Performance Specifications for Porcelain Enamel Writing Surfaces (Whiteboards and Chalkboards)* 2002.

1.3 SUBMITTALS

- A. Informational Submittals:
 - 1. Manufacturer Instructions:
 - a. Published installation instructions.
 - b. Printed cleaning instructions.
- B. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Operations and Maintenance Data:
 - 1) Maintenance instructions.
 - 2) Printed cleaning instructions.
 - b. Warranty Documentation:
 - 1) Manufacturer Warranty.
 - c. Record Documentation:
 - 1) Manufacturer's documentation:
 - a) Manufacturer's product literature.

1.4 WARRANTY

- A. Manufacturer Warranty:
 - 1. Letter from Manufacturer certifying Contract Documents have been complied with and guarantee against faulty workmanship and materials for five (5) years.

PART 2 - PRODUCTS

2.1 OWNER FURNISHED PRODUCTS

- A. Category Two Approved Manufacturers. See Section 01 6200 for definitions of Categories:
 - 1. ADP Lemco Corporation, Draper, UT www.adplemco.com.
- B. Fixed Markerboard:
 - 1. Coatings shall meet requirements of PEI-1002:
 - a. All Rooms:
 - 1) Coatings shall be for marker use.
 - 2. Color: White.
 - 3. Mounting Hardware: Suitable for wall conditions.
- C. Fixed Markerboard:
 - 1. Face shall be steel, **28 ga (0.4 mm)** minimum, coated two (2) sides with fused ground coat, and finished one (1) side with vitreous porcelain enamel.
 - 2. Coatings shall meet requirements of PEI-1002:
 - a. All Rooms:
 - 1) Coatings shall be for marker use.
 - 3. Core shall be mat-formed particleboard.
 - a. **3/8 inch (9.5 mm)** thick medium-density.
 - b. **1/2 inch (12.7 mm)** thick low-density minimum.
 - 4. Backing:
 - a. Backing shall be **0.005 inch (0.13 mm)** minimum aluminum foil.
 - 5. Trim:
 - a. Extruded 6063-T5 alloy aluminum with satin etched, natural aluminum anodized finish.
 - b. Extrusions shall match thickness of units without wedging.
 - c. Round all sharp edges.
 - d. **2 inch (50 mm)** high map rail.
 - 6. Trays:
 - a. Provide **2 inch (50 mm)** radius rounded ends on marker trays.
 - b. Marker trays with squared, sharp ends are not acceptable.
 - 7. Map Clips:
 - a. Manufacturer's standard.
 - b. Provide two map clips on markerboards.
 - 8. Color: White.
 - 9. Mounting Hardware: Suitable for wall conditions.
- D. Fabrication:
 - 1. Prefabricate units at factory and ship to jobsite in one piece, except for marker trays.
 - 2. Units shall be of first quality and lamination done by approved standards of industry.
 - 3. Furnish printed cleaning instructions with each shipment.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Mount boards square and level.
 - 1. Shim as necessary to provide permanent installation and smooth operation.
 - 2. Anchor boards securely to wall following Manufacturer's printed installation instructions.
 - 3. Anchor concealed hangers with screws at **24 inches (600 mm)** on center.
- B. Mounting fasteners shall penetrate framing lumber or blocking **1-1/2 inch (38 mm)** minimum. Use toggle bolts or expansion bolts in masonry walls.

- C. After attaching map clips, apply permanently attached end cap or screw to prevent removal of map clips.

END OF SECTION

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SECTION 10 1495

MISCELLANEOUS INTERIOR SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To:
 - 1. Salvage and reinstall existing room signs as described in Contract Documents.

PART 2 - PRODUCTS

2.1 PRODUCTS

- A. Standard Interior Signs: (salvage existing)
 - 1. Color:
 - a. Background: Welfare Gray.
 - b. Lettering: White.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install interior signs square and plumb:
 - 1. Room Signs:
 - a. Install bracket using two screws. Use proper anchor for substrate.
 - b. Attach sign to bracket using set-screw.
 - c. Mount signs as described in Contract Drawings.

END OF SECTION

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

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

1.2 REFERENCES

- A. Reference Standards:
 - 1. ASTM International:
 - a. ASTM A484/A484M-18a, 'Standard Specification for General Requirements for Stainless Steel Bars, Billets, and Forgings'.

1.3 SUBMITTALS

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

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
 - 1. Materials shall be delivered in original, unopened packages with labels intact.
- B. Storage And Handling Requirements:
 - 1. Store and handle in compliance with Manufacturer's instructions and recommendations.

1.5 WARRANTY

- A. Manufacturer Warranty:
 - 1. Manufacturer's standard warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Type One Acceptable Manufacturers:
1. Accurate Partitions Inc, Lyons, IL www.accuratepartitions.com.
 2. AMPCO Products Inc, Miami, FL www.ampco.com.
 3. Columbia Partitions, Columbia, SC www.psisc.com.
 4. Flush-Metal Partition Corp, Maspeth, NY www.flushmetal.com.
 5. Global Steel Products Corp, Eastanollee, GA www.globalpartitions.com.
 6. Hadrian Inc, Mentor, OH www.hadrian-inc.com.
 7. Knickerbocker Partitions Corp, Freeport, NY www.knickerbockerpartition.com.
 8. Metpar, Westbury, NY www.metpar.com.
 9. Equal as Approved by Architect before bidding. See Section 01 6200.

2.2 MANUFACTURED UNITS

- A. Toilet And Miscellaneous Partitions:
1. Floor-mounted, overhead-braced.
 2. Panels:
 - a. Galvanized bonderized steel sheets (minimum **0.00015 inch (0.004 mm)** zinc coating).
 - b. Edges bound interlocked with drawn molding welded on corners.
 - c. Corners welded and ground smooth.
 - d. Sound deadening honeycomb core.
 - e. Provide wood blocking on all panels that have grab bars.
 - f. Gauge:
 - 1) Doors: **22 ga (0.08 mm)** minimum.
 - 2) Panels: **22 ga (0.08 mm)** minimum.
 - 3) Pilasters: **22 ga (0.08 mm)** minimum.
 - 4) Screens: **22 ga (0.08 mm)** minimum.
 3. Posts:
 - a. **20 ga (one mm)** minimum of same construction and finish as panels.
 4. Headrails:
 - a. Aluminum.
 - b. **20 ga (one mm)** minimum of same construction and finish as panels.
 - c. Anti-grip design.
 5. Plinths:
 - a. **20 ga (one mm)** Type 304 stainless steel, Number 4 finish.
 - b. **3 inch (76 mm)** minimum high, secured with concealed clips.
 - c. All fasteners used to attach Plinths, Posts and Pilasters to the floor shall be Type 304 stainless steel.
 6. Anchorages and fasteners:
 - a. Concealed: Non-corrosive, protective finish.
 - b. Tamper resistant Torx Head with pin screws.
 7. Hardware:
 - a. Each door:
 - 1) Gravity type hinges with double handed, nylon bottom cam, adjustable for partial door closing position, bottom hinge finished flush with door bottom.
 - 2) Sliding or concealed door bolt with emergency access.
 - 3) Door strike and keeper with rubber bumper.
 - 4) Coat hook / door bumper.
 - b. Finish: Chrome plated.
 - c. Meet requirements of ASTM B86, Alloy AG 40A.
- B. Urinal Partition:
1. Basic construction same as panels above, floor mounted.

2.3 FINISHES

- A. Finish And Color:
 - 1. Powder-coated paint finish.
 - 2. Color Quality Standard: See Section 01 6200.
 - a. Hadrian: Light Gray 535
 - b. Field verify to match existing as required.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

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

3.3 FIELD QUALITY CONTROL

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

3.4 ADJUSTING

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

3.5 CLEANING

- A. Remove protective masking. Clean exposed surfaces of partitions, hardware, fittings, and accessories.

- B. Touch-up minor scratches and other finish imperfections using materials and methods recommended by Manufacturer.

END OF SECTION

SECTION 10 2118**DRESSING COMPARTMENTS: Fitting Rooms****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Coordinate scheduling for Owner furnished and installed fitting rooms (modular dressing compartments) located in Retail Area as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 07 9213: 'Elastomeric Joint Sealants' for sealant applied around perimeter of mirrors.

1.2 REFERENCES

- A. Association Publications:
 - 1. United States Access Board:
 - a. Americans with Disabilities Act (ADA):
 - 1) ADA Standards:
 - a) ADA Accessibility Guidelines (ADAAG) (2004 or latest version).
- B. Definitions:
 - 1. Stainless Steel Alloys:
 - a. Type 304 (UNS S30400): Austenitic stainless steel with non-magnetic properties in annealed condition that provide good corrosion resistance to both chemical and atmospheric exposures, with high resistance to oxidations. Most common and widely used stainless steel
- C. Reference Standards:
 - 1. International Code Council / American National Standards Institute:
 - a. ICC/ANSI A117.1-2009, 'Accessible and Usable Buildings and Facilities'.

1.3 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Manufacturer's literature or cut sheet.
 - 2. Shop Drawings:
 - a. Show layout, door swings, clearance, hardware, and methods of anchoring.
- B. Informational Submittals:
 - 1. Manufacturer Instructions:
 - a. Written 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.
 - b. Warranty Documentation:
 - 1) Manufacturer Warranty.
 - c. Record Documentation:
 - 1) Manufacturer's documentation:
 - a) Manufacturer's literature or cut sheet.
 - b) Color selection.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
 - 1. Unload and inspect components for damage incurred during shipping and transit procedures.
- B. Storage And Handling Requirements:
 - 1. Store products in manufacturer's unopened packaging until ready for installation.
 - 2. Protect materials from damage during handling and installation.

1.5 WARRANTY

- A. Manufacturer Warranty:
 - 1. Manufacturer standard warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Manufacturer Contact List:
 - 1. Gabriel Logan, Logan, OH www.gabriellogan.com.
 - 2. Privee Designs, Orange, CA www.priveedesigns.com.

2.2 MANUFACTURED UNITS

- A. Fitting Rooms:
 - 1. Description:
 - a. Wall mount fitting rooms with prefinished walls and self-closing door.
 - 2. Design Criteria:
 - a. Standard and ADA compliant dressing rooms where shown on Contract Drawings.
 - b. Re-usable and re-locatable wall panels.
 - 3. Wall Layout:
 - a. 2 inches (50 mm) Wall System.
 - b. 3-Wall configuration.
 - 4. Component:
 - a. Wall panels.
 - b. Aluminum posts.
 - c. Aluminum Framing.
 - 5. Door and Door Hardware:
 - a. Aluminum door frame.
 - b. ADA Compliant lock/lever set.
 - c. All rooms keyed alike.
 - d. Self-closing door system.
 - 6. Sizes and configurations as shown on Contract Drawings.
 - 7. Finish:
 - a. Prefinished walls:
 - 1) Gabriel Logan: Melamine finished wall panel in seven finishes.
 - 2) Privee Designs: Vinyl Clad Hardboard Facings, clear satin.
 - b. Color: As selected by Owner.
 - 8. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a. Fitting Rooms by Gabriel Logan.
 - b. Pro 200 Wall System by Privee Designs.
- B. Benches:
 - 1. Material:
 - a. MDF with white finish and white edge banding.

2. Dimensions:
 - a. Standard Bench: 36 inch wide x 18 inch high x 24 inch deep.
 - b. ADA Compliant Bench: 42 inch wide x 18 inch high x 24 inch deep.
- C. Disability Sign:
 1. Design Criteria:
 - a. ADA compliant meeting ADA sign regulations:
 - b. Matte finished acrylic with eased corners.
 - c. Thickness: 1/8 inch (3 mm).
 - d. Raised pictogram: 1/32 inch (0.8 mm).
 2. Provide foam mounting tape.
- D. Grab Bars:
 1. Description:
 - a. Concealed mount grab bar with snap lock cover flanges and peened (non-slip) finish.
 2. Design Criteria:
 - a. Comply with ADA guidelines and ADAAG accessible design for structural strength and local and state codes.
 - b. 18 ga (1.27 mm), type 304 stainless steel tubing with #4 satin finish.
 - c. Provide center support when required.
 - d. Sustain loads in excess of 900 lbs (408 kg).
 3. Dimensions:
 - a. 36 inch (915 mm) ADA compliant stainless steel surface mounted grab bar.
 - b. 1-1/2 inch (38 mm) diameter.
- E. Hooks:
 1. Surface mounted single robe hook.
 2. Two hooks per room.

2.3 ACCESSORIES

- A. Mirrors:
 1. Full Body Glass Wall Mirrors mounted in each booth as shown on Contract Drawings:
 - a. Glass: Acrylic Mirrors.
 - b. Size: 18 inch (450 mm) wide x 68 inches (1 727 mm) high x 1/4 inch (6.4 mm) thick.
 - c. Six (6) mounting clips and screws.
 - d. Model 499-1868.
 2. Wall Mirrors mounted outside of each end of fittings rooms as shown on Contract Drawings:
 - a. Glass: Acrylic Mirrors.
 - b. Size (Cut to Size): 18 inch (450 mm) wide x 42 inches (1 067 mm) high x 1/4 inch (6.4 mm) thick.
 - c. Six (6) mounting clips and screws.
 - d. Model 499-1868.
 3. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a. Model 499-1868 by Grand and Benedicts, Inc., Portland, OR www.grand-benedicts.com.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared. Notify Project Manager of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.

3.3 INSTALLATION

- A. Interface With Other Work:
 - 1. Coordinate installation of fitting rooms with other trades.
- B. General:
 - 1. Follow Manufacture's written instructions:
- C. Fitting Rooms Walls:
 - 1. Install fitting rooms with prefinished walls in location wall configuration as shown on Contract Drawings.
 - 2. Doors:
 - a. Install doors in fitting room walls.
 - b. Adjust hardware for proper operation of doors.
- D. Benches:
 - 1. Place ADA and standard benches in locations as shown on Contract Drawings.
- E. Disability Sign:
 - 1. Mount Disability Sign at each ADA fitting room compartment at compliant elevation.
- F. Grab Bars:
 - 1. Mount at ADA compliant elevation.
 - 2. Mounting grab bars in metal wall with wood blocking:
 - a. Install grab bar with 3 #10 x 2-1/2 inch (63.5 mm) pan head stainless steel screws provided for each end wall flange and 2 #10 x 2-1/2 inch (63.5 mm) pan head stainless steel screws provided for each center wall flange.
 - b. Slide cover flanges over wall flanges and press firmly to complete installation.
 - 3. Mounting grab bars in CMU wall:
 - a. Install with plastic or lead anchors.
- G. Hooks:
 - 1. Mount wall plate bracket(s) per installation instructions with supplied fasteners.
 - 2. Slip hook over wall plate(s) and tighten set screws until secure.
- H. Mirrors:
 - 1. Mount Mirrors using provided mounting clips and screws.
 - 2. Apply elastomeric sealant around perimeter of mirrors.

3.4 PROTECTION

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

END OF SECTION

SECTION 10 2613**CORNER GUARDS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install corner guards as described in Contract Documents.

1.2 REFERENCES

- A. Definitions:
 - 1. Flame Spread: The propagation of flame over a surface.
 - 2. Flame Spread Index: The numerical value assigned to a material tested in accordance with ASTM E84.
 - 3. Smoke-Developed Index: The numerical value assigned to a material tested in accordance with ASTM E84.
- B. Reference Standards:
 - 1. ASTM International:
 - a. ASTM D256-10(2018), 'Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics'.
 - b. ASTM D543-14, 'Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents'.
 - c. ASTM E84-18b, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
 - 2. Underwriters Laboratories / American National Standards Institute:
 - a. UL/ANSI 723, 'Standard for Safety Test for Surface Burning Characteristics of Building Materials' 11th Edition).

1.3 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data: Color selections.
 - 2. Shop Drawings:
 - a. Show locations, extent and installation details.
 - b. Show method of attachment.
 - 3. Sample:
 - a. Provide **12 inches (305 mm)** sample show color, texture, pattern, and guard.
- B. Informational Submittals:
 - 1. Test And Evaluation Reports:
 - a. Copies of Quality Assurance requirements for 'Class A' flame spread rating.
 - 2. Qualification Statement:
 - a. Installer:
 - 1) Provide Qualification documentation if requested by Architect or Owner.
- C. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Operations and Maintenance Data:
 - 1) Maintenance, and cleaning instructions.
 - b. Record Documentation:
 - 1) Manufacturers documentation:

- a) Manufacturer's literature.
- b) Color selection.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. System shall be recognized for intended use by applicable building codes.
 - 2. Fire Test Response Characteristics:
 - a. UL classified conforming to NFPA Class A fire rating with surface burning characteristics as tested materials in accordance with UL 723 (ASTM E84).
 - 1) Flame Spread: 10.
 - 2) Smoke Developed: 350 to 450.
 - b. 20 ft/lbs/ per square inch as tested in accordance with ASTM D256, Notched Izod Test.
- B. Qualifications:
 - 1. Installers:
 - a. Installer shall have performed at least three (3) installations of similar size, scope, and complexity in each of the past two (2) years.
 - b. Provide documentation if requested.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
 - 1. Deliver materials in sealed containers with Manufacturer's labels intact.
- B. Storage And Handling Requirements:
 - 1. Store materials in protected area in original, undamaged packaging in a cool, dry place out of direct sunlight and exposure to elements. Minimum room temperature of 40 deg F (4.4 deg C) and a maximum of 100 deg F (37.8 deg C) should be maintained.
 - 2. Material must be stored flat.

1.6 FIELD CONDITIONS

- A. Ambient Conditions:
 - 1. Material must be acclimated in an environment of 65 deg F to 75 deg F (18 deg C to 24 deg C) for at least twenty-four (24) hours prior to beginning installation.
 - 2. Installation areas must be enclosed and weatherproofed before installation commences.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

- A. Manufacturers:
 - 1. Stainless Steel Corner Guards:
 - a. Type Two Acceptable Manufacturers:
 - 1) Acrovyn, Div Construction Specialties Group, Muncy, PA www.c-sgroup.com.
 - 2) American Floor Products Co, Rockville, MD www.afco-usa.com.
 - 3) IPC Door and Wall Protection Systems, Muskego, WI www.inprocorp.com.
 - 4) Pawling Corp, Pawling, NY www.pawling.com.
 - 5) Equal as approved by Architect before installation. See Section 01 6200.
 - b. Type One Acceptable Manufacturers:
 - 1) Koroseal Wall Protection Systems, Fairlawn, OH www.korogard.com.
 - 2) Equal as approved by Architect before bid. See Section 01 6200.

B. Materials:**1. Stainless Steel Corner Guards:**

- a. **16-ga (1.6 mm)** stainless steel with finish equal to US32D Satin Stainless Steel.
- b. Size:
 - 1) Wall Corners: **3-1/2 inches (89 mm) by 3-1/2 inches (89 mm) by 96 inches (2 400 mm)** high.
 - 2) Steel Column Corners: **48 inch (1 200 mm)** high, conforming to shape of column without voids and completely enclosing column.

2. Vinyl Corner Guards:

- a. Design Criteria:
 - 1) Surface mounted and consisting of **1-1/2 inches (38 mm)** radius **1/4 inch (6.4 mm)** thick high-impact vinyl / acrylic cover mounted on continuous metal retainer.
 - 2) Chemical and stain resistance: Provide wall protection system components with chemical and stain resistance in accordance with ASTM D543.
- b. Color and Texture: Grey to closely match color of bumper guards.
- c. Quality Standard: Koroguard G200 Series.

C. Fabrication:

1. Fabricate wall protection systems to comply with requirements indicated for design, dimensions, details, finish, and member sizes.

2.2 ACCESSORIES

- A. Adhesive: As supplied or recommended by Corner Guard Manufacturer.

PART 3 - EXECUTION**3.1 EXAMINATION****A. Verification Of Conditions:**

1. Examine substrate and conditions under which Work is to be performed and identify conditions detrimental to proper or timely completion.
2. Notify Architect of unsuitable conditions in writing.
3. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION**A. Surface Preparation:**

1. Prior to installation, clean substrate to remove dirt, debris and loose particles. Perform additional preparation procedures as required by manufacturer's instructions.

B. Protection:

1. Take all necessary steps to prevent damage to material during installation as required in manufacturer's installation instructions.

3.3 INSTALLATION**A. Acceptable Installers:**

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

B. Install the Work of this section in strict accordance with manufacturer's recommendations, using only approved mounting hardware, and locating all components firmly into position, level and plumb.**C. Maintain ambient conditions for at least forth eight (48) hours.**

- D. Install stainless steel guards in retail and processing area and vinyl / PVC guards in office areas.
- E. Apply adhesive carefully to insure continuous contact between wall and guard. Take care to avoid soiling or leaving visible adhesive on wall or base.

3.4 CLEANING

- A. General:
 - 1. Immediately upon completion of installation, clean guards and accessories in accordance with manufacturer's recommended cleaning method.
 - 2. Remove surplus materials, rubbish and debris resulting from installation as work progresses and upon completion of work.

3.5 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

SECTION 10 2616**BUMPER GUARDS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install crash rails as described in Contract Documents and includes the following:
 - a. Bumper cushion.
 - b. Clips.
 - c. Cover.
 - d. End caps.
 - e. Fasteners.
 - f. Mounting hardware.
 - 2. Furnish and install vinyl cart / equipment guards as described in Contract Documents and includes the following:
 - a. Accessories.
 - b. Bumper guards.
 - c. End caps.
 - d. Mounting hardware.
 - e. Trim.
 - 3. Furnish and install edge bumper guards as described in Contract Documents and includes the following:
 - a. Edge bumper guards on bottom of joist girder at Mezzanine Area for head protection.
- B. Related Requirements:
 - 1. Section 06 1100: 'Wood Framing' for wall blocking required for bumper guards.

1.1 REFERENCES

- A. Definitions:
 - 1. Bumper Guard: Bumper guards in this specification are also called crash rails, equipment guards, vinyl cart, and wall guards.
 - 2. Flame Spread: The propagation of flame over a surface.
 - 3. Flame Spread Index: The numerical value assigned to a material tested in accordance with ASTM E84 or UL 723.
 - 4. Smoke-Developed Index: The numerical value assigned to a material tested in accordance with ASTM E84 or UL 723.
- B. Reference Standards:
 - 1. ASTM International:
 - a. ASTM D543-14, 'Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents'.
 - b. ASTM E84-15b, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
 - 2. National Fire Protection Association:
 - a. NFPA 101: 'Life Safety Code' (2015 Edition).
 - b. NFPA 265: 'Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Textile Coverings on Full Height Panels and Walls', (2015 Edition).
 - 3. Underwriters Laboratories, Inc.:
 - a. UL 723: 'Standard for Safety Test for Surface Burning Characteristics of Building Materials'; (2010 Edition).

1.2 SUBMITTALS

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

1.3 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Fire-Test-Response Characteristics: As determined by test method indicated below by qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Surface-Burning Characteristics:
 - 1) Insulation shall have Class A flame spread rating in accordance with ASTM E84 or UL 723.
 - a) Class A (Flame spread index 0-25; Smoke-developed index 0-450).
 - b) Flash point: None.
- B. Qualifications:
 - 1. Installers:
 - a. Installer shall have performed at least three (3) installations of similar size, scope, and complexity of this project in past two (2) years.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
 - 1. Materials shall be delivered in original, unopened packages with labels intact.
- B. Storage And Handling Requirements:
 - 1. Store materials in original, undamaged packaging in cool, dry place out of direct sunlight and exposure to elements and extreme heat.
 - 2. Store at room temperature of **40 deg F (4.4 deg C)** minimum and **100 deg F (38 deg C)** maximum.
 - 3. Store material on flat surface.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

- A. Crash Rail (Office Area only):
 - 1. Description:
 - a. Surface mounted assembly consisting of aluminum clips with snap-on cover and integral shock absorbing cushions.
 - 2. Design Criteria:

- a. 5 inch (127 mm) high by 1-1/16 inch (27 mm) deep.
 - b. Color Quality Standard: No. 927 Folkstone by Construction Specialties.
 3. Type One Acceptable Products:
 - a. SCR-50N by Construction Specialties Inc., Lebanon, NJ www.c-sgroup.com.
 - b. Equal as approved by Architect before bid. See Section 01 6200.
- B. Vinyl Cart / Equipment Guards:
 1. Description:
 - a. Surface mounted, double-bulb flexible vinyl bumper.
 2. Design Criteria:
 - a. 4-7/16 inch (112.7 mm) high by 1-3/16 inch (30.2 mm) deep.
 - b. Color Quality Standard: No. 5, Gray by Pawling.
 3. Type One Acceptable Products:
 - a. MD-2 by Pawling Corp, Pawling, NY www.pawling.com.
 - b. Equal as approved by Architect before bid. See Section 01 6200.
- C. Edge Bumper Guards (Mezzanine Area):
 1. Description:
 - a. Soft cushioned bumper guards for head protection.
 - b. Recyclable polyurethane foam.
 - c. Foam Temperature range: minus 30 deg F (minus 35 deg C) to 176 deg F (80 deg C).
 - d. Narrow groove (non-adhesive) to slide onto narrow beam flange.
 2. Color: yellow and black.
 3. Size: 39 3/8 inches (1 000 mm) long by 1-9/16 inch (39.7 mm) diameter with 5/16 inch (8 mm) by 3/4 inch (19 mm) narrow groove.
 - a. Manufacturer: American Permalight Inc., Torrance, CA www.americanpermalight.com.
 - 1) Name: Round Edge Protector.
 - 2) Type B Edge Bumper.
 - 3) Mount Style: Non-Adhesive Slide On.
 - 4) Manufacturer's Item No. 82-0920.
 - 5) Mount Type: Pressure fit.
 4. Type One Acceptable Suppliers:
 - a. Edge Bumper Guard, Type B (Item # WG442280) by Global Equipment Co., Port Washington, NY www.globalindustrial.com.
 - b. Equal as approved by Architect before bid. See Section 01 6200.

2.2 ASSESSORIES

- A. Provide appropriate end caps, corners, and mounting brackets as required to properly finish wall guard system and to support it securely.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification Of Conditions:
 1. Verify that wall surfaces are properly prepared and finished to receive installation of wall guards and crash rails.

3.2 PREPARATION

- A. 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.

- B. Take all necessary steps to prevent damage to material during installation as required in manufacturer's installation instructions.
- C. 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.

3.3 INSTALLATION

- A. Follow Manufacturers' installation instructions, using only approved mounting hardware, and locating all components firmly into position, level and plumb.

3.4 CLEANING

- A. Clean bumper guard covers and accessories as per Manufacturer's cleaning instructions.
- B. Waste Management:
 - 1. Dispose of packaging debris.
 - 2. Remove surplus materials, rubbish and debris resulting from installation as work progresses and upon completion of work.

3.5 PROTECTION

- A. Protect bumper guard material to prevent damage by other trades during installation and upon completion of installation.

END OF SECTION

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

- A. Included But Is Not Limited To:
 - 1. Selected accessories for Rest Rooms:
 - a. Grab Bars.
 - b. Hand Dryer.
 - c. Mirrors.
 - d. Recessed Waste Receptacle and Cabinet. (Existing to remain).
 - e. Sanitary Napkin Disposal Container.
 - f. Single Robe Hook.
 - 2. Custodial Room accessories:
 - a. Utility Shelf.
- B. Related Requirements:
 - 1. Section 06 1100: 'Wood Framing' for blocking.
 - 2. Section 06 2001: 'Common Finish Carpentry Requirements' for installation.
- C. Related Requirements:
 - 1. Section 01 1200: 'Multiple Contract Summary' soap dispensers, paper towel dispensers, and toilet tissue dispensers furnished and installed by Owner (FM Group).

1.2 REFERENCES

- A. Association Publications:
 - 1. United States Access Board:
 - a. Americans with Disabilities Act (ADA):
 - 1) ADA Standards:
 - a) ADA Accessibility Guidelines (ADAAG) (2004 or latest version).
- B. Reference Standards:
 - 1. ASTM International:
 - a. A153/A153M-16a, 'Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware'.
 - b. ASTM A653/A653M-17, 'Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process'.
 - c. ASTM A666-15, 'Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar'.
 - d. ASTM C1036-18, 'Standard Specification for Flat Glass'.
 - e. ASTM F446-85(2009), 'Standard Consumer Safety Specification for Grab Bars and Accessories Installed in the Bathing Area'.
 - 2. International Code Council / American National Standards Institute:
 - a. ICC/ANSI A117.1-2017, 'Accessible and Usable Buildings and Facilities'.
 - 3. International Standard Organization:
 - a. ISO 25537:2008, 'Glass in Building - Silvered Flat Glass Mirror'.

1.3 SUBMITTALS

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

- a. Manufacturer's product data sheets indicating operating characteristics, materials and finishes.
 - b. Mounting requirements and rough-in dimensions.
- 2. Shop Drawings:
 - a. Schedule showing items used, location where installed, and proper attaching devices for substrate.
- B. Informational Submittals:
 - 1. Manufacturers' Instructions:
 - a. Provide operation, care and cleaning instructions.
- C. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Operations and Maintenance Data:
 - 1) Hand Dryer:
 - a) Manufacturer's service and parts manual.
 - b. Warranty Documentation:
 - 1) Final, executed copy of Warranty for each product.
 - c. Record Documentation:
 - 1) Manufacturers documentation:
 - a) Manufacturer's literature or cut sheets.

1.4 QUALITY ASSURANCE

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

1.5 WARRANTY

- A. Manufacturer Warranty:
 - 1. Manufacturer's standard warranty.
- B. Special Mirror Warranty:
 - 1. Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage or frame corrosion defects within specified warranty period:
 - a. Warranty Period: fifteen (15) years from date of Substantial Completion.
- C. Hand Dryer:
 - 1. Manufacturer's Warranty to be free from defects for period of five (5) years. Warranty includes labor performed at factory as well as repair or exchange of defective parts, at Manufacturer's option.

PART 2 - PRODUCTS

2.1 OWNER FUNISHED PRODUCTS

- A. Category One Approved Products (Furnished and Installed by Owner):
 - 1. Automatic Touchless Towel Dispensers:
 - a. Mount Towel Dispenser in 'Recessed Waste Receptacle Cabinet'.
 - b. Category One Approved Products. See Section 01 6200 for definitions of Categories: Georgia-Pacific enMotion model no. 59460:
 - 1) Size: 14.8 inches (376 mm) wide x 9.75 inches (248 mm) deep x 16.75 inches (425 mm) high.
 - 2) Power source: battery.

- 3) Color: splash blue.
2. Soap dispensers.
3. Toilet tissue dispensers.

2.2 MANUFACTURED UNITS

A. Manufacturers:

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

B. Materials:

1. Design Criteria:
 - a. Stainless Steel: ASTM A666 Type 304 (18-8); satin finish exposed surfaces unless otherwise indicated.
 - b. Galvanized-Steel Mounting Devices: ASTM A153/A153M, hot-dip galvanized after fabrication.
 - c. Fasteners:
 - 1) Exposed: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant.
 - 2) Concealed: Galvanized Steel.
2. Rest Rooms:
 - a. Mirrors:
 - 1) Channel-Frame Mirror:
 - a) Frame: Type 304 or Type 430, 20 gauge stainless steel channel frame.
 - b) Roll-formed one piece construction.
 - c) Exposed surfaces have #4 satin finish.
 - d) Edges and corners are burr free.
 - e) Glass: 1/4 inch (6.4 mm) silver coated and hermetically sealed. Guaranteed for 15 years against silver spoilage. Mirrors meet ASTM C1036 requirements.
 - f) Concealed surface mounted wall hanger.
 - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) AJW Architectural Products: Model U711.
 - b) American Specialties (ASI): Model 0620.
 - c) Bobrick: Model B-165.
 - d) Bradley: Model 781.
 - e) General Accessory (GAMCO): Model C Series.
 - b. Sanitary Napkin Disposal Container:
 - 1) Design Criteria:
 - a) Surface mounted type 304, 22 gauge stainless steel with #4 satin finish. Seamless construction with radius and hemmed edges.
 - b) Stainless steel piano hinge.
 - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) AJW Architectural Products: Model U590.
 - b) American Specialties (ASI): Model 0852.
 - c) Bobrick: Model B-270.
 - d) Bradley: Model 4781-15.
 - e) General Accessory (GAMCO): Model ND-1.
 - c. Single Robe Hook:
 - 1) Surface mounted type 304, 22 gauge stainless steel with #4 satin finish.
 - 2) Concealed mounting bracket.
 - 3) Stainless steel locking setscrew on bottom.
 - 4) Category Four Approved Products. See Section 01 6200 for definitions of Categories:

- a) AJW Architectural Products: Model UX110SF.
- b) American Specialties (ASI): Model 7340-S.
- c) Bobrick: Model B6717.
- d) Bradley: Model 9114.
- e) General Accessory (GAMCO): Model 76717.
- d. Grab Bars:
 - 1) Configuration shown on Contract Drawings. Include center support for longer lengths when required:
 - 2) Design Criteria:
 - a) Comply with ADA guidelines and ADAAG accessible design for structural strength and local and state codes.
 - b) Concealed mount.
 - c) 18 ga (1.27 mm), type 304 stainless steel tubing.
 - d) 1-1/2 inch (38 mm) diameter.
 - e) Provide center support when required.
 - f) Snap-on flange covers.
 - g) Peened (non-slip) finish.
 - h) Sustain loads in excess of 900 lbs (408 kg).
 - 3) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) AJW Architectural Products: Model UG3 Series.
 - b) American Specialties (ASI): Model 3800 Series.
 - c) Bobrick: Model B-6806 Series.
 - d) Bradley: Model 812 Series.
 - e) General Accessory (GAMCO): Model 150 Series.
- e. Recessed Waste Receptacle and Cabinet:
 - 1) Existing to remain.
 - 2) Design Criteria:
 - a) Cabinet: Type 304 stainless steel. Welded construction, exposed surfaces to be satin finish.
 - b) Flange: Type 304 stainless steel 22 gauge (0.788 mm) with satin finish.
 - c) Waste Receptacle: Type 304 stainless steel 22 gauge (0.788 mm) with satin finish and 18 gallon (68 liter) capacity.
 - 3) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) Bobrick: Model 3947, Semi-Recessed with 18 gallon (68 liter) option (part no. 368-60). Do not include Roll Towel Dispenser Module.
- f. Hand Dryer:
 - 1) Design Criteria:
 - a) Power source: 110/120 volt, 12.5 amp, 60 Hz.
 - b) Semi-recess mounted.
 - c) Sensor activated.
 - d) Provide 'noise reduction nozzle' option.
 - e) Provide 'speed and sound control' option.
 - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) Xlerator by Excel Dryer, Model XL-SB.
- 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) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) AJW Architectural Products: Model UJ41.
 - b) American Specialties (ASI): Model 1300 Series.
 - c) Bobrick: Model B-224 Series.
 - d) Bradley: Model 9933 Series.
 - e) General Accessory (GAMCO): Model US Series.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Comply with ADA Accessibility Guidelines and installation heights as shown on Contract Drawings.
- B. Assemble fixtures and associated fittings and trim in accordance with manufacturer's instructions.
- C. Install using mounting devices proper for base structure.
- D. Install equipment level, plumb, and firmly in place in accordance with manufacturer's rough-in drawings.
- E. Where possible, mount like items in adjoining compartments back-to-back on same partition.
- F. Grab Bars:
 - 1. Install as per Manufacturers written installation instructions.
 - 2. Install grab bars to withstand downward force of not less than **250 lbf (1112 N)** per ASTM F446.

3.2 REPAIR

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

3.3 CLEANING

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

3.4 ADJUSTING

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

3.5 CLOSEOUT ACTIVITIES

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

END OF SECTION

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SECTION 10 2814**BABY-CHANGING STATION****PART 1 - GENERAL****1.1 SUMMARY**

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

1.2 REFERENCES

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

1.3 ADMINISTRATIVE REQUIREMENTS

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

1.4 SUBMITTALS

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

1. Certificates:
 - a. Manufacturer to provide \$10,000,000 minimum 'Certificate of Liability Insurance' policy.
 - 1) Policy on file at Church Headquarters. For questions, notify Mark Douglass at markdouglass@ldschurch.org.
 2. Manufacturer Instructions:
 - a. Printed installation instructions.
- C. Closeout Submittals:
1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Warranty Documentation:
 - 1) Include copy of final, executed warranty for defects in material and workmanship.
 - b. Record Documentation:
 - 1) Manufacturers Documentation:
 - a) Manufacturer's literature or cut sheets.

1.5 WARRANTY

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

PART 2 - PRODUCTS

2.1 OWNER-FURNISHED PRODUCTS

- A. Category Two Approved Manufacturer. See Section 01 6200 for definition of Categories:
1. Koala, Denver, CO www.koalabear.com.
- B. Baby Changing Station:
1. Model Number: KB300-SS
 2. Description:
 - a. Surface-mounted, horizontal plastic baby changing station with stainless steel veneer.
 - b. Constructed of polypropylene, unibody steel chassis.
 - c. Integral straps for securing baby.
 3. Design Criteria:
 - a. Manufacture to provide 'Certificate of Liability Insurance' policy.
 - b. Antimicrobial bed surface
 - c. Support **200 lbs (90 kg)** with minimal deflection.
 - d. Meet ADA regulations of ICC/ANSI A117.1 when properly installed.
 - e. Conform to ANSI Z535.4 for safety signs and labels, ASTM G21 for antifungal standards, and ASTM F2285 for consumer safety performance standard.
 4. Approved Products. See Section 01 6200 for definition of Categories:
 - a. Horizontal: Koala Kare model number KB200 by Koala.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

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

END OF SECTION

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DIVISION 21: FIRE SUPPRESSION

21 1000 WATER-BASED FIRE SUPPRESSION SYSTEMS

21 1313 WET-PIPE SPRINKLER SYSTEMS

END OF TABLE OF CONTENTS

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

- A. Includes But Not Limited To:
 - 1. Modify existing complete wet-pipe fire sprinkler system to provide full coverage of modified areas as described in Contract Documents.

1.2 REFERENCES

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

1.3 SUBMITTALS

A. Action Submittals:

1. Shop Drawings:

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

B. Informational Submittals:

1. Certificates:

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

2. Qualification Statement:

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

C. Closeout Submittals:

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

a. Operations and Maintenance Data:

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

b. Warranty Documentation:

- 1) Include copies of required warranties.

c. Record Documentation:

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

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

1.4 QUALITY ASSURANCE

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

PART 2 - PRODUCTS

2.1 SYSTEM

- A. Manufacturers:
 1. Manufacturer Contact List:

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

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

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

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

² Class 125 or 150.

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

⁴ Grade 'A'.

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

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

2.2 ACCESSORIES

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

PART 3 - EXECUTION

3.1 INSTALLERS

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

3.2 EXAMINATION

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

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

3.3 INSTALLATION

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

END OF SECTION

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DIVISION 22: PLUMBING

22 0500 COMMON WORK RESULTS FOR PLUMBING

- 22 0501 COMMON PLUMBING REQUIREMENTS
- 22 0529 HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT
- 22 0553 IDENTIFICATION FOR PLUMBING PIPES AND EQUIPMENT
- 22 0719 PLUMBING PIPING INSULATION

22 1000 PLUMBING PIPES AND PUMPS

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

22 4000 PLUMBING FIXTURES

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

END OF TABLE OF CONTENTS

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SECTION 22 0501**COMMON PLUMBING REQUIREMENTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Common requirements and procedures for plumbing systems.
 - 2. Responsibility for proper operation of electrically powered equipment furnished under this Division.
 - 3. Furnish and install sealants relating to installation of systems installed under this Division.
 - 4. Furnish and install Firestop Penetration Systems for plumbing systems penetrations as described in Contract Documents.
- B. Products Furnished But Not Installed Under This Section:
 - 1. Sleeves, inserts, supports, and equipment for plumbing systems installed under other Sections.
- C. Related Requirements:
 - 1. Section 05 0523: 'Metal Fastening' for quality and requirements for welding.
 - 2. Section 07 8400: 'Firestopping' for quality of penetration firestop systems to be used on Project and submittal requirements.
 - 3. Section 07 9213: 'Elastomeric Joint Sealant' for quality at building exterior.
 - 4. Sections Under 09 9000 Heading: 'Paints And Coatings' for painting of plumbing items requiring field painting.
 - 5. Division 26: 'Electrical' for raceway and conduit, unless specified otherwise, and line voltage wiring.
 - 6. Slots and openings through floors, walls, ceilings, and roofs provided under other Divisions in their respective materials.

1.2 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

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

- A. Includes But Not Limited To:
 - 1. Furnish and install insulation on hot and cold water lines, fittings, valves, and accessories as described in Contract Documents.
- 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

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

- A. Includes But Not Limited To:
 - 1. Furnish and install potable water piping 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 Silvacbrite 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.
6. Mixing Valve:
 - 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 11 GPM with maximum 10 psi pressure drop. Perform to minimum flow of 0.5 GPM in accordance with ASSE 1017.
 - d. Set for 110 deg F. Service.
 - e. Match Construction Drawings for connection sizes.
 - f. Class One Quality Standard: Powers LFMM430. See Section 01 6200.
 - g. Acceptable Manufacturers: Acorn, Chicago Faucets, Leonard, Powers, Sloan, Symmons and Watts.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Locate cold water lines a minimum of 6 inches 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. Water Hammer Arrestors:
 - a. Design Criteria:
 - 1) Meet NSF International Standards for Lead Free.
 - 2) Nesting type, air pre-charged bellows with casing.
 - 3) Bellows constructed of stabilized 18-8 stainless steel.
 - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Josam: 75003.
 - 2) Jay R. Smith: 5020.
 - 3) Sioux Chief: 650 Series.
 - 4) Wade: 20.

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.siuoxchief.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.

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

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

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

1.2 REFERENCES

- A. Definitions:
 - 1. 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

DIVISION 23: HEATING, VENTILATING, AND AIR-CONDITIONING

23 0500 COMMON WORK RESULTS FOR HVAC

- 23 0501 COMMON HVAC REQUIREMENTS
- 23 0529 HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT
- 23 0713 DUCT INSULATION
- 23 0933 ELECTRIC AND ELECTRONIC CONTROL SYSTEM FOR HVAC

23 3000 HVAC AIR DISTRIBUTION

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

END OF TABLE OF CONTENTS

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

- A. Includes But Not Limited To:
 - 1. Common requirements and procedures for HVAC systems.
 - 2. Responsibility for proper operation of electrically powered equipment furnished under this Division.
 - 3. Interface with Testing And Balancing Agency.
 - 4. Furnish and install sealants relating to installation of systems installed under this Division.
 - 5. Furnish and install Firestop Penetration Systems for HVAC system penetrations as described in Contract Documents.
 - 6. Furnish and install sound, vibration, and seismic control elements.
- B. Products Furnished But Not Installed Under This Section:
 - 1. Sleeves, inserts, and equipment for mechanical systems installed under other Sections.
- C. Related Requirements:
 - 1. Section 05 0523: 'Metal Fastening' for quality and requirements for welding.
 - 2. Section 07 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

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SECTION 23 0529**HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Common hanger and support requirements and procedures for HVAC systems.
- B. Related Requirements:
 - 1. Section 05 0523: 'Metal Fastening' for quality and requirements for welding.
 - 2. Section 07 8400: 'Firestopping' for quality of Penetration Firestop Systems to be used on Project and submittal requirements.
 - 3. Slots and openings through floors, walls, ceilings, and roofs provided under other Divisions in their respective materials.
- C. Products Installed But Not Furnished Under This Section:
 - 1. Stencils and band colors of gas piping used in HVAC equipment.
- D. Related Requirements:
 - 1. Section 09 9124: 'Interior Painted Metal' for providing field painting of identification of piping used with HVAC equipment.
 - 2. Section 23 0553: 'Identification For HVAC Piping And Equipment' for HVAC piping and equipment identification signage requirements.
 - 3. Sections Under 09 9000 Heading: Painting of mechanical items requiring field painting.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Section 09 9124 to coordinate with Section 23 0529 for location of identification of HVAC piping and equipment to be field painted and Section 23 0553 for painting requirements of HVAC piping and equipment.
 - 2. Section 23 0529 to coordinate with Section 23 0553 for stencil and band color locations and identification requirements of HVAC piping and equipment for field application.

1.3 SUBMITTALS

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

PART 2 - PRODUCTS**2.1 ASSEMBLIES**

- A. Manufacturers:
 - 1. 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**

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 Polymerics: DP2501 or DP2502 (CMCL-2501).
 - c) Duro Dyne: WSA.
 - d) Elgen: A-410-WB.
 - e) Hardcast: Coil-Tack.
 - f) Hercules: Mighty Tough Adhesives MTA500 or MTA600.
 - g) Miracle / Kingco: PF-101.
 - h) Mon-Eco: 22-67 or 22-76.
 - i) Polymer Adhesive: Glasstack #35.
 - j) Techno Adhesive: 133.
 - k) McGill AirSeal: Uni-tack.
- 2) Category Four Approved Solvent-Based (non-flammable) Products. See Section 01 6200 for definitions of Categories:
 - a) Cain: Safetak.
 - b) Duro Dyne: FPG.
 - c) Hardcast: Glas-Grip 648-NFSE.
 - d) Miracle / Kingco: PF-91.
 - e) Mon-Eco: 22-24.
 - f) Polymer Adhesive: Q-Tack.
 - g) Techno Adhesive: 'Non-Flam' 106.
- 3) Category Four Approved Solvent-Based (flammable) Products. See Section 01 6200 for definitions of Categories:
 - a) Cain: HV200.
 - b) Duro Dyne: MPG.
 - c) Hardcast: Glas-Grip 636-SE.
 - d) Miracle / Kingco: PF-96.
 - e) Mon-Eco: 22-22.
 - f) Polymer Adhesive: R-Tack.

- g) Techno Adhesive: 'Flammable' 106.
- c. Fasteners:
 - 1) Adhesively secured fasteners not allowed.
 - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) AGM Industries: 'DynaPoint' Series RP-9 pin.
 - b) Cain.
 - c) Duro Dyne.
 - d) Gripnail: May be used if each nail is installed by 'Grip Nail Air Hammer' or by 'Automatic Fastener Equipment' in accordance with Manufacturer's 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 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

DIVISION 26: ELECTRICAL

26 0500 COMMON WORK RESULTS FOR ELECTRICAL

26 0501 COMMON ELECTRICAL REQUIREMENTS
26 0519 LINE-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
26 0526 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
26 0533 RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS SCHEDULE
26 0613 ELECTRICAL EQUIPMENT MOUNTING HEIGHT SCHEDULE
26 0924 LIGHTING CONTROL SYSTEM

26 2000 LOW-VOLTAGE ELECTRICAL TRANSMISSION

26 2726 WIRING DEVICES

26 5000 LIGHTING

26 5100 INTERIOR LIGHTING
26 5121 INTERIOR LIGHTING: LED DIMMING DRIVERS
26 5200 EMERGENCY LIGHTING

END OF TABLE OF CONTENTS

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

- A. Includes But Not Limited To:
 - 1. General electrical system requirements and procedures.
 - 2. Perform excavating and backfilling work required by work of this Division as described in Contract Documents.
 - 3. Make electrical connections to equipment provided under other Sections.
- B. Products Furnished But Not Installed Under This Section:
 - 1. Anchor bolts and templates for exterior lighting equipment bases.
- C. Related Requirements:
 - 1. Section 01 3200: 'Construction Process Documentation' for scheduling of equipment and materials removed by Owner.
 - 2. Section 02 4119: 'Selective Structure Demolition' for salvage of existing electrical items to be reused or recycled.

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

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

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. 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).

END OF SECTION

SECTION 26 0924**LIGHTING CONTROL SYSTEM****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install complete lighting control system as described in Contract Documents consisting of the following:
 - a. Lighting Control Panel.
 - b. Programmable Digital Control Switches.
 - c. Photocells.
- B. Related Requirements:
 - 1. Section 26 0501: 'Common Electrical Requirements'.

1.2 REFERENCES

- A. Definitions:
 - 1. Class A: Equipment has been tested and found to comply with limits for Class A digital device, pursuant to part 15 of FCC Rules. These limits provide reasonable protection against harmful interference when equipment is operated in commercial environment.
- B. Reference Standards:
 - 1. Federal Communications Commission (FCC):
 - a. Emission requirements for Class A applications.
 - 2. Underwriters Laboratories:
 - a. UL 916, 'Energy Management Equipment' (2015).

1.3 SUBMITTALS

- A. Informational Submittals:
 - 1. Certifications:
 - a. Technician Certification that equipment has been installed, adjusted and tested in accordance with Manufacturer's recommendations.
- B. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Operations and Maintenance Data:
 - 1) Equipment operation and maintenance manual(s).

1.4 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. All control equipment shall be in compliance with FCC emissions' standards in Part 15 Subpart J for Class A application.
 - 2. Programmable panelboards shall be UL listed under UL 916 Energy Management Equipment.
- B. Qualifications:
 - 1. Manufacturer Qualifications:
 - a. Manufacturer of assembly shall be manufacturer of major components with assembly.

- b. Manufacturer of this equipment shall have minimum of five (5) years manufacturing experience.
 - 2. Technician Qualifications:
 - a. Authorized by Manufacturer and trained.
 - b. Have thorough knowledge of software, hardware and system programming.
- C. Certifications:
- 1. Provide Technician Certification that equipment has been installed, adjusted and tested in accordance with Manufacturer's recommendations.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
- 1. Equipment shall be delivered, handled and stored in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.1 ASSEMBLIES

- A. Manufacturers:
- 1. Acceptable Manufacturer:
 - a. Watt Stopper Inc., Santa Clara, CA www.wattstopper.com.
 - b. No others will be allowed.
- B. Design Criteria:
- 1. Lighting Control System shall meet or exceed following capabilities:
 - a. Capable of switching for specific lighting zone for following:
 - 1) Time-of-day scheduling
 - 2) Daylight savings time adjustments.
 - 3) Light level sensors.
- C. Components:
- 1. Light Control Panel:
 - a. Enclosure/tub shall be NEMA 1 unless indicated otherwise on Drawings, sized to accommodate required components.
 - b. Cover shall have hinged and lockable door and be configured for flush mounting of panel.
 - c. Panel shall include power supply and interior assembly with motherboard and control electronics.
 - 1) Interior construction shall provide isolation between line voltage and low voltage (class 2) wiring.
 - d. Panel shall be factory assembled and designed for disassembly for mounting enclosure first and reassembly after conduit installation.
 - e. Panel shall utilize mechanically held latching relays rated for 30A ballast load at 120/277VAC with 10,000A short circuit current rating and shall include contactor for exterior lighting control.
 - 1) Visual LED status and manual override for each relay shall be included.
 - f. Panel shall contain network clock/programmer and photocell control module for interface with interior and exterior photocell controls.
 - 1) Network clock shall provide menu driven control for seven (7) day repeating schedules and holiday provisions.
 - 2) Clock shall provide user selectable pre-programmed scenarios for: Scheduled on/off, Manual on/off, Scheduled off, and on/off when used with photocell control module.
 - g. Panel shall contain automation intelligence card for program, monitor, and control functions and group cards as required for control of groups of relays.
 - 2. Programmable Digital Control Switches:

- a. Programmable digital control switches shall be provided with number of control buttons as indicated on Contract Drawings.
 - 1) Each button shall be capable of individual programming without use of computer or other programming device.
 - 2) Each button shall be able to control individual relay or group of relays.
 - 3) Individual buttons shall allow for permanent labeling.
- b. Switches shall be illuminated for ease of location in dark.
- 3. Photocells:
 - a. Weatherproof Class 2 photocell shall be provided for exterior light levels.
 - b. Adjustable interior photo cell shall be provided for day-lighting control.
 - 1) Photocell shall provide output suitable for controlling continuously dimming loads.
 - 2) Refer to Contract Drawings for fixtures to be controlled.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General:
 - 1. Install switches flush with wall, straight and level.
 - 2. Permanently label switches as shown on drawing schedule in Contract Drawings.
- B. Interface With Other Work:
 - 1. Coordinate with appropriate Sections of Divisions 26.
 - 2. Program system to meet the local energy code.
- C. Space Control Requirements:
 - 1. Unless relevant provisions of applicable local Energy codes are more stringent, provide minimum application of lighting controls as follows:
 - a. Provide occupancy/vacancy sensors with Manual-ON/OFF functionality in all.
 - b. Provide Manual-ON occupancy/vacancy sensors for any enclosed office, conference room, meeting room or classroom. For spaces with multiple occupants, or where line-of-sight may be obscured, provide ceiling-mounted sensors and Manual-ON switches, if necessary.

3.2 FIELD QUALITY CONTROL

- A. Field Testing:
 - 1. Manufacturer shall provide Manufacturer's authorized Technician to adequately test supplied equipment and software to ensure system performs as intended including the following:
 - a. Test start-up system and confirm proper installation, operation, and adjustment of all system components.
 - 2. Submit Certification in writing that equipment has been installed, adjusted and tested in accordance with Manufacturer's recommendations.
- B. Non-Conforming Work: Non-conforming work as covered in the General Conditions applies, but is not limited to following:
 - 1. Correct any work found defective or not complying with Contract Document requirements at no additional cost to the Owner.

3.3 CLOSE-OUT ACTIVITIES

- A. Instruction of Owner:
 - 1. Provide Manufacturer's authorized Technician training session for Owner's Representative(s) for demonstrating operation and programming of completed system.
 - a. Training program shall include instructions on control system, programming, and other major components. Provide Manufacturer Manual(s) to be submitted to Owner to assist training.

- b. Training program shall include:
 - 1) System review of all system components and their function.
 - 2) System review of all management software and its function.
 - 3) Operator training to develop experience with control applications.

END OF SECTION

SECTION 26 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.
 - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Cooper: GF15W.
 - 2) Hubbell: GF5252WA.
 - 3) Leviton: 8599-W.
 - 4) Pass & Seymour: 1594-W.
- D. Plates:
- 1. Standard Cover Plates:
 - a. Office / Occupied Areas:
 - 1) Nylon or high impact resistant thermoplastic.
 - 2) Color shall match wiring device.
 - b. All Other: Steel.

- c. Ganged switches shall have gang plates.
 - d. Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories:
 - 1) Cooper.
 - 2) Hubbell.
 - 3) Leviton.
 - 4) Pass & Seymour.
- E. Occupancy Sensors:
- 1. Ceiling, ultrasonic type.
 - a. Complete with sensor and combined relay / control transformer.
 - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) 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.

PART 3 - EXECUTION

3.1 INSTALLATION

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

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 5121**INTERIOR LIGHTING: LED Dimming Drivers****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install Interior Lighting LED Dimming Drivers as described in Contract Documents, complete with lamps.
- B. Related Requirements:
 - 1. Section 26 0501: 'Common Electrical Requirements'.
 - 2. Section 26 0924, 'Lighting Control System'.
 - 3. Section 26 2726: 'Wiring Devices'.
 - 4. Section 26 5100: 'Interior Lighting'.
- C. Reference Standards:
 - 1. American National Standards Institute (ANSI) / American National Standard Lighting Group (ANSLG):
 - a. ANSI/ANSLG C78.377-2017, 'American National Standard for Electric Lamps: Specification for the Chromaticity of Solid State Lighting Products'.
 - b. ANSI/ANSLG C82.11-2017, 'High-Frequency Fluorescent Lamp Ballasts'.
 - 2. American National Standards Institute (ANSI) / Illuminating Engineering Society (IES):
 - a. ANSI/IES RP-16-10, 'Nomenclature and Definitions for Illuminating Engineering'.
 - 3. Federal Communications Commission (FCC):
 - a. Code of Federal Regulations (CFR):
 - 1) FCC 47 CFR Part 15, 'Class B: Radio Frequency Devices'.
 - 4. Institute of Electrical and Electronics Engineers (IEEE) / American National Standards Institute (ANSI):
 - a. IEEE/ANSI C62.41.1-2002, 'Guide on the Surge Environment in Low-Voltage (1000 V and Less) AC Power Circuits'.
 - 5. International Electrotechnical Commission (IEC):
 - a. IEC 60929 ED. 4.0 B:2011, 'AC and/or DC Supplied Electronic Control Gear for Tubular Fluorescent Lamps - Performance Requirements'.
 - b. IEC 61000-3-2 ED. 5.0 B:2018, 'Electromagnetic Compatibility (EMC) - Part 3-2: Limits for Harmonic Current Emissions (Equipment Input Current ≤ 16 A per phase)'.
 - c. IEC 61347-1 ED. 3.1 B:2017, 'Lamp Controlgear - Part 1: General and Safety Requirements'.
 - d. IEC 61347-2-13 ED. 2.1 B:2016, 'Lamp Controlgear - Part 2-13: Particular Requirements for d.c. or a.c. Supplied Electronic Controlgear for LED modules'.
 - e. IEC 61547 ED. 2.0 B:2009, 'Equipment for General Lighting Purposes - EMC Immunity Requirements'.
 - f. IEC 62384 ED. 1.0 B:2006, 'D.C. or A.C. Supplied Electronic Control Gear for LED Modules - Performance Requirements'.
 - g. IEC 62386-101 ED. 2.1 B:2018, 'Digital Addressable Lighting Interface - Part 101: General Requirements - System'.
 - 6. National Electrical Manufacturers Association (NEMA):
 - a. NEMA 410-2015, 'Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts'.
 - 7. Underwriters Laboratories (UL):
 - a. UL 1310: 'Class 2 Power Units' (2018).
 - 8. Underwriters Laboratories (UL) / Underwriters Laboratories of Canada (ULC):
 - a. UL 8750: 'Standard for Light Emitting Diode (LED) Equipment for Use in Lighting Products' (2015).

1.2 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Manufacturer's published product data on dimensions, ratings, catalog numbers and identification of products and accessories for products included for project. Include performance data.
 - 2. Shop Drawings:
 - a. Provide fixture type(s) list for each specific driver.
 - b. Provide wiring diagrams as needed for special operation or interaction with other system(s).
- B. Informational Submittals:
 - 1. Qualification Statements:
 - a. Manufacturer: Provide experience compliance documentation.
 - b. Products: Provide compliance documentation with UL / ULC requirements.
- C. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Warranty Documentation:
 - 1) Final, executed copy of Warranty on drivers.

1.3 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Meet UL / ULC requirements.
- B. Qualifications. Requirements of Section 01 4301 applies but not limited to following:
 - 1. Manufacturer:
 - a. Manufacture with five (5) years experience in manufacture of dimmable electronic lighting drivers.
 - b. Provide experience documentation.

1.4 FIELD CONDITIONS

- A. Ambient Conditions:
 - 1. General:
 - a. Proceed with installation only when following ambient conditions can be maintained:
 - 1) Install when the temperature is between **minus 4 deg F (minus 20 deg C)** minimum and **122 deg. F (50 deg. C)** maximum and relative humidity is ninety (90) percent, non-condensing.
 - 2) Protect from dust and excess moisture during installation.

1.5 WARRANTY

- A. Manufacturer Warranty:
 - 1. Provide five (5) year warranty on drivers to operate driver at or below required driver warranty temperature.

PART 2 - PRODUCTS

2.1 ASSEMBLIES

- A. Manufacturers:
 - 1. Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories:

- a. eldoLED America, San Jose, CA www.eldoled.com.
 - b. General Electric Lighting, Hendersonville, NC or General Electric Lighting Canada Inc, Mississauga, ON www.gelighting.com/na.
 - c. Howard Lighting Products, Laurel, MS www.howard-ind.com.
 - d. OSRAM Sylvania, Danvers, MA or OSRAM Sylvania LTD, Mississauga, Ontario Canada www.Sylvania.com.
 - e. Philips Lighting Co, Somerset, NJ www.lighting.philips.com/nam or Philips Lighting Canada, Scarborough, ON (416) 292-3000.
- B. LED Dimming Driver:
1. Description:
 - a. LED Dimming Driver:
 - 1) 4 wire (010V DC Voltage Controlled) Dimming Drivers.
 - 2) Digital (DALI Low Voltage Controlled) Dimming Drivers.
 - 3) Integral Diming Driver for replacement lamp.
 2. Design Criteria:
 - a. Driver:
 - 1) Driver must be able to operate for (+/- 10 percent) supply voltage of 120V through 277VAC at 60Hz.
 - 2) Driver to be UL / ULC recognized under component program and shall be modular for simple field replacement. Drivers that are not UL / ULC recognized or not suited for field replacement will not be used.
 - 3) Driver shall have ability to provide no light output when analog control signal drops below 0.5 V, or DALI digital signal calls for light to be extinguished and shall consume 0.5 watts or less in this standby. Control deadband between 0.5V and 0.65V shall be included to allow for voltage variation of incoming signal without causing noticeable variation in fixture to fixture output.
 - b. Range and Quality:
 - 1) LED dimming to be equal in range and quality to commercial grade incandescent dimmer:
 - a) Quality of dimming to be defined by dimming range, freedom from perceived flicker or visible stroboscopic flicker, smooth and continuous change in level (no visible steps in transitions), natural square law response to control input, and stable when input voltage conditions fluctuate over what is typically experience in commercial environment.
 - 2) Ten-year expected life while operating at maximum case temperature and 90 percent non-condensing relative humidity.
 - c. Inrush Current:
 - 1) Driver must limit inrush current as followings:
 - a) Minimum Requirement: Meet or exceed NEMA 410 driver inrush standard of 430 amps per 10 amps load with maximum of 370 amps² per second.
 - b) Preferred Requirement: Meet or exceed 30mA²s at 277VAC for up to 50 watts of load and 75A at 240us at 277VAC for 100 watts of load.
 - d. Withstand up to 1,000 volt surge without impairment of performance as defined by IEEE/ANSI C62.41.1 Category A.
 - e. Light Output:
 - 1) No visible change in light output with variation of plus/minus 10 percent line voltage input.
 - f. Harmonic Distortion:
 - 1) Total Harmonic Distortion less than 20 percent and meet ANSI/ANSLG C82.11 maximum allowable THD requirements at full output.
 - 2) THD shall at no point in dimming curve allow imbalance current to exceed full output THD.
 - g. Automatic Adaptation:
 - 1) Driver must support automatic adaptation, allowing for future luminaire upgrades and enhancements and deliver improved performance.
 - a) Adjustment of forward LED voltage, supporting 3V through 55V.
 - b) Adjustment of LED current from 200mA to 1.05A at the 100 percent control input point in increments of 1 mA.

- c) Adjustment for operating hours to maintain constant lumens (within 5 percent) over 50,000 hour design life of system, and deliver up to 20 percent energy savings early in life cycle.
- h. Light Quality:
 - 1) Over entire range of available drive currents, driver shall provide step-free, continuous dimming to black from 100 - 1 percent light output and step to 0 percent where indicated. Driver shall respond similarly when raising from 0 percent to 100 percent.
 - 2) Drivers to track evenly across multiple fixtures at all light levels, and shall have input signal to output light level that allows smooth adjustment over entire dimming range.
 - 3) Driver and luminaire electronics shall deliver illumination that is free from objectionable flicker as measured by flicker index (ANSI/IES RP-16-10). At all points within dimming range from 100-0.1 percent luminaire shall have:
 - a) LED dimming driver shall provide continuous step-free, flicker free dimming similar to incandescent source.
 - b) Minimum Requirement: Flicker index shall less that 5 percent at all frequencies below 1000 Hz.
 - c) Preferred specification: Flicker index shall be equal to incandescent, less that 1 percent at all frequencies below 1000 Hz.
- i. Control Input:
 - 1) 4-Wire (0-10V DC Voltage Controlled) Dimming Drivers:
 - a) Must meet IEC 60929 ED. 4.0 B Annex E for General White Lighting LED drivers.
 - b) Connect to devices compatible with 0 to 1 OV Analog Control Protocol, Class 2, capable of sinking 0.6 ma per driver at low end of 0.3V. Limit number of drivers on each 0-1 OV control output based on voltage drop and control capacity.
 - c) Control relays or contactors and transformers for up to six circuits
 - d) Sensor controller with HIGH, LOW, and DEADBAND adjustments.
 - 2) Digital (DALI Low Voltage Controlled) Dimming Drivers:
 - a) Must meet requirements of IEC 62386-101 ED.1.0 B.
 - 3) Integral Dimmer Driver for replacement lamps:
 - a) LED Driver shall not cause shadows.
 - b) LED Driver shall be line voltage controlled and shall be compatible with any universal dimmer.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation of driver to meet Manufacturer's prescribed methods and instructions.
- B. Meet Ambient Conditions requirements for installation.
- C. Driver may be remote mounted up to 300 ft (90 m) depending on power level and wire gauge.
- D. 0-10V input shall be protected from line voltage miswire, and immune and output unresponsive to induced AC voltage on control leads.

END OF SECTION

SECTION 26 5200**EMERGENCY LIGHTING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install emergency battery units as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 26 0501: 'Common Electrical Requirements'.

PART 2 - PRODUCTS**2.1 SYSTEMS**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Beghelli, Miramar, FL www.beghelliusa.com.
 - b. Bodine Emergency Lighting, Collierville, TN www.bodine.com
 - c. Dual-Lite, Cheshire, CT www.dual-lite.com.
 - d. Iota Engineering Co, Tucson, AZ www.iotaengineering.com
 - e. Lightolier, Fall River, MA www.lightolier.com.
 - f. Lithonia Lighting, Conyers, GA www.lithonia.com.
 - g. McPhilben / Day-Brite Lighting, Tupelo, MS www.mcphilben.com.
 - h. Sure-Lites / Cooper Lighting, Elk Grove, IL www.cooperlighting.com.
- B. Materials:
 - 1. Fluorescent Battery Packs:
 - a. Design Criteria:
 - 1) Batteries shall be long life nickel cadmium type.
 - 2) Complete with charging indicator light and test switch.
 - 3) Components shall be fully concealed and easily accessible for maintenance or replacement.
 - 4) Factory installed in lighting fixture, or field installed to same standards.
 - b. 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

DIVISION 28: ELECTRONIC SAFETY AND SECURITY

28 3000 ELECTRONIC DETECTION AND ALARM

28 3101 FIRE DETECTION AND ALARM SYSTEM

END OF TABLE OF CONTENTS

SECTION 28 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. Strobe Only:
 - 1) Wall mounted flush or semi-flush.
 - 2) Integrally mounted flashing light unit with block letters 'FIRE.' Adjustable light intensity of 15-110 candela and flash rate between one and three Hertz.
 - 3) Listed under UL Standard 1971.
 - c. Combination Horn / Strobe:
 - 1) Wall 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 (2 032 mm). 6 inches (150 mm) below ceiling, whenever ceiling is below 80 inches (2 032 mm).
 - 3) Wall-Mounted Strobe: 80 inches (2 032 mm). 6 inches (150 mm) below ceiling, whenever ceiling is below 80 inches (2 032 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

DIVISION 32: EXTERIOR IMPROVEMENTS

32 1000 BASES, BALLASTS, AND PAVING

32 1723 PAVEMENT MARKINGS

32 3000 SITE IMPROVEMENTS

32 3113 CHAIN LINK FENCES AND GATES

END OF TABLE OF CONTENTS

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SECTION 32 1723**PAVEMENT MARKINGS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish acrylic paint and apply pavement and curb markings as described in Contract Documents including:

1.2 REFERENCES

- A. Reference Standards:
 - 1. Federal Specifications and Standards:
 - a. FED-STD-595C, 'Federal Standard: Colors Used in Government Procurement' (16 Jan 2008).
 - b. FED TT-P-1952F, 'Paint, Traffic and Airfield Marking, Waterborne' (17 Feb 2015).
 - 2. U.S. Department of Transportation Federal Highway Administration:
 - a. FHWA MUTCD-10, 'Manual on Uniform Traffic Control Devices'.

1.3 SUBMITTALS

- A. Action Submittal:
 - 1. Product Data:
 - 1) Manufacturer's published product data and certification that product supplied meets requirements of this specification.
- B. Informational Submittal:
 - 1. Test And Evaluation Reports:
 - a. Acrylic Paint:
 - 1) Provide reports showing compliance to FED TT-P-1952F.
- C. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Record Documentation:
 - 1) Manufacturer's Documentation:
 - a) Product data.
 - b) Specification compliance documentation.
 - 2) Testing and Inspection Reports:
 - a) Reports showing compliance.

1.4 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Paint must meet requirements of FED TT-P-1952-F and local regulations for VOC.
 - 2. Paint handicap spaces to conform to ADA Standards and local code requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

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

- a. Labels to include:
 - 1) Manufacturer's name and address.
 - 2) TT-P-1952F reference.
 - 3) Classification Type.
 - 4) Color.
- B. Storage And Handling Requirements:
 1. Follow Manufacturer's storage and handling requirements.
 2. Protect stored material from freezing at temperatures above 35 deg F (2 deg C) or above 115 deg F (46.1 deg C).
 3. Do not invert or roll containers.

1.6 FIELD CONDITIONS

- A. Ambient Conditions:
 1. Acrylic Paint:
 - a. Apply only on dry clean surfaces, during favorable weather (not excessively windy, dusty, or foggy), and when damage by rain, fog, or condensation not anticipated.
 - b. Paving surface and Ambient temperature shall be minimum 50 deg F (10 deg C) and rising.
 - c. Temperature shall not drop below 50 deg F (10 deg C) within twenty-four (24) hour period following application.
 - d. Acetone based paints that are one hundred (100) percent acrylic shall not drop below 32 deg F (0 deg C) within twenty-four (24) hour period following application.

PART 2 - PRODUCTS

2.1 MATERIAL

- A. Acrylic Paint:
 1. Description:
 - a. Low VOC, ready-mixed, one- component, acrylic waterborne traffic marking paint suitable for application on concrete, asphalt, sealers, and previously painted areas of these surfaces.
 2. Design Criteria:
 - a. General:
 - 1) Traffic Paint.
 - 2) Non-volatile portion of vehicle for all classification types shall be composed of one hundred (100) percent acrylic.
 - 3) Meet FED TT-P-1952F specification requirements.
 - 4) Fast drying when applied at ambient conditions requirement.
 - 5) Low VOC.
 - 6) Non-Reflectorized.
 - 7) Traffic paints not intended for use as floor paints. Do not use on pedestrian walkways or large surfaces such as ramps, floors and stairs which may become slippery when wet.
 - b. Classification:
 - 1) Type I for use under normal conditions.
 - 2) Type II for use under adverse conditions.
 - 3) Type III for increased durability.
 - c. Composition:
 - 1) Non-volatile portion for all types shall be composed of one hundred (100) percent acrylic polymer as determined by infrared spectral analysis.
 - 2) Prohibited material:
 - a) Product does not contain mercury, lead, hexavalent chromium, toluene, chlorinated solvents, hydrolysable chlorine derivatives, ethylene-based glycol ethers and their acetates, nor any carcinogen.
 - d. Qualitative Requirements:

- 1) Meet FED TT-P-1952F requirements for:
 - a) Abrasion resistance.
 - b) Accelerated package stability.
 - c) Accelerated weathering.
 - d) Appearance.
 - e) Color requirements:
 - (1) Color Match (all colors except white and yellow).
 - (2) Daylight directional reflectance.
 - (3) Yellow color match.
 - f) Condition in container.
 - g) Dry-through (early washout) for Type II only.
 - h) Flexibility.
 - i) Freeze/thaw stability.
 - j) Heat-shear stability.
 - k) Scrub resistance.
 - l) Skinning.
 - m) Titanium dioxide content.
 - n) Water resistance.
- e. Quantitative requirements:
 - 1) Meet FED TT-P-1952F requirements (Table 1).
 - 2) Acetone based paints that are one hundred (100) percent acrylic and have exempt status under Federal law are exempt from meeting FED TT-P-1952F requirements.
3. Colors:
 - a. General:
 - 1) Traffic Paint will be furnished in white and any Federal Standard 595 color in accordance to FED-STD-595C:
 - a) Yellow: 33538.
 - b) Blue: 35180.
 - c) Red: 31136.
 - b. White (Yellow may be used at Owner Representative's discretion):
 - 1) Lane lines, edge lines, transverse lines, arrows, words, symbol markings, speed bump markings, parking space markings.
 - c. Yellow:
 - 1) Cross-hatching in medians, cross hatching in safety zones separating opposing traffic flows, crosswalk stripes, safety markings, centerlines, edge lines along left edge of one-way roadway or one-way ramp.
 - d. Blue And White:
 - 1) In parking spaces specifically designated as reserved for disabled.
 - e. Red:
 - 1) Fire lanes, no parking zones, special raised pavement markers that are placed to be visible to "wrong-way" drivers.
4. Type Two Acceptable Products:
 - a. Any product meeting design criteria of this specification as approved by Architect/Owner's Representative before application. See Section 01 6200.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Acrylic Paint:
 1. Asphalt Surfaces:
 - a. Do not apply paint until asphalt has cooled.
 - b. Allow new seal coated surfaces to cure for at least twenty-four (24) hours before applying paint.
 2. Concrete Surfaces:
 - a. Do not apply paint to new concrete surfaces until concrete has cured seven (7) days minimum.

- B. Surfaces shall be dry and free of grease and loose dirt particles.
 - 1. Scrape and wire brush chipped, peeling, or damaged paint on existing curbs.
- C. Perform layout with chalk or lumber crayon only.

3.2 APPLICATION

- A. General:
 - 1. Mix in accordance and apply as per Manufacturer's instructions.
 - 2. Apply at locations and to dimensions and spacing as shown on Contract Drawings.
- B. Tolerances:
 - 1. General: Make lines parallel, evenly spaced, and with sharply defined edges.
 - 2. Line Widths:
 - a. Plus or minus **1/4 inch (6 mm)** variance on straight segments.
 - b. Plus or minus **1/2 inch (13 mm)** variance on curved alignments.
- C. Coverage:
 - 1. Paint stripes added to new asphalt and concrete surfaces:
 - a. Apply single coat.
 - 2. Paint stripes applied to existing asphalt and concrete surfaces:
 - a. Apply single coat to existing asphalt parking lots which are being re-striped and where no surface treatments are being applied to asphalt.
 - b. Apply single coat to existing concrete parking lots which are being re-striped.
 - c. Apply single coat to existing concrete curbs.
 - 3. Paint stripes applied to new asphalt paving surface treatment over existing asphalt paving.
 - a. Except for slurry seal:
 - 1) Apply single coat after seal coat has completely dried.
 - b. Slurry seal coat:
 - 1) Apply first coat after seal coat has completely dried.
 - 2) Apply second coat after first coat has thoroughly dried and then wait thirty (30) to forty-five (45) days and after ravel sweeping to apply second coat.
 - 4. Apply traffic paint at rate of 13 to 15 mils minimum wet thickness, 8 to 9 mils dry thickness. Application at more than 15 mils may result in extended dry times and may cause lifting or cracking on some asphalt surfaces.

3.3 FIELD QUALITY CONTROL

- A. Non-Conforming Work:
 - 1. Replace or correct defective material not conforming to requirements of this specification or any work performed that is of inferior quality at no cost to Owner.

3.4 CLEANING

- A. General:
 - 1. Remove drips, overspray, improper markings, and paint material tracked by traffic by sand blasting, wire brushing, or other method approved by Architect/Owner's Representative before performance.
- B. Waste Management:
 - 1. Remove debris resulting from work of this Section. Dispose of or recycle all trash and excess material in manner conforming to current EPA regulations and local laws.

END OF SECTION

SECTION 32 3113**CHAIN LINK FENCES AND GATES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install complete fence and gates as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 03 3111: 'Cast-In-Place Structural Concrete' for mow strips at fencing and setting sleeves in concrete retaining walls.
 - 2. Section 05 0503: 'Shop-Applied Metal Coatings' for priming and galvanizing repair.
 - 3. Section 05 0523: 'Metal Fastening' for welding requirements.

1.2 REFERENCES

- A. Association Publications: / Organizations:
 - 1. Chain Link Fence Manufacturers Institute (CLFMI), Columbia, MD www.chainlinkinfo.org.
 - a. WLG 2445, '*Chain Link Fence Wind Load Guide for the Selection of Line Post and Line Post Spacing*' (2012).
 - b. CLF-SFR0111, '*Chain Link Fence Manufacturers Institute Security Fencing Recommendations*'.
 - c. CLF-PM0610, '*Field Inspection Guide*'.
 - d. CLF-TP0211, '*Tested and Proven Performance of Security Grade Chain Link Fencing Systems*'.
- B. Reference Standards:
 - 1. ASTM International:
 - a. ASTM A123/A123M-17, 'Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products'.
 - b. ASTM A153/A153M-16a, 'Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware'.
 - c. ASTM A392-11a(2017), 'Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric'.
 - d. ASTM A1011/A1011M-18a, 'Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength'.
 - e. ASTM C1107/C1107M-17, 'Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)'.
 - f. ASTM F1043-18, 'Standard Specification for Strength and Protective Coatings on Steel Industrial Chain Link Fence Framework'.
 - g. ASTM F1083-18, 'Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures'.
 - h. ASTM F3000/F3000M-13(2018), 'Standard Specification for Polymer Privacy Insert Slats for Chain Link Fabric and Privacy Chain Link Fabric Manufactured Containing Pre-Installed Privacy Slats'.

1.3 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data: Manufacturer literature or cut sheets on fence components.
 - 2. Samples: Types of vision slats and colors for Architect's selection.

B. Closeout Submittals:

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

1.4 WARRANTY

A. Vision Slats:

1. Manufacturers twenty-five (25) year, pro-rata limited Warranty.

PART 2 - PRODUCTS**2.1 ASSEMBLIES**

A. Materials:

1. Fabric:
 - a. Chain Link Fabric of 9 ga (3.7 mm) wire, galvanized before or after weaving with 1.2 ounce (34 grams) zinc coating conforming to requirements of ASTM A392, Class I.
 - b. Mesh:
 - 1) With Visual Privacy / Security Slats:
 - a) 3-1/2 inch by 5 inch (89 mm by 125 mm) mesh as required by specified vision slat.
 - c. Knuckle both selvages.
2. Framework:
 - a. Posts and Rails shall be roll-formed, self-draining shapes meeting strength requirements of ASTM F1043, Table 3, and with 2 ounce (56.7 grams) zinc coating per 1 sq ft (0.0929 sq meter) of surface area conforming to ASTM A123/A123M.
 - b. Line Posts:
 - 1) Line Posts 8 feet (2.45 m) and under:
 - a) 1.875 by 1.625 inch (48 by 41 mm) C-section roll formed from steel conforming to ASTM A1011/A1011M, Grade 45, with minimum theoretical bending strength of 247 lbs (112 kg) under 6 foot (1.80 m) cantilever load.
 - b) 2.375 inch (60 mm) outside diameter Schedule 40 tubular section weighing 3.65 lbs (1.6 kg) per lineal 1 ft (305 mm) meeting requirements of ASTM F1083.
 - c) 2.375 inch (60 mm) outside diameter Schedule 40 tubular section weighing 3.12 lbs (1.42 kg) per lineal 1 ft (305 mm) formed from steel meeting requirements of ASTM A1011/A1011M.
 - 2) Line Posts over 8 feet (2.45 m):
 - a) 2.25 by 1.70 inch (57 by 43 mm) C-section meeting other requirements given above.
 - b) 2.875 inch (48 mm) outside diameter Schedule 40 tubular section weighing 5.79 lbs (2.63 kg) per lineal 1 ft (305 mm) meeting requirements of ASTM F1083.
 - c) 2.875 inch (48 mm) outside diameter Schedule 40 tubular section weighing 4.64 lbs (2.11 kg) per lineal 1 ft (305 mm) formed from steel meeting requirements of ASTM A1011/A1011M.
 - c. Terminal And Gate Posts:
 - 1) Gate Posts and gate posts for gate leaves under 6 feet (1.80 m) wide:
 - a) 3.5 by 3.5 inch (89 by 89 mm) roll formed section with minimum theoretical bending strength of 486 pounds (220.5 kg) under 6 foot (1.80 m) cantilever load.
 - b) 3 inch (76 mm) outside diameter Schedule 40 pipe weighing 5.79 lbs (2.63 kg) per lineal 1 ft (305 mm) meeting requirements of ASTM F1083.
 - c) 3 inch (76 mm) outside diameter Schedule 40 tubular section weighing 4.64 lbs (2.11 kg) per lineal 1 ft (305 mm) formed from steel meeting requirements of ASTM A1011/A1011M.
 - 2) Gate Posts for supporting single gate leaf, or one leaf of a double gate installation, for nominal gate widths over 6 feet (1.80 meter):

Leaf Width	Post Outside Diameter	Lbs / lin ft (305 mm)
Over 6 ft (1.80 m) to 13 ft (3.96 m)	4 inches (100 mm)	9.11 (4.13 kg)
Over 13 ft (3.96 m) to 18 ft (5.49 m)	6.625 inches (168 mm)	18.97 (8.60 kg)
Over 18 ft (5.49 m)	8.925 inches (227 mm)	28.55 (12.95 kg)

- d. Top And Brace Rail:
 - 1) 1.625 by 1.25 inch (41 by 32 mm) roll formed section of 45,000 psi (310 MPa) yield strength channel shaped rail with minimum theoretical bending strength of 247 lbs (112 kg) on 10 foot (3.050 m) midpoint load.
 - 2) 1.660 inch 42 mm outside diameter Schedule 40 pipe weighing 2.27 lbs (1.03 kg) per lineal 1 ft (305 mm) meeting requirements of ASTM F1083.
 - 3) 1.660 inch 42 mm outside diameter Schedule 40 tubular section weighing 1.84 lbs (0.83 kg) per lineal 1 ft (305 mm) formed from steel meeting requirements of ASTM A1011/A1011M.
 - e. Fittings:
 - 1) Pressed steel or malleable iron, hot-dip galvanized conforming to ASTM A153/A153M.
 - 2) Tie wires shall be 12 ga (2.05 mm) minimum galvanized steel or 9 ga (3 mm) minimum aluminum wire.
 - f. Tension Wire: 7 ga (3.66 mm) minimum galvanized spring steel.
3. Gate Leafs Wider Than 6 Feet (1.80 Meters):
 - a. Fabricate perimeter frames from metal and finish to match fence framework. Assemble frames by welding or with special fittings and rivets, for rigid connections, providing security against removal or breakage connections.
 - 1) Provide same fabric as for fence. Install fabric with stretcher bars at vertical edges and at top and bottom edges. Attach stretchers bars to frame at not more than 15 inches (380 mm) on center.
 - 2) Install diagonal cross-bracing consisting of 3/8 inch (9.5 mm) diameter adjustable length truss rods to ensure frame rigidity without sag or twist.
 - b. Swing Gates: Fabricate perimeter frames of minimum 1.90 inches (48.26 mm) OD pipe.
 - c. Gate Hardware: Provide hardware and accessories for each gate, galvanized per ASTM A153/A153M, and in accordance with following:
 - 1) Hinges: Size and material to suit gate size, non-lift-off type, offset to permit 180 degree gate opening. Provide 1-1/2 pair of hinges for each leaf over 6 foot (1.80 m) nominal height.
 - 2) Latch At Paving: Forked type or plunger-bar type to permit operation from either side of gate, with padlock eye as integral part of latch.
 - d. Keeper: Provide keeper for vehicle gates, which automatically engages gate leaf and holds it in open position until manually released.
 - e. Double Gates:
 - 1) Provide gate stops for double gates, consisting of mushroom type flush plate with anchors, set in concrete, and designed to engage center drop rod or plunger bar.
 - 2) Include locking device and padlock eyes as integral part of latch, permitting both gate leaves to be locked with single padlock.
 - f. Sliding Gates: Provide Manufacturer's standard heavy-duty inverted channel track, ball-bearing hanger sheaves, overhead framing and supports, guides, stays, bracing, hardware, and accessories as required.
- B. Mixes:
 1. Post Foundation Concrete:
 - a. One cu ft cement, 2 cu ft (0.0566 cu m) sand, 4 cu ft (0.1132 cu m) gravel, and 5 gallons (18.93 liters) minimum to 6 gallons (22.71 liters) maximum water.
 - b. Mix thoroughly before placing.

2.2 ACCESSORIES

- A. Vision Slats And Fabric:
 1. Manufacturer Contact List:
 - a. PrivacyLink, Hyde Park, UT www.eprivacylink.com.

2. Description:
 - a. High-density polyethylene (HDPE), double-walled, self-locking or with locking feature that prevents slats from being removed
 - b. Slats pre-woven and pre-inserted into chain link fabric.
3. Design Criteria:
 - a. Meet ASTM F3000/F3000M requirements for pre-installed privacy slats.
 - b. Provide slats with ultra violet (UV) inhibitors.
4. Visual Privacy / Security (replacing chain link fence in existing fencing at As-Is Sales Area):
 - a. Near-Total Privacy:
 - 1) Description:
 - a) When installed, slats will provide 98 percent minimum visual privacy/security. On portion of fence between As-Is Sales area and Service Area, orient fencing slats so 100 percent minimum visual privacy / security are provided when fence is viewed from pavement area.
 - b) Mesh: 3-1/2 inch x 5 inch (89 mm x125 mm).
 - 2) Continuous 1-1/4 inch (32 mm) x 1 inch (25 mm) metal angel meeting framework requirements of this specification attached with carriage bolts to bottom rail as shown on Contract Drawings.
 - 3) Pre-inserted Slats:
 - a) Double-wall with wings on each side of slat that wedge slats tightly into mesh.
 - 4) Category Four Approved Product. See Section 01 6200 for definitions of Categories:
 - a) PrivacyLink or Privacy Link Ultra by PrivacyLink.
5. Color:
 - a. Slats:
 - 1) Grey.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Fence shall be installed by mechanics skilled and experienced in erecting fences of this type and in accordance with Contract Documents.
 1. When general ground contour is to be followed, make changes of grade in gradual, rolling manner.
 2. Evenly space posts in line of fence a maximum of 10 feet (3.050 meter) center to center.
- B. Post Foundations:
 1. Except atop retaining walls, set posts with concrete post foundations as specified below:
 - a. Line Posts:
 - 1) Diameter 8 inch (200 mm)
 - 2) Depth 36 inch (915 mm).
 - b. Gate, End, And Corner Posts:
 - 1) Diameter 12 inch (305 mm)
 - 2) Depth 42 inch (1 065 mm).
 - c. At mow strips, set top of post foundation below grade sufficient to allow for placing of mow strip. Measure post foundation depth from top of mow strip.
 - d. Where fences are incorporated into slabs, measure post foundation depth from top of slab. Extend bottom of slab footing sufficient to allow specified amount of concrete around post. At existing slabs, install fence outside perimeter of slab.
 - e. For fences on retaining walls, provide 12 inch (305 mm) long sleeves to be cast into retaining wall. Set pipe in sleeve and grout space between sleeve and post full.
- C. Fence:
 1. After posts have been permanently positioned and concrete cured for one (1) week minimum, install framework, braces, and top rail. Join top rail with 6 inch (150 mm) minimum couplings at not more than 21 foot (6.40 meter) centers.

2. Stretch fabric by attaching one end to terminal post and supplying sufficient tension to other end of stretch so slack is removed.
 - a. Fasten fabric to line posts with tie wires. Pass ties over one strand of fabric and hook under line post flange.
 - b. Place one tie as close to bottom of fabric as is possible with additional ties equally spaced between top and bottom band on approximately equal spacing not to exceed 14 inches (355 mm) on center.
 - c. Attach fabric to roll formed terminals by weaving fabric into integral lock loops formed in post. Attach fabric to tubular terminals with tension bars and bands.
 - d. Hold fabric approximately 2 inches (50 mm) above finish grade line.
 - e. On top rail, space tie wires at no more than 24 inches (610 mm) on center.
 - f. Securely attach fittings and firmly tighten nuts.
- D. Gates:
 1. Weld gate frames and provide for free and easy operation.
 2. Provide gate latching device with padlocking capabilities. Provide cane bolt to engage sleeve set in concrete at double gates.
 3. Align top bar of gates with top rail of fence.
 4. Gates shall be plumb and on same plane as fence, both vertically and horizontally.
 5. Set gate stops and other catches in concrete.

3.2 CLEANING

- A. Spread dirt from foundation excavations evenly around surrounding area unless otherwise directed. Leave area free of excess dribbles of concrete, pieces of wire, and other scrap materials.

END OF SECTION

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