Beaverton School District
Cooper Mountain Elementary School
Seismic Rehabilitation Grant Program (SRGP) Improvements

7670 SW 170th Ave.
Beaverton, OR 97007

Project Manual
Permit/Bid Set
12/4/2020

Owner
Beaverton School District
16550 SW Merlo Rd.
Beaverton, OR 97003
503.704.6783

Architect
Oh planning+design, architecture
115 NW First Avenue, Suite 300
Portland, OR 97209

Project Number
90060

SECTION 00 01 03

PROJECT TEAM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Identification of project team members and their contact information.

1.02 OWNER:

Beaverton School District.
Address: 16550 SW Merlo Rd..
City: Beaverton.
State: OR.
Zip Code: 97003.

Primary Contact: All correspondence from the Contractor to the Architect will be direct, with copies to this party, unless alternate arrangements are mutually agreed upon at preconstruction meeting.
Title: Project Manager.
Name: Eric Bolken.
Email: eric_bolken@beaverton.k12.or.us.
Phone: (503)704-6783.

1.03 ARCHITECT:

Design Professional of Record. All correspondence from the Contractor regarding construction documents authored by Architect's consultants will be through this party, unless alternate arrangements are mutually agreed upon at preconstruction meeting.
Architecture Firm:
Oh planning+design, architecture
115 NW 1st Avenue, Suite 300
Portland, OR 97209
Phone: 503-280-8000.
Fax: 503-224-5442.
Principal:
Deb France, AIA, NCARB, LEED AP
Primary Contact:
Name: Caitlin McGehee.
Title: Project Manager.
Email: caitlin.mcgehee@ohpd.net.
Phone: (503)551-2550.

1.04 CONSULTANTS:

A. Structural Engineering Consultant:
1. Company Name: Holmes Structures.
a. Address: 555 SE MLK Blvd., suite 602.
b. City: Portland.
c. State: OR.
d. Zip Code: 97214.
e. Telephone: (503)850-9144.

B. Mechanical Engineering Consultant - Plumbing:
1. Company Name: KCL Engineering.
a. Address: 312 NW 10TH AVE., SUITE 100.
b. City: Portland.
c. State: OR.
d. Zip Code: 97209.
e. Telephone: (971)400-0416.

C. Mechanical Engineering Consultant - HVAC:
   1. Company Name: KCL Engineering.
      a. Address: 312 NW 10TH AVE., SUITE 100.
      b. City: Portland.
      c. State: OR.
      d. Zip Code: 97209.
      e. Telephone: (971)400-0416.

D. Electrical Engineering Consultant:
   1. Company Name: KCL Engineering.
      a. Address: 312 NW 10TH AVE., SUITE 100.
      b. City: Portland.
      c. State: OR.
      d. Zip Code: 97209.
      e. Telephone: (971)400-0416.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 00 01 07
SEALS PAGE

PART 1 GENERAL

1.01 ARCHITECT OF RECORD:

A. Architect: Design Professional of Record. All correspondence from the Contractor regarding construction documents authored by Architect's consultants will be through this party, unless alternate arrangements are mutually agreed upon at preconstruction meeting.

B. Company Name: Oh planning+design, architecture.

DATE:

SEAL:

1.02 CONSULTANTS

A. **Structural Engineering Consultant:**

1. Company Name: Holmes Structures.
   a. Address: 555 SE MLK Blvd., Suite 602.
   b. City: Portland.
   c. State: OR.
   d. Zip Code: 97214.
   e. Telephone: (503)850-9144.



EXP. 12/31/2021

B. **Mechanical Engineering Consultant - Plumbing:**
   1. Company Name: KCL Engineering.
      a. Address: 312 NW 10TH AVE., SUITE 100.
      b. City: Portland.
      c. State: OR.
      d. Zip Code: 97209.
      e. Telephone: (971)400-0416.



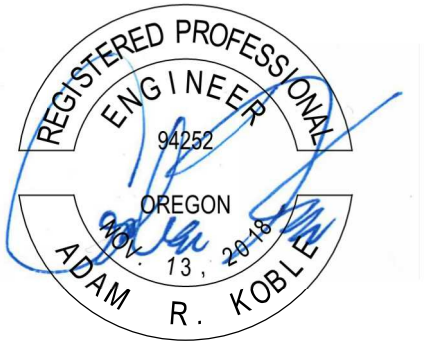
EXPIRES: 6/30/2022

C. **Mechanical Engineering Consultant - HVAC:**
   1. Company Name: KCL Engineering.
      a. Address: 312 NW 10TH AVE., SUITE 100.
      b. City: Portland.
      c. State: OR.
      d. Zip Code: 97209.
      e. Telephone: (971)400-0416.



EXPIRES: 6/30/2022

D. **Electrical Engineering Consultant:**
   1. Company Name: KCL Engineering.
      a. Address: 312 NW 10TH AVE., SUITE 100.
      b. City: Portland.
      c. State: OR.
      d. Zip Code: 97209.
      e. Telephone: (971)400-0416.



EXPIRES: 6/30/2021

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

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ALTERNATES FORM

PARTICULARS

1.01 THE FOLLOWING IS THE LIST OF ALTERNATES REFERENCED IN THE BID SUBMITTED BY:

1.02 (BIDDER) _____

1.03 TO (OWNER): BEAVERTON SCHOOL DISTRICT

1.04 DATED _____ AND WHICH IS AN INTEGRAL PART OF THE BID FORM.

ALTERNATES LIST

2.01 THE FOLLOWING AMOUNTS SHALL BE ADDED TO OR DEDUCTED FROM THE BID AMOUNT. REFER TO SECTION 01 23 00 - ALTERNATES.

ALTERNATE # 1: (DEDUCT) $ _____

ALTERNATE # 2: (DEDUCT) $ _____

ALTERNATE # 3: ADD $ _____

END OF SECTION

SECTION 00 43 25

SUBSTITUTION REQUEST FORM - DURING PROCUREMENT

TO:

PROJECT:

SPECIFIED ITEM:

SECTION: **PAGE:** **PARAGRAPH:**

DESCRIPTION:

PROPOSED SUBSTITUTION:

ATTACHED DATA INCLUDES PRODUCT DESCRIPTION, SPECIFICATIONS, DRAWINGS, PHOTOGRAPHS, PERFORMANCE AND TEST DATA ADEQUATE FOR EVALUATION OF REQUEST INCLUDING IDENTIFYING APPLICABLE DATA PORTIONS.

ATTACHED DATA ALSO INCLUDES DESCRIPTION OF CHANGES TO CONTRACT DOCUMENTS AND PROPOSED SUBSTITUTION REQUIRED FOR ITS PROPER INSTALLATION.

UNDERSIGNED CERTIFIES FOLLOWING ITEMS, UNLESS MODIFIED BY ATTACHMENTS, ARE CORRECT:

PROPOSED SUBSTITUTION DOES NOT AFFECT DIMENSIONS SHOWN ON DRAWINGS.

UNDERSIGNED PAYS FOR CHANGES TO BUILDING DESIGN, INCLUDING ENGINEERING DESIGN, DETAILING AND CONSTRUCTION COSTS CAUSED BY PROPOSED SUBSTITUTION.

PROPOSED SUBSTITUTION HAS NO ADVERSE EFFECT ON OTHER TRADES, CONSTRUCTION SCHEDULE, OR SPECIFIED WARRANTY REQUIREMENTS.

MAINTENANCE AND SERVICE PARTS AVAILABLE LOCALLY OR READILY OBTAINABLE FOR PROPOSED SUBSTITUTION.

UNDERSIGNED FURTHER CERTIFIES FUNCTION, APPEARANCE, AND QUALITY OF PROPOSED SUBSTITUTION ARE EQUIVALENT OR SUPERIOR TO SPECIFIED ITEM.

UNDERSIGNED AGREES, IF THIS PAGE IS REPRODUCED, TERMS AND CONDITIONS FOR SUBSTITUTIONS FOUND IN BIDDING DOCUMENTS APPLY TO THIS PROPOSED SUBSTITUTION.

SUBMITTED BY:

FIRM NAME:

ADDRESS:

CITY, STATE ZIP:

NAME

SIGNATURE:

TELEPHONE:

FAX:

DATE:

Architect/Engineer Review:

☐Approved ☐Approved as noted

☐Not Approved ☐Received too late

By:

Date:

Comments:

END OF SECTION

SECTION 00 63 25

SUBSTITUTION REQUEST FORM - DURING CONSTRUCTION

TO:

PROJECT:

SPECIFIED ITEM:

SECTION: **PAGE:** **PARAGRAPH:**

DESCRIPTION:

PROPOSED SUBSTITUTION:

ATTACHED DATA INCLUDES PRODUCT DESCRIPTION, SPECIFICATIONS, DRAWINGS, PHOTOGRAPHS, PERFORMANCE AND TEST DATA ADEQUATE FOR EVALUATION OF REQUEST INCLUDING IDENTIFYING APPLICABLE DATA PORTIONS.

ATTACHED DATA ALSO INCLUDES DESCRIPTION OF CHANGES TO CONTRACT DOCUMENTS AND PROPOSED SUBSTITUTION REQUIRED FOR ITS PROPER INSTALLATION.

UNDERSIGNED CERTIFIES FOLLOWING ITEMS, UNLESS MODIFIED BY ATTACHMENTS, ARE CORRECT:

PROPOSED SUBSTITUTION DOES NOT AFFECT DIMENSIONS SHOWN ON DRAWINGS.

UNDERSIGNED PAYS FOR CHANGES TO BUILDING DESIGN, INCLUDING ENGINEERING DESIGN, DETAILING AND CONSTRUCTION COSTS CAUSED BY PROPOSED SUBSTITUTION.

PROPOSED SUBSTITUTION HAS NO ADVERSE EFFECT ON OTHER TRADES, CONSTRUCTION SCHEDULE, OR SPECIFIED WARRANTY REQUIREMENTS.

MAINTENANCE AND SERVICE PARTS AVAILABLE LOCALLY OR READILY OBTAINABLE FOR PROPOSED SUBSTITUTION.

UNDERSIGNED FURTHER CERTIFIES FUNCTION, APPEARANCE, AND QUALITY

UNDERSIGNED AGREES, IF THIS PAGE IS REPRODUCED, TERMS AND CONDITIONS FOR SUBSTITUTIONS FOUND IN BIDDING DOCUMENTS APPLY TO THIS PROPOSED SUBSTITUTION.

SUBMITTED BY:

FIRM NAME:

ADDRESS:

CITY, STATE ZIP:

NAME:

SIGNATURE:

TELEPHONE:

FAX:

DATE:

Architect/Engineer Review:

☐ Approved ☐ Approved as noted

☐ Not Approved ☐ Received too late

By:

Date:

Comments:

END OF SECTION

SECTION 01 10 00
SUMMARY OF WORK

PART 1 GENERAL

1.01 PROJECT

A. Project Name: Cooper Mountain Elementary School - SRGP Improvements

B. Owner's Name: Beaverton School District.

C. Architect's Name: Oh planning+design, architecture.

D. Additional Project contact information is specified in Section 00 01 03 - Project Directory.

1.02 PERMITS AND FEES

A. The Owner will be responsible for filing and paying for building permits and all fees associated with the building permit and system development charges.

B. The Contractor will be responsible for picking up all Project permits and will have full responsibility for requirements of and payments for all trade permits (i.e. electrical, plumbing, mechanical) and all costs associated with deferred submittals. Contractor shall be responsible for coordinating installation of serving utilities and is responsible for paying for all charges associated with installation of utilities.

1.03 WORK COVERED BY CONTRACT DOCUMENTS

A. Scope of demolition and removal work is indicated on drawings.

B. Scope of alterations work is indicated on drawings.

C. The Work shall include all supplies, tools, equipment, scaffolding, transportation, utilities, service, superintendence, labor, and the furnishing of all materials, items, and accessories needed for the Project.

1. All on-site work, including demolition, installation, and final cleaning is required to be completed during the regularly scheduled hours. Contractor is to coordinate work to accommodate the continuous operation of the adjacent streets and utilities, without interruption or hindrance.
2. The Contractor shall provide for all scheduling, coordination, cutting and patching and all other items required by the Contract Documents to complete the Work.

1.04 WORK BY OWNER

A. Items noted OFOI (Owner Furnished, Owner Installed) will be supplied and installed by Owner before Substantial Completion, unless noted otherwise.

B. Items noted OFCI (Owner Furnished, Contractor Installed) will be supplied by the Owner and installed by the Contractor before Substantial Completion, unless noted otherwise.

1.05 OWNER OCCUPANCY

A. Owner intends to occupy the Project upon Substantial Completion.

B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.

C. Schedule the Work to accommodate Owner occupancy.

1.06 CONTRACTOR USE OF SITE

A. Construction Operations: Limited to areas noted on Drawings.

1. Locate and conduct construction activities in ways that will limit disturbance to site.

B. Provide access to and from site as required by law and by Owner:

1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
2. Do not obstruct roadways, sidewalks, or other public ways without permit.

C. Utility Outages and Shutdown:

1. Limit disruption of utility services to hours the building is unoccupied.

2. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 7 days notice to Owner and authorities having jurisdiction.
3. Prevent accidental disruption of utility services to other facilities.
4. Do not interrupt electric, gas, water, or other services to existing Owner-occupied structures without prior notice to the District and then only at a definite time and for a definite duration approved by Owner.
    a. Disruption of utilities must be approved by the Owner. Requests must be made 72 hours prior to disruption and a plan detailing a definite start time and duration provided.

D. Contractor's Site Conduct:
1. Identifying name tags will be worn at all times.
2. No loitering in the school buildings or unsupervised/unauthorized entry.
3. Site is tobacco- and cannabis-free. No smoking or chewing is allowed on any school property.
4. Beyond courtesy, there should be no interaction between staff and faculty.
5. Keep project free of pop cans, lunch wrappers and similar debris.
6. Review with the Owner the scheduling of any work that is excessively noisy or has the potential to disrupt activities of Owner or neighbors.
7. Be considerate of the client, the students and faculty. Always consider, prior to an act, the safety of students, faculty and other co-workers.
8. Profanity is not acceptable.
9. The wearing of clothing with logos displaying alcohol, tobacco, illegal or restricted substances or suggestive themes is not acceptable attire.

1.07 WORK SEQUENCE

A. Coordinate construction schedule and operations with Owner.

1.08 EXCESSIVE NOISE

A. Comply with all City and County noise ordinances, start and completion times.

B. Minimize noise during working hours. Notify Architect at least 48 hours prior to any necessary excessive noise.

1.09 ASBESTOS FREE CERTIFICATION

A. Absolutely no materials containing asbestos are to be furnished or installed as part of this Project. Ensure that no subcontractor or any of the Contractor's own forces installs any materials containing asbestos. At final closeout of the Project, provide to the Owner certification that no materials containing asbestos have been installed in the Project, and that the Project is asbestos-free as required by the State of Oregon.

1.10 CONTRACTOR DESIGNED ELEMENTS

A. Where work of this Contract requires bidder/designer design, comply with following requirements:
1. Submit Shop Drawings and Calculations to Architect for review.
2. Submit Shop Drawings and Calculations to appropriate City and County agencies for approval and permits.
3. All Shop Drawings and Calculations shall be stamped by Registered Architect/Engineer or Architect/Engineer licensed in State of Oregon.

1.11 COORDINATION OF WORK

A. Coordinate work of all Subcontractors, Sub-subcontractors, Suppliers, and Contractor's own forces to:
1. Assure that requirements of Contract Documents are met.
2. Provide efficient and orderly sequence of installation of interdependent construction elements.
3. Minimize need for cutting, patching, and removal of poorly-timed work.

B. Cooperate fully with the Owner, Architect/Engineer, testing laboratory, Project Manager, governmental agencies, utility companies, other contractors on site, and other affected parties to:
   1. Protect existing structures, utilities, landscaping, and improvements.
   2. Facilitate project testing and inspection.
   3. Assure that project work is accomplished with a minimum of disruption to affected persons and neighboring properties.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 20 00
PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedures for preparation and submittal of applications for progress payments.

B. Documentation of changes in Contract Sum and Contract Time.

C. Change procedures.

D. Procedures for preparation and submittal of application for final payment.

1.02 RELATED REQUIREMENTS

A. Section 00 50 00 - Contracting Forms and Supplements: Forms to be used.

B. Section 00 52 00 - Agreement Form: Contract Sum, retainages, payment period, monetary values of unit prices.

C. Section 00 72 00 - General Conditions: Additional requirements for progress payments, final payment, changes in the Work.

D. Section 00 73 00 - Supplementary Conditions: Percentage allowances for Contractor's overhead and profit.

E. Section 01 21 00 - Allowances: Payment procedures relating to allowances.

F. Section 01 22 00 - Unit Prices: Monetary values of unit prices; Payment and modification procedures relating to unit prices.

G. Section 01 78 00 - Closeout Submittals: Project record documents.

1.03 SCHEDULE OF VALUES

A. Use Schedule of Values Form: AIA G703, edition stipulated in the Agreement.

B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Architect for approval.

C. Submit Schedule of Values in duplicate within 10 days after date of Owner-Contractor Agreement.

D. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification section. Identify site mobilization and bonds and insurance.

E. Include in each line item, the amount of Allowances specified in this section. For unit cost Allowances, identify quantities taken from Contract Documents multiplied by the unit cost to achieve the total for the item.

1.04 APPLICATIONS FOR PROGRESS PAYMENTS

A. Payment Period: Submit at intervals stipulated in the Agreement.

B. Use Form AIA G702 and Form AIA G703, edition stipulated in the Agreement.

C. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.

D. For each item, provide a column for listing each of the following:
   1. Item Number.
   2. Description of work.
   3. Scheduled Values.
   4. Previous Applications.
   5. Work in Place and Stored Materials under this Application.
   6. Authorized Change Orders.
   7. Total Completed and Stored to Date of Application.
   8. Percentage of Completion.

9. Balance to Finish.
10. Retainage.

E. Execute certification by signature of authorized officer.

F. Submit one electronic and zero hard-copies of each Application for Payment.

1.05 MODIFICATION PROCEDURES

A. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Architect will issue instructions directly to Contractor.

B. For other required changes, Architect will issue a document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
2. Promptly execute the change.

C. For changes for which advance pricing is desired, Architect will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within 10 days.

D. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.

E. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

1.06 APPLICATION FOR FINAL PAYMENT

A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.

B. Application for Final Payment will not be considered until the following have been accomplished:
1. All closeout procedures specified in Section 01 70 00.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 23 00
ALTERNATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Description of Alternates.

1.02 RELATED REQUIREMENTS

A. Document 00 43 23 - Alternates Form: List of Alternates as supplement to Bid Form.

1.03 ACCEPTANCE OF ALTERNATES

A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in the Owner-Contractor Agreement.

B. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.

1.04 SCHEDULE OF ALTERNATES

A. Deductive Alternate No. 1 - Salvage and reinstall existing acoustical ceiling tile (ACT) at all classrooms, office, and auxiliary rooms. Corridor ACT to be fully replaced as outlined in the Drawings.

B. Deductive Alternate No. 2 - Existing batt insulation at Area D exterior wall assembly to remain.

C. Add Alternate No. 3 - Sound Absorptive Panels at Music Room.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 25 00
SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedural requirements for proposed substitutions.

1.02 RELATED REQUIREMENTS

A. Section 00 43 25 - Substitution Request Form - During Procurement: Required form for substitution requests made prior to award of contract (During procurement).

B. Section 00 63 25 - Substitution Request Form - During Construction: Required form for substitution requests made after award of contract (During construction).

C. Section 01 23 00 - Alternates, for product alternatives affecting this section.

1.03 DEFINITIONS

A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.
   1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
      a. Unavailability.
      b. Regulatory changes.
   2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
   2. Agrees to provide the same warranty for the substitution as for the specified product.
   3. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
   4. Waives claims for additional costs or time extension that may subsequently become apparent.
   5. Agrees to reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.

B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.

C. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
   1. Forms indicated in the Project Manual are adequate for this purpose, and must be used.

D. Limit each request to a single proposed substitution item.
   1. Submit an electronic document, combining the request form with supporting data into single document.

3.02 SUBSTITUTION PROCEDURES DURING PROCUREMENT

A. Submittal Form (before award of contract):
   1. Submit substitution requests by completing the form in Section 00 43 25; see this section for additional information and instructions. Use only this form; other forms of submission are unacceptable.

B. Owner will consider requests for substitutions only if submitted at least 10 days prior to the date for receipt of bids.

3.03 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

A. Submittal Form (after award of contract):
   1. Submit substitution requests by completing the form in Section 00 63 25; see this section for additional information and instructions. Use only this form; other forms of submission are unacceptable.

B. Submit request for Substitution for Cause within 14 days of discovery of need for substitution, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.

C. Substitutions will not be considered under one or more of the following circumstances:
   1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.

3.04 RESOLUTION

A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.

B. Architect will notify Contractor in writing of decision to accept or reject request.
   1. Architect's decision following review of proposed substitution will be noted on the submitted form.

3.05 ACCEPTANCE

3.06 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

B. Include completed Substitution Request Forms as part of the Project record.

END OF SECTION

SECTION 01 30 00
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General administrative requirements.

B. Electronic document submittal service.

C. Preconstruction meeting.

D. Site mobilization meeting.

E. Progress meetings.

F. Construction progress schedule.

G. Progress photographs.

H. Coordination drawings.

I. Submittals for review, information, and project closeout.

J. Number of copies of submittals.

K. Requests for Information (RFI) procedures.

L. Submittal procedures.

1.02 RELATED REQUIREMENTS

A. Section 00 72 00 - General Conditions: Dates for applications for payment.

B. Section 01 32 16 - Construction Progress Schedule: Form, content, and administration of schedules.

C. Section 01 60 00 - Product Requirements: General product requirements.

D. Section 01 70 00 - Execution and Closeout Requirements: Additional coordination requirements.

E. Section 01 78 00 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.

F. Section 01 91 13 - General Commissioning Requirements: Additional procedures for submittals relating to commissioning.
   1. Where submittals are indicated for review by both Architect and the Commissioning Authority, submit one extra and route to Architect first, for forwarding to the Commissioning Authority.
   2. Where submittals are not indicated to be reviewed by Architect, submit directly to the Commissioning Authority; otherwise, the procedures specified in this section apply to commissioning submittals.

1.03 REFERENCE STANDARDS

1.04 GENERAL ADMINISTRATIVE REQUIREMENTS

A. Comply with requirements of Section 01 70 00 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.

B. Make the following types of submittals to Architect:
   1. Requests for Information (RFI).
   2. Requests for substitution.
   3. Shop drawings, product data, and samples.
   4. Test and inspection reports.
   5. Design data.
   6. Manufacturer's instructions and field reports.
   7. Applications for payment and change order requests.
   8. Progress schedules.

9. Coordination drawings.
10. Correction Punch List and Final Correction Punch List for Substantial Completion.
11. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF, MS Word, or MS Excel) format, as appropriate to the document, and transmitted via an Internet-based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.
   1. Besides submittals for review, information, and closeout, this procedure applies to Requests for Information (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, Contractor's correction punchlist, and any other document any participant wishes to make part of the project record.
   2. Contractor and Architect are required to use this service.
   3. It is Contractor's responsibility to submit documents in allowable format.
   4. Subcontractors, suppliers, and Architect's consultants are to be permitted to use the service at no extra charge.
   5. Users of the service need an email address, internet access, and PDF review software that includes ability to mark up and apply electronic stamps (such as Adobe Acrobat, www.adobe.com, or Bluebeam PDF Revu, www.bluebeam.com), unless such software capability is provided by the service provider.
   6. Paper document transmittals will not be reviewed; emailed electronic documents will not be reviewed.
   7. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.

B. Cost: The cost of the service is to be paid by Contractor; include the cost of the service in the Contract Sum.

C. Submittal Service: The selected service is:
   1. e-Builder, Construction Management Software.

D. Training: One, one-hour, web-based training session will be arranged for all participants, with representatives of Architect and Contractor participating; further training is the responsibility of the user of the service.

E. Project Closeout: Architect will determine when to terminate the service for the project and is responsible for obtaining archive copies of files for Owner.

3.02 PRECONSTRUCTION MEETING

A. Owner will schedule a meeting after Notice of Award.

B. Attendance Required:
   1. Owner.
   2. Architect.
   3. Contractor.

C. Agenda:
   1. Execution of Owner-Contractor Agreement.
   2. Submission of executed bonds and insurance certificates.
   3. Distribution of Contract Documents.
   4. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
   5. Submission of initial Submittal schedule.
   6. Designation of personnel representing the parties to Contract and Architect.

7. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
8. Scheduling.
9. Asbestos and hazardous material remediation. Reference "Asbestos Abatement Contractor Bid Document and Specifications" dated 10/22/2020 under seperate cover.

D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.03 SITE MOBILIZATION MEETING

A. Owner will schedule meeting at the Project site prior to Contractor occupancy.

B. Attendance Required:
1. Contractor.
2. Owner.
3. Architect.
4. Contractor's superintendent.
5. Major subcontractors.

C. Agenda:
1. Use of premises by Owner and Contractor.
2. Owner's requirements.
3. Construction facilities and controls provided by Owner.
4. Temporary utilities provided by Owner.
5. Survey and building layout.
6. Security and housekeeping procedures.
7. Schedules.
8. Application for payment procedures.
9. Procedures for testing.
10. Procedures for maintaining record documents.
11. Requirements for start-up of equipment.
12. Inspection and acceptance of equipment put into service during construction period.

D. Record minutes and distribute copies within two days after meeting to participants, with one copies to Architect, Owner, participants, and those affected by decisions made.

3.04 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the work at maximum weekly intervals.

B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

C. Attendance Required:
1. Contractor.
2. Owner.
3. Architect.
4. Contractor's superintendent.
5. Major subcontractors.

D. Agenda:
1. Review minutes of previous meetings.
2. Review of work progress.
3. Field observations, problems, and decisions.
4. Identification of problems that impede, or will impede, planned progress.
5. Review of submittals schedule and status of submittals.
6. Review of RFIs log and status of responses.
7. Maintenance of progress schedule.
8. Corrective measures to regain projected schedules.

9. Planned progress during succeeding work period.
10. Maintenance of quality and work standards.
11. Effect of proposed changes on progress schedule and coordination.
12. Other business relating to work.

E. Record minutes and distribute copies within two days after meeting to participants, with one copies to Architect, Owner, participants, and those affected by decisions made.

3.05 CONSTRUCTION PROGRESS SCHEDULE

A. Within 10 days after date of the Agreement, submit preliminary schedule defining planned operations for the first 60 days of work, with a general outline for remainder of work.

B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.

C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
   1. Include written certification that major contractors have reviewed and accepted proposed schedule.

D. Within 10 days after joint review, submit complete schedule.

E. Submit updated schedule with each Application for Payment.

3.06 PROGRESS PHOTOGRAPHS

A. Submit new photographs at least once a month, within 3 days after being taken.

B. Photography Type: Digital; electronic files.

C. In addition to periodic, recurring views, take photographs of each of the following events:
   1. Completion of site clearing.
   2. Excavations in progress.
   3. Foundations in progress and upon completion.
   4. Structural framing in progress and upon completion.
   5. Enclosure of building, upon completion.
   6. Final completion, minimum of ten (10) photos.

D. Views:
   1. Provide non-aerial photographs from four cardinal views at each specified time, until date of Substantial Completion.
   2. Consult with Architect for instructions on views required.
   3. Provide factual presentation.
   4. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.

E. Digital Photographs: 24 bit color, minimum resolution of 1024 by 768, in JPG format; provide files unaltered by photo editing software.
   1. Delivery Medium: e-Builder.
   2. File Naming: Include project identification, date and time of view, and view identification.

3.07 COORDINATION DRAWINGS

A. Provide information required by Project Coordinator for preparation of coordination drawings.

B. Review drawings prior to submission to Architect.

3.08 REQUESTS FOR INFORMATION (RFI)

A. Definition: A request seeking one of the following:
   1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in Contract Documents.
   2. A resolution to an issue which has arisen due to field conditions and affects design intent.

B. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
   1. Prepare a separate RFI for each specific item.
      a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
      b. Do not forward requests which solely require internal coordination between subcontractors.
   2. Prepare using software provided by the Electronic Document Submittal Service.
   3. Combine RFI and its attachments into a single electronic file. PDF format is preferred.

C. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
   1. Include in each request Contractor's signature attesting to good faith effort to determine from Contract Documents information requiring interpretation.
   2. Unacceptable Uses for RFIs: Do not use RFIs to request the following::
      a. Approval of submittals (use procedures specified elsewhere in this section).
      b. Approval of substitutions (see Section - 01 60 00 - Product Requirements)
      c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
   3. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, Contract Documents, with no additional input required to clarify the question. They will be returned without a response, with an explanatory notation.
      a. The Owner reserves the right to assess the Contractor for the costs (on time-and-materials basis) incurred by the Architect, and any of its consultants, due to processing of such RFIs.

D. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
   1. Official Project name and number, and any additional required identifiers established in Contract Documents.
   2. Owner's, Architect's, and Contractor's names.
   3. Discrete and consecutive RFI number, and descriptive subject/title.
   4. Issue date, and requested reply date.
   5. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).
   6. Annotations: Field dimensions and/or description of conditions which have engendered the request.
   7. Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.

E. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.

F. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
   1. Indicate current status of every RFI. Update log promptly and on a regular basis.
   2. Note dates of when each request is made, and when a response is received.
   3. Highlight items requiring priority or expedited response.

G. Review Time: Architect will respond and return RFIs to Contractor within seven calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.

1. Response period may be shortened or lengthened for specific items, subject to mutual agreement, and recorded in a timely manner in progress meeting minutes.

H. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Owner.
1. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with an R suffix to the original number.
2. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.
3. Notify Architect within seven calendar days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.

3.09 SUBMITTAL SCHEDULE

A. Submit to Architect for review a schedule for submittals in tabular format.
1. Format schedule to allow tracking of status of submittals throughout duration of construction.
2. Arrange information to include scheduled date for initial submittal, specification number and title, submittal category (for review or for information), description of item of work covered, and role and name of subcontractor.
3. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.
a. For assemblies, equipment, systems comprised of multiple components and/or requiring detailed coordination with other work, allow for additional time to make corrections or revisions to initial submittals, and time for their review.

3.10 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:
1. Product data.
2. Shop drawings.
3. Samples for selection.
4. Samples for verification.

B. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.

C. Samples will be reviewed for aesthetic, color, or finish selection.

D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 78 00 - Closeout Submittals.

3.11 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:
1. Design data.
2. Certificates.
3. Test reports.
4. Inspection reports.
5. Manufacturer's instructions.
6. Manufacturer's field reports.
7. Other types indicated.

B. Submit for Architect's knowledge as contract administrator or for Owner.

3.12 SUBMITTALS FOR PROJECT CLOSEOUT

A. Submit Correction Punch List for Substantial Completion.

B. Submit Final Correction Punch List for Substantial Completion.

C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 78 00 - Closeout Submittals:
   1. Project record documents.
   2. Operation and maintenance data.
   3. Warranties.
   4. Bonds.
   5. Other types as indicated.

D. Submit for Owner's benefit during and after project completion.

3.13 NUMBER OF COPIES OF SUBMITTALS

A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.

B. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
   1. After review, produce duplicates.
   2. Retained samples will not be returned to Contractor unless specifically so stated.

3.14 SUBMITTAL PROCEDURES

A. General Requirements:
   1. Use a single transmittal for related items.
   2. Submit separate packages of submittals for review and submittals for information, when included in the same specification section.
   3. Transmit using eBuilder.
   4. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
   5. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
   6. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
      a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
   7. Schedule submittals to expedite the Project, and coordinate submission of related items.
      a. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
      b. For sequential reviews involving Architect's consultants, Owner, or another affected party, allow an additional 7 days.
      c. For sequential reviews involving approval from authorities having jurisdiction (AHJ), in addition to Architect's approval, allow an additional 30 days.
   8. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
   9. Provide space for Contractor and Architect review stamps.
   10. When revised for resubmission, identify all changes made since previous submission.
   11. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.
   12. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.
   13. Submittals not requested will be recognized, and will be returned "Not Reviewed",

B. Product Data Procedures:
   1. Submit only information required by individual specification sections.
   2. Collect required information into a single submittal.

3. Do not submit (Material) Safety Data Sheets for materials or products.

C. Shop Drawing Procedures:
1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
2. Do not reproduce Contract Documents to create shop drawings.
3. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.

D. Samples Procedures:
1. Transmit related items together as single package.
2. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.
3. Include with transmittal high-resolution image files of samples to facilitate electronic review and approval. Provide separate submittal page for each item image.

3.15 SUBMITTAL REVIEW

A. Submittals for Review: Architect will review each submittal, and approve, or take other appropriate action.

B. Submittals for Information: Architect will acknowledge receipt and review. See below for actions to be taken.

C. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.

D. Architect's and consultants' actions on items submitted for review:
1. Authorizing purchasing, fabrication, delivery, and installation:
a. "Approved", or language with same legal meaning.
b. "Approved as Noted", or language with same legal meaning.
1) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.
2. Not Authorizing fabrication, delivery, and installation:
a. "Revise and Resubmit".
1) Resubmit revised item, with review notations acknowledged and incorporated.
b. "Rejected".
1) Submit item complying with requirements of Contract Documents.

E. Architect's and consultants' actions on items submitted for information:
1. Items for which no action was taken:
a. "Received" - to notify the Contractor that the submittal has been received for record only.
2. Items for which action was taken:
a. "Reviewed" - no further action is required from Contractor.

END OF SECTION

SECTION 01 32 16
CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preliminary schedule.

1.02 RELATED SECTIONS

A. Section 01 10 00 - Summary: Work sequence.

1.03 SUBMITTALS

A. Within 10 days after date of Agreement, submit preliminary schedule defining planned operations for the first 60 days of Work, with a general outline for remainder of Work.

B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.

C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
   1. Include written certification that major contractors have reviewed and accepted proposed schedule.

D. Within 10 days after joint review, submit complete schedule.

E. Submit updated schedule with each Application for Payment.

F. Submit in PDF format.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRELIMINARY SCHEDULE

A. Prepare preliminary schedule in the form of a horizontal bar chart.

3.02 CONTENT

A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.

B. Identify each item by specification section number.

C. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.

D. Provide legend for symbols and abbreviations used.

3.03 UPDATING SCHEDULE

A. Maintain schedules to record actual start and finish dates of completed activities.

B. Indicate progress of each activity to date of revision, with projected completion date of each activity.

C. Annotate diagrams to graphically depict current status of Work.

D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.

E. Indicate changes required to maintain Date of Substantial Completion.

F. Submit reports required to support recommended changes.

3.04 DISTRIBUTION OF SCHEDULE

A. Distribute copies of updated schedules to Contractor's project site file, to subcontractors, suppliers, Architect, Owner.

B. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

END OF SECTION

SECTION 01 40 00
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Submittals.

B. Quality assurance.

C. References and standards.

D. Testing and inspection agencies and services.

E. Contractor's construction-related professional design services.

F. Contractor's design-related professional design services.

G. Control of installation.

H. Mock-ups.

I. Tolerances.

J. Manufacturers' field services.

K. Defect Assessment.

1.02 RELATED REQUIREMENTS

A. Document 00 72 00 - General Conditions: Inspections and approvals required by public authorities.

B. Section 01 30 00 - Administrative Requirements: Submittal procedures.

C. Section 01 60 00 - Product Requirements: Requirements for material and product quality.

1.03 REFERENCE STANDARDS

A. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants; 2008 (Reapproved 2014).

B. ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation; 2017.

C. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2018.

D. ASTM E699 - Standard Specification for Agencies Involved in Testing, Quality Assurance, and Evaluating of Manufactured Building Components; 2016.

E. IAS AC89 - Accreditation Criteria for Testing Laboratories; 2018.

1.04 DEFINITIONS

A. Contractor's Quality Control Plan: Contractor's management plan for executing the Contract for Construction.

B. Contractor's Professional Design Services: Design of some aspect or portion of the project by party other than the design professional of record. Provide these services as part of the Contract for Construction.

1. Design Services Types Required:
    a. Construction-Related: Services Contractor needs to provide in order to carry out the Contractor’s sole responsibilities for construction means, methods, techniques, sequences, and procedures.
    b. Design-Related: Design services explicitly required to be performed by another design professional due to highly-technical and/or specialized nature of a portion of the project. Services primarily involve engineering analysis, calculations, and design, and are not intended to alter the aesthetic aspects of the design.

C. Design Data: Design-related, signed and sealed drawings, calculations, specifications, certifications, shop drawings and other submittals provided by Contractor, and prepared directly by, or under direct supervision of, appropriately licensed design professional.

1.05 CONTRACTOR'S CONSTRUCTION-RELATED PROFESSIONAL DESIGN SERVICES

A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.

B. Provide such engineering design services as may be necessary to plan and safely conduct certain construction operations, pertaining to, but not limited to the following:
   1. Temporary sheeting, shoring, or supports.
   2. Temporary scaffolding.
   3. Temporary bracing.
   4. Temporary stairs or steps required for construction access only.
   5. Temporary hoist(s) and rigging.

1.06 CONTRACTOR'S DESIGN-RELATED PROFESSIONAL DESIGN SERVICES

A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.

B. Base design on performance and/or design criteria indicated in individual specification sections.

C. Scope of Contractor's Professional Design Services: Provide for the following items of work:

1.07 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to Contractor.
   1. Include:
      a. Date issued.
      b. Project title and number.
      c. Name of inspector.
      d. Date and time of sampling or inspection.
      e. Identification of product and specifications section.
      f. Location in the Project.
      g. Type of test/inspection.
      h. Date of test/inspection.
      i. Results of test/inspection.
      j. Compliance with Contract Documents.
      k. When requested by Architect, provide interpretation of results.
   2. Test report submittals are for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.

C. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
   1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

D. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.08 QUALITY ASSURANCE

A. Testing Agency Qualifications:

1. Prior to start of work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
2. Qualification Statement: Provide documentation showing testing laboratory is accredited under IAS AC89.

B. Designer Qualifications: Where professional engineering design services and design data submittals are specifically required of Contractor by Contract Documents, provide services of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1.09 REFERENCES AND STANDARDS

A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Comply with reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.

C. Obtain copies of standards where required by product specification sections.

D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.

E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.

F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from Contract Documents by mention or inference otherwise in any reference document.

1.10 TESTING AND INSPECTION AGENCIES AND SERVICES

A. Owner will employ and pay for services of an independent testing agency to perform other specified testing.

B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

PART 3 EXECUTION

2.01 CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

2.02 MOCK-UPS

A. Before installing portions of the Work where mock-ups are required, construct mock-ups in location and size indicated for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects and workmanship.

B. Accepted mock-ups establish the standard of quality the Architect will use to judge the Work.

C. Integrated Exterior Mock-ups: Construct integrated exterior mock-up as indicated on drawings. Coordinate installation of exterior envelope materials and products as required in individual Specification Sections. Provide adequate supporting structure for mock-up materials as necessary.

D. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.

E. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.

F. Architect will use accepted mock-ups as a comparison standard for the remaining Work.

2.03 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

2.04 TESTING AND INSPECTION

A. Testing Agency Duties:
   1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
   2. Perform specified sampling and testing of products in accordance with specified standards.
   3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
   4. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
   5. Perform additional tests and inspections required by Architect.
   6. Submit reports of all tests/inspections specified.

B. Limits on Testing/Inspection Agency Authority:
   1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
   2. Agency may not approve or accept any portion of the Work.
   3. Agency may not assume any duties of Contractor.
   4. Agency has no authority to stop the Work.

C. Contractor Responsibilities:
   1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
   2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
   3. Provide incidental labor and facilities:
      a. To provide access to Work to be tested/inspected.
      b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
      c. To facilitate tests/inspections.
      d. To provide storage and curing of test samples.
   4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
   5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
   6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

D. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.

E. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

2.05 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance equipment as applicable, and to initiate instructions when necessary.

B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

2.06 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not complying with specified requirements.

END OF SECTION

SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Dewatering

B. Temporary sanitary facilities.

C. Temporary Controls: Barriers, enclosures, and fencing.

D. Security requirements.

E. Waste removal facilities and services.

1.02 RELATED REQUIREMENTS

A. Section 01 35 53 - Security Procedures

B. Section 01 51 00 - Temporary Utilities.

C. Section 01 52 13 - Field Offices and Sheds.

D. Section 01 55 00 - Vehicular Access and Parking.

E. Section 01 58 13 - Temporary Project Signage.

1.03 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.

B. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).

1.04 DEWATERING

A. Provide temporary means and methods for dewatering all temporary facilities and controls.

1.05 TEMPORARY UTILITIES - SEE SECTION 01 51 00

1.06 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

B. Maintain daily in clean and sanitary condition.

1.07 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.

C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.08 EXTERIOR ENCLOSURES

A. Provide temporary weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.09 SECURITY

A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.

1.10 VEHICULAR ACCESS AND PARKING - SEE SECTION 01 55 00

A. Coordinate access and haul routes with governing authorities and Owner.

B. Provide and maintain access to fire hydrants, free of obstructions.

C. Provide means of removing mud from vehicle wheels before entering streets.

D. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

1.11 WASTE REMOVAL

A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

B. Provide containers with lids. Remove trash from site periodically.

C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.12 FIELD OFFICES

A. Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rack, and drawing display table.

B. Provide space for Project meetings, with table and chairs to accommodate 6 persons.

C. Locate offices a minimum distance of 30 feet from existing structures.

1.13 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.

B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.

C. Clean and repair damage caused by installation or use of temporary work.

D. Restore existing facilities used during construction to original condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 51 00
TEMPORARY UTILITIES

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards; current edition.

1.02 TEMPORARY ELECTRICITY

A. Connect to Owner's existing power service.
   1. Exercise measures to conserve energy.
   2. Provide separate metering and reimburse Owner for cost of energy used.

B. Provide temporary electric feeder from existing building electrical service at location as directed.

C. Complement existing power service capacity and characteristics as required.

D. Provide power outlets for construction operations, with branch wiring and distribution boxes located at each floor. Provide flexible power cords as required.

E. Provide main service disconnect and over-current protection at convenient location and meter.

F. Permanent convenience receptacles may be utilized during construction.

G. Provide adequate distribution equipment, wiring, and outlets to provide single phase branch circuits for power and lighting.

1.03 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

A. Provide and maintain LED, compact fluorescent, or high-intensity discharge lighting as suitable for the application for construction operations in accordance with requirements of 29 CFR 1926 and authorities having jurisdiction.

B. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.

C. Maintain lighting and provide routine repairs.

D. Permanent building lighting may be utilized during construction.

1.04 TEMPORARY HEATING

A. Cost of Energy: By Contractor.

B. Provide heating devices and heat as needed to maintain specified conditions for construction operations.

C. Maintain minimum ambient temperature of 50 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.

D. Owner's existing heat plant may be used.
   1. Exercise measures to conserve energy.
   2. Enclose building prior to activating temporary heat.
   3. Provide separate metering and reimburse Owner for cost of energy used.

E. Prior to operation of permanent equipment for temporary heating purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.

1.05 TEMPORARY COOLING

A. Provide cooling devices and cooling as needed to maintain specified conditions for construction operations.

B. Maintain maximum ambient temperature of 80 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.

1.06 TEMPORARY VENTILATION

A. Existing ventilation equipment may not be used.

1.07 TEMPORARY WATER SERVICE

A. Cost of Water Used: By Contractor.

B. Connect to existing water source.
   1. Exercise measures to conserve water.
   2. Provide separate metering and reimburse Owner for cost of water used.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General product requirements.

B. Re-use of existing products.

C. Transportation, handling, storage and protection.

D. Product option requirements.

E. Substitution limitations.

F. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

A. Section 01 10 00 - Summary: Lists of products to be removed from existing building.

B. Section 01 25 00 - Substitution Procedures: Substitutions made during procurement and/or construction phases.

C. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.

D. Section 01 74 19 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.

1.03 SUBMITTALS

A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
   1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

A. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.

B. Specific Products to be Reused: The reuse of certain materials and equipment already existing on the project site is required.
   1. See drawings for list of items required to be salvaged for reuse and relocation.

2.02 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by Contract Documents.

B. Use of products having any of the following characteristics is not permitted:
   1. Containing lead, cadmium, or asbestos.

C. Where other criteria are met, Contractor shall give preference to products that:
   1. If used on interior, have lower emissions, as defined in Section 01 61 16.
   2. If wet-applied, have lower VOC content, as defined in Section 01 61 16.

2.03 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.04 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

B. Deliver and place in location as directed; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

A. See Section 01 25 00 - Substitution Procedures.

3.02 TRANSPORTATION AND HANDLING

A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

D. Transport and handle products in accordance with manufacturer's instructions.

E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.

H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.03 STORAGE AND PROTECTION

A. Provide protection of stored materials and products against theft, casualty, or deterioration.

B. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 01 74 19.

1. Structural Loading Limitations: Handle and store products and materials so as not to exceed static and dynamic load-bearing capacities of project floor and roof areas.

C. Store and protect products in accordance with manufacturers' instructions.

D. Store with seals and labels intact and legible.

E. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.

F. For exterior storage of fabricated products, place on sloped supports above ground.

G. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

H. Comply with manufacturer's warranty conditions, if any.

I. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

J. Prevent contact with material that may cause corrosion, discoloration, or staining.

K. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

L. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 01 70 00
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Requirements for alterations work, including selective demolition.

C. Pre-installation meetings.

D. Cutting and patching.

E. Surveying for laying out the work.

F. Cleaning and protection.

G. Starting of systems and equipment.

H. Demonstration and instruction of Owner personnel.

I. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

J. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

A. Section 01 30 00 - Administrative Requirements: Submittals procedures, Electronic document submittal service.

B. Section 01 40 00 - Quality Requirements: Testing and inspection procedures.

C. Section 01 50 00 - Temporary Facilities and Controls: Temporary exterior enclosures.

D. Section 01 78 00 - Closeout Submittals: Project record documents, operation and maintenance data, warranties, and bonds.

E. Section 01 79 00 - Demonstration and Training: Demonstration of products and systems to be commissioned and where indicated in specific specification sections

F. Section 02 41 00 - Demolition: Demolition of whole structures and parts thereof; site utility demolition.

G. Section 07 84 00 - Firestopping.

1.03 REFERENCE STANDARDS

A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2019.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
   1. On request, submit documentation verifying accuracy of survey work.
   2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in compliance with Contract Documents.
   3. Submit surveys and survey logs for the project record.

C. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
   1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences. Include design drawings and calculations for bracing and shoring.
   2. Identify demolition firm and submit qualifications.
   3. Include a summary of safety procedures.

D. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:

1. Structural integrity of any element of Project.
2. Integrity of weather exposed or moisture resistant element.
3. Efficiency, maintenance, or safety of any operational element.
4. Visual qualities of sight exposed elements.
5. Work of Owner or separate Contractor.
6. Include in request:
    a. Identification of Project.
    b. Location and description of affected work.
    c. Necessity for cutting or alteration.
    d. Description of proposed work and products to be used.
    e. Effect on work of Owner or separate Contractor.
    f. Written permission of affected separate Contractor.
    g. Date and time work will be executed.

E. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.05 QUALIFICATIONS

A. For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in the State in which the Project is located. Employ only individual(s) trained and experienced in establishing and maintaining horizontal and vertical control points necessary for laying out construction work on project of similar size, scope and/or complexity.

B. For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1.06 PROJECT CONDITIONS

A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

C. Perform dewatering activities, as required, for the duration of the project.

D. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

E. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
    1. Provide dust-proof enclosures to prevent entry of dust generated outdoors.

F. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.

G. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.

H. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.

I. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.

J. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.07 COORDINATION

A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. Notify affected utility companies and comply with their requirements.

C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

F. Coordinate completion and clean-up of work of separate sections.

G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS

A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.

B. Require attendance of parties directly affecting, or affected by, work of the specific section.

C. Notify Architect four days in advance of meeting date.

D. Prepare agenda and preside at meeting:
   1. Review conditions of examination, preparation and installation procedures.
   2. Review coordination with related work.

E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.04 LAYING OUT THE WORK

A. Verify locations of survey control points prior to starting work.

B. Promptly notify Architect of any discrepancies discovered.

C. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

D. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

E. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.

F. Utilize recognized engineering survey practices.

G. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
   1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
   2. Grid or axis for structures.
   3. Building foundation, column locations, ground floor elevations.

H. Periodically verify layouts by same means.

I. Maintain a complete and accurate log of control and survey work as it progresses.

3.05 GENERAL INSTALLATION REQUIREMENTS

A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.06 ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that construction and utility arrangements are as indicated.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of alterations work constitutes acceptance of existing conditions.

B. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
   1. Where openings in exterior enclosure exist, provide construction to make exterior enclosure weatherproof.
   2. Insulate existing ducts or pipes that are exposed to outdoor ambient temperatures by alterations work.

C. Remove existing work as indicated and as required to accomplish new work.
   1. Remove items indicated on drawings.
   2. Relocate items indicated on drawings.

3. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
4. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.

D. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove, relocate, and extend existing systems to accommodate new construction.
1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
    a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
    b. Provide temporary connections as required to maintain existing systems in service.
4. Verify that abandoned services serve only abandoned facilities.
5. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.

E. Protect existing work to remain.
1. Prevent movement of structure; provide shoring and bracing if necessary.
2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
3. Repair adjacent construction and finishes damaged during removal work.

F. Adapt existing work to fit new work: Make as neat and smooth transition as possible.
1. When existing finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Architect.
2. Where a change of plane of 1/4 inch or more occurs in existing work, submit recommendation for providing a smooth transition for Architect review and request instructions.
3. Trim existing wood doors as necessary to clear new floor finish. Refinish trim as required.

G. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.

H. Refinish existing surfaces as indicated:
1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.

I. Clean existing systems and equipment.

J. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.

K. Do not begin new construction in alterations areas before demolition is complete.

L. Comply with all other applicable requirements of this section.

3.07 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. See Alterations article above for additional requirements.

C. Perform whatever cutting and patching is necessary to:
   1. Complete the work.
   2. Fit products together to integrate with other work.
   3. Provide openings for penetration of mechanical, electrical, and other services.
   4. Match work that has been cut to adjacent work.
   5. Repair areas adjacent to cuts to required condition.
   6. Repair new work damaged by subsequent work.
   7. Remove samples of installed work for testing when requested.
   8. Remove and replace defective and non-complying work.

D. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

E. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

G. Restore work with new products in accordance with requirements of Contract Documents.

H. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 84 00, to full thickness of the penetrated element.

J. Patching:
   1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
   2. Match color, texture, and appearance.
   3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.08 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.09 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

G. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.10 SYSTEM STARTUP

A. Coordinate with requirements of Section 01 91 13 - General Commissioning Requirements.

B. Coordinate schedule for start-up of various equipment and systems.

C. Notify Architect and Owner seven days prior to start-up of each item.

D. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.

E. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

F. Verify that wiring and support components for equipment are complete and tested.

G. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.

H. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.11 DEMONSTRATION AND INSTRUCTION

A. See Section 01 79 00 - Demonstration and Training.

3.12 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.13 FINAL CLEANING

A. Use cleaning materials that are nonhazardous.

B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

C. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.

D. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

E. Clean filters of operating equipment.

F. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, and drainage systems.

G. Clean site; sweep paved areas, rake clean landscaped surfaces.

H. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.14 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.
   1. Provide copies to Architect and Owner.

B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.

C. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.

D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.

E. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.

F. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.

G. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.

H. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

3.15 MAINTENANCE

A. Provide service and maintenance of components indicated in specification sections.

B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.

C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.

E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION

SECTION 01 74 19

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

A. Owner requires that this project generate the least amount of trash and waste possible.

B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.

C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.

D. Contractor shall submit periodic Waste Disposal Reports; all landfill disposal, incineration, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues; use the same units of measure on all reports.

E. Methods of trash/waste disposal that are not acceptable are:
   1. Burning on the project site.
   2. Burying on the project site.
   3. Dumping or burying on other property, public or private.
   4. Other illegal dumping or burying.

F. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 DEFINITIONS

A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.

B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.

C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.

D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.

E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.

F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.

H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

I. Return: To give back reusable items or unused products to vendors for credit.

J. Reuse: To reuse a construction waste material in some manner on the project site.

K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.

L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.

M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.

N. Toxic: Poisonous to humans either immediately or after a long period of exposure.

O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
   1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
   2. Submit Report on a form acceptable to Owner.
   3. Landfill Disposal: Include the following information:
      a. Identification of material.
      b. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.
      c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
      d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
   4. Incinerator Disposal: Include the following information:
      a. Identification of material.
      b. Amount, in tons or cubic yards, of trash/waste material from the project delivered to incinerators.
      c. State the identity of incinerators, total amount of fees paid to incinerator, and total disposal cost.
      d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
   5. Recycled and Salvaged Materials: Include the following information for each:
      a. Identification of material, including those retrieved by installer for use on other projects.
      b. Amount, in tons or cubic yards, date removed from the project site, and receiving party.
      c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
      d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
      e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.
   6. Material Reused on Project: Include the following information for each:
      a. Identification of material and how it was used in the project.
      b. Amount, in tons or cubic yards.
      c. Include weight tickets as evidence of quantity.
   7. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

PART 3 EXECUTION

2.01 WASTE MANAGEMENT PROCEDURES

A. See Section 01 30 00 for additional requirements for project meetings, reports, submittal procedures, and project documentation.

B. See Section 01 50 00 for additional requirements related to trash/waste collection and removal facilities and services.

C. See Section 01 60 00 for waste prevention requirements related to delivery, storage, and handling.

D. See Section 01 70 00 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

2.02 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.

B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and Architect.

C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.

D. Meetings: Discuss trash/waste management goals and issues at project meetings.
   1. Prebid meeting.
   2. Preconstruction meeting.
   3. Regular job-site meetings.

E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
   1. Provide containers as required.
   2. Provide adequate space for pick-up and delivery and convenience to subcontractors.
   3. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.

F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.

G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.

I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION

SECTION 01 78 00
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project record documents.

B. Operation and maintenance data.

C. Warranties and bonds.

1.02 RELATED REQUIREMENTS

A. Section 00 72 00 - General Conditions and 00 73 00 - Supplementary Conditions: Performance bond and labor and material payment bonds, warranty, and correction of work.

B. Section 01 30 00 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

C. Section 01 70 00 - Execution and Closeout Requirements: Contract closeout procedures.

D. Individual Product Sections: Specific requirements for operation and maintenance data.

E. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

A. Project Record Documents: Submit electronic documents to Architect via eBuilder with claim for final Application for Payment.

B. Close Out Submittal Log:
   1. Manual to include a log listing the closeout deliverables in order of specification number. Log to include a clumn for each of the following: Specification number, Spec Title, Constractor Responsible, Product Data, Operation & Maintenance Data, Shop Drawings, Warranty, and Record Documents.

C. Operation and Maintenance Data:
   1. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
   2. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
   3. Submit one electronic set via eBuilder of revised final documents in final form within 10 days after final inspection.

D. Warranties and Bonds:
   1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
   2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
   3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

E. Stamped Authority Having Jurisdiction (AHJ) Permit Drawings: Submit electronic documents to Architect and Owner via eBuilder.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

A. Maintain the following record documents on eBuilder; record actual revisions to the Work:
   1. Drawings.
   2. Specifications.

3. Addenda.
4. Change Orders and other modifications to the Contract.
5. Reviewed shop drawings, product data, and samples.
6. Manufacturer's instruction for assembly, installation, and adjusting.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress.

E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
1. Changes made by Addenda and modifications.

F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
1. Field changes of dimension and detail.
2. Details not on original Contract drawings.

3.02 OPERATION AND MAINTENANCE DATA

A. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

B. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

C. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:

B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

C. Additional information as specified in individual product specification sections.

D. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

B. Include manufacturer's printed operation and maintenance instructions.

C. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

D. Provide control diagrams by controls manufacturer as installed.

E. Additional Requirements: As specified in individual product specification sections.

3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.

B. Where systems involve more than one specification section, provide separate tabbed divider for each system.

C. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.

F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.

G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.

H. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.

I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

J. Arrangement of Contents: Organize each volume in parts as follows:
   1. Project Directory.
   2. Table of Contents, of all volumes, and of this volume.
   3. Operation and Maintenance Data: Arranged by system, then by product category.
      a. Source data.
      b. Operation and maintenance data.
      c. Field quality control data.
      d. Photocopies of warranties and bonds.

3.06 WARRANTIES AND BONDS

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

END OF SECTION

SECTION 01 79 00
DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.01 SUMMARY

A. Demonstration of products and systems to be commissioned and where indicated in specific specification sections.

B. Training of Owner personnel in operation and maintenance is required for:
   1. Items specified in individual product Sections.

C. Training of Owner personnel in care, cleaning, maintenance, and repair is required for:
   1. Roofing, waterproofing, and other weather-exposed or moisture protection products.
   2. Finishes, including flooring, wall finishes, ceiling finishes.
   3. Items specified in individual product Sections.

1.02 RELATED REQUIREMENTS

A. Section 01 78 00 - Closeout Submittals: Operation and maintenance manuals.

B. Section 01 91 13 - General Commissioning Requirements: Additional requirements applicable to demonstration and training.

C. Other Specification Sections: Additional requirements for demonstration and training.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures; except:
   1. Make all submittals specified in this section, and elsewhere where indicated for commissioning purposes, directly to the Commissioning Authority.
   2. Submit one copy to the Commissioning Authority, not to be returned.
   3. Make commissioning submittals on time schedule specified by Commissioning Authority.
   4. Submittals indicated as "Draft" are intended for the use of the Commissioning Authority in preparation of overall Training Plan; submit in editable electronic format, Microsoft Word 2003 preferred.

B. Draft Training Plans: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.
   1. Submit to Commissioning Authority for review and inclusion in overall training plan.
   2. Submit not less than four weeks prior to start of training.
   3. Revise and resubmit until acceptable.
   4. Provide an overall schedule showing all training sessions.
   5. Include at least the following for each training session:
      a. Identification, date, time, and duration.
      b. Description of products and/or systems to be covered.
      c. Name of firm and person conducting training; include qualifications.
      d. Intended audience, such as job description.
      e. Objectives of training and suggested methods of ensuring adequate training.
      f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
      g. Media to be used, such a slides, hand-outs, etc.
      h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.

C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
   1. Include applicable portion of O&M manuals.
   2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
   3. Provide one extra copy of each training manual to be included with operation and maintenance data.

1.04 QUALITY ASSURANCE

A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
   1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
   2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 DEMONSTRATION - GENERAL

A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Owner.

B. Demonstrations conducted during Functional Testing need not be repeated unless Owner personnel training is specified.

C. Demonstration may be combined with Owner personnel training if applicable.

D. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
   1. Perform demonstrations not less than two weeks prior to Substantial Completion.
   2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

E. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
   1. Perform demonstrations not less than two weeks prior to Substantial Completion.

3.02 TRAINING - GENERAL

A. Commissioning Authority will prepare the Training Plan based on draft plans submitted.

B. Conduct training on-site unless otherwise indicated.

C. Owner will provide classroom and seating at no cost to Contractor.

D. Do not start training until Functional Testing is complete, unless otherwise specified or approved by the Commissioning Authority.

E. Provide training in minimum two hour segments.

F. The Commissioning Authority is responsible for determining that the training was satisfactorily completed and will provide approval forms.

G. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge Contractor for personnel "show-up" time.

H. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
   1. The location of the O&M manuals and procedures for use and preservation; backup copies.
   2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
   3. Typical uses of the O&M manuals.

I. Product- and System-Specific Training:
   1. Review the applicable O&M manuals.
   2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.

3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
4. Provide hands-on training on all operational modes possible and preventive maintenance.
5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
6. Discuss common troubleshooting problems and solutions.
7. Discuss any peculiarities of equipment installation or operation.
8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
9. Review recommended tools and spare parts inventory suggestions of manufacturers.
10. Review spare parts and tools required to be furnished by Contractor.
11. Review spare parts suppliers and sources and procurement procedures.

J. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

END OF SECTION

SECTION 01 91 13

GENERAL COMMISSIONING REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

A. Commissioning is intended to achieve the following specific objectives; this section specifies the Contractor's responsibilities for commissioning:
   1. Verify that the work is installed in accordance with Contract Documents and the manufacturer's recommendations and instructions, and that it receives adequate operational checkout prior to startup: Startup reports and Prefunctional Checklists executed by Contractor are utilized to achieve this.
   2. Verify and document that functional performance is in accordance with Contract Documents: Functional Tests executed by Contractor and witnessed by the Commissioning Authority are utilized to achieve this.
   3. Verify that operation and maintenance manuals submitted to Owner are complete: Detailed operation and maintenance (O&M) data submittals by Contractor are utilized to achieve this.
   4. Verify that the Owner's operating personnel are adequately trained: Formal training conducted by Contractor is utilized to achieve this.

B. The Commissioning Authority directs and coordinates all commissioning activities; this section describes some but not all of the Commissioning Authority's responsibilities.

C. The Commissioning Authority is employed by Owner.

1.02 RELATED REQUIREMENTS

A. Section 01 78 00 - Closeout Submittals: Scope and procedures for operation and maintenance manuals and project record documents.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures; except:
   1. Make all submittals specified in this section, and elsewhere where indicated for commissioning purposes, directly to the Commissioning Authority, unless they require review by Architect; in that case, submit to Architect first.
   2. Submit one copy to the Commissioning Authority, not to be returned.
   3. Make commissioning submittals on time schedule specified by Commissioning Authority.
   4. Submittals indicated as "Draft" are intended for the use of the Commissioning Authority in preparation of Prefunctional Checklists or Functional Test requirements; submit in editable electronic format, Microsoft Word 2010 preferred.
   5. As soon as possible after submittals made to Architect are approved, submit copy of approved submittal to the Commissioning Authority.

B. Product Data: If submittals to Architect do not include the following, submit copies as soon as possible:
   1. Manufacturer's product data, cut sheets, and shop drawings.
   2. Manufacturer's installation instructions.
   3. Startup, operating, and troubleshooting procedures.
   4. Fan and pump curves.
   5. Factory test reports.
   6. Warranty information, including details of Owner's responsibilities in regard to keeping warranties in force.

C. Manufacturers' Instructions: Submit copies of all manufacturer-provided instructions that are shipped with the equipment as soon as the equipment is delivered.

D. Startup Plans and Reports.

E. Completed Prefunctional Checklists.

PART 2 PRODUCTS

2.01 TEST EQUIPMENT

A. Provide all standard testing equipment required to perform startup and initial checkout and required Functional Testing; unless otherwise noted such testing equipment will NOT become the property of Owner.

B. Calibration Tolerances: Provide testing equipment of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified. If not otherwise noted, the following minimum requirements apply:
   1. Temperature Sensors and Digital Thermometers: Certified calibration within past year to accuracy of 0.5 degree F and resolution of plus/minus 0.1 degree F.
   2. Pressure Sensors: Accuracy of plus/minus 2.0 percent of the value range being measured (not full range of meter), calibrated within the last year.
   3. Calibration: According to the manufacturer's recommended intervals and when dropped or damaged; affix calibration tags or keep certificates readily available for inspection.

C. Equipment-Specific Tools: Where special testing equipment, tools and instruments are specific to a piece of equipment, are only available from the vendor, and are required in order to accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the work at no extra cost to Owner; such equipment, tools, and instruments are to become the property of Owner.

D. Dataloggers: Independent equipment and software for monitoring flows, currents, status, pressures, etc. of equipment.
   1. Dataloggers required to for Functional Tests will be provided by the Commissioning Authority and will not become the property of Owner.

PART 3 EXECUTION

3.01 COMMISSIONING PLAN

A. Commissioning Authority will prepare the Commissioning Plan.
   1. Attend meetings called by the Commissioning Authority for purposes of completing the commissioning plan.
   2. Require attendance and participation of relevant subcontractors, installers, suppliers, and manufacturer representatives.

B. Contractor is responsible for compliance with the Commissioning Plan.

C. Commissioning Plan: The commissioning schedule, procedures, and coordination requirements for all parties in the commissioning process.

D. Commissioning Schedule:
   1. Submit anticipated dates of startup of each item of equipment and system to Commissioning Authority within 60 days after award of Contract.
   2. Re-submit anticipated startup dates monthly, but not less than 4 weeks prior to startup.
   3. Prefunctional Checklists and Functional Tests are to be performed in sequence from components, to subsystems, to systems.
   4. Provide sufficient notice to Commissioning Authority for delivery of relevant Checklists and Functional Test procedures, to avoid delay.

3.02 STARTUP PLANS AND REPORTS

A. Startup Plans: For each item of equipment and system for which the manufacturer provides a startup plan, submit the plan not less than 8 weeks prior to startup.

B. Startup Reports: For each item of equipment and system for which the manufacturer provides a startup checklist (or startup plan or field checkout sheet), document compliance by submitting the completed startup checklist prior to startup, signed and dated by responsible entity.

C. Submit directly to the Commissioning Authority.

3.03 PREFUNCTIONAL CHECKLISTS

A. A Prefunctional Checklist is required to be filled out for each item of equipment or other assembly specified to be commissioned.
   1. No sampling of identical or near-identical items is allowed.
   2. These checklists do not replace manufacturers' recommended startup checklists, regardless of apparent redundancy.
   3. Prefunctional Checklist forms will not be complete until after award of the contract; the following types of information will be gathered via the completed Checklist forms:
      a. Certification by installing contractor that the unit is properly installed, started up, and operating and ready for Functional Testing.
      b. Confirmation of receipt of each shop drawing and commissioning submittal specified, itemized by unit.
      c. Manufacturer, model number, and relevant capacity information; list information "as specified," "as submitted," and "as installed."
      d. Serial number of installed unit.
      e. List of inspections to be conducted to document proper installation prior to startup and Functional Testing; these will be primarily static inspections and procedures; for equipment and systems may include normal manufacturer’s start-up checklist items and minor testing.
      f. Sensor and actuator calibration information.

B. Contractor is responsible for filling out Prefunctional Checklists, after completion of installation and before startup; witnessing by the Commissioning Authority is not required unless otherwise specified.
   1. Each line item without deficiency is to be witnessed, initialed, and dated by the actual witness; checklists are not complete until all line items are initialed and dated complete without deficiencies.
   2. Checklists with incomplete items may be submitted for approval provided the Contractor attests that incomplete items do not preclude the performance of safe and reliable Functional Testing; re-submission of the Checklist is required upon completion of remaining items.
   3. Individual Checklists may contain line items that are the responsibility of more than one installer; Contractor shall assign responsibility to appropriate installers or subcontractors, with identification recorded on the form.
   4. If any Checklist line item is not relevant, record reasons on the form.
   5. Contractor may independently perform startup inspections and/or tests, at Contractor's option.
   6. Regardless of these reporting requirements, Contractor is responsible for correct startup and operation.
   7. Submit completed Checklists to Commissioning Authority within two days of completion.

C. Commissioning Authority is responsible for furnishing the Prefunctional Checklists to Contractor.
   1. Initial Drafts: Contractor is responsible for initial draft of Prefunctional Checklist where so indicated in Contract Documents.
   2. Provide all additional information requested by Commissioning Authority to aid in preparation of checklists, such as shop drawing submittals, manufacturers' startup checklists, and O&M data.
   3. Commissioning Authority may add any relevant items deemed necessary regardless of whether they are explicitly mentioned in Contract Documents or not.
   4. When asked to review the proposed Checklists, do so in a timely manner.

D. Commissioning Authority Witnessing: Required for:
   1. Each piece of primary equipment, unless sampling of multiple similar units is allowed by the commissioning plan.
   2. A sampling of non-primary equipment, as allowed by the commissioning plan.

E. Deficiencies: Correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to Owner.
   1. If difficulty in correction would delay progress, report deficiency to the Commissioning Authority immediately.

3.04 FUNCTIONAL TESTS

A. A Functional Test is required for each item of equipment, system, or other assembly specified to be commissioned, unless sampling of multiple identical or near-identical units is allowed by the final test procedures.

B. Contractor is responsible for execution of required Functional Tests, after completion of Prefunctional Checklist and before closeout.

C. Commissioning Authority is responsible for witnessing and reporting results of Functional Tests, including preparation and completion of forms for that purpose.

D. Contractor is responsible for correction of deficiencies and re-testing at no extra cost to Owner; if a deficiency is not corrected and re-tested immediately, the Commissioning Authority will document the deficiency and the Contractor's stated intentions regarding correction.
   1. Deficiencies are any condition in the installation or function of a component, piece of equipment or system that is not in compliance with Contract Documents or does not perform properly.
   2. When the deficiency has been corrected, the Contractor completes the form certifying that the item is ready to be re-tested and returns the form to the Commissioning Authority; the Commissioning Authority will reschedule the test and the Contractor shall re-test.
   3. Identical or Near-Identical Items: If 10 percent, or three, whichever is greater, of identical or near-identical items fail to perform due to material or manufacturing defect, all items will be considered defective; provide a proposal for correction within 2 weeks after notification of defect, including provision for testing sample installations prior to replacement of all items.
   4. Contractor shall bear the cost of Owner and Commissioning Authority personnel time witnessing re-testing.
   5. Contractor shall bear the cost of Owner and Commissioning Authority personnel time witnessing re-testing if the test failed due to failure to execute the relevant Prefunctional Checklist correctly; if the test failed for reasons that would not have been identified in the Prefunctional Checklist process, Contractor shall bear the cost of the second and subsequent re-tests.

E. Functional Test Procedures:
   1. Some test procedures are included in Contract Documents; where Functional Test procedures are not included in Contract Documents, test procedures will be determined by the Commissioning Authority with input by and coordination with Contractor.
   2. Examples of Functional Testing:
      a. Test the dynamic function and operation of equipment and systems (rather than just components) using manual (direct observation) or monitoring methods under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure setpoint).
      b. Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc.
      c. Systems are run through all the HVAC control system’s sequences of operation and components are verified to be responding as the sequence's state.
      d. Traditional air or water test and balancing (TAB) is not Functional Testing; spot checking of TAB by demonstration to the Commissioning Authority is Functional Testing.

F. Deferred Functional Tests: Some tests may need to be performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design or other site

conditions; performance of these tests remains the Contractor's responsibility regardless of timing.

3.05 SENSOR AND ACTUATOR CALIBRATION

A. Calibrate all field-installed temperature, relative humidity, carbon monoxide, carbon dioxide, and pressure sensors and gauges, and all actuators (dampers and valves) on this piece of equipment shall be calibrated. Sensors installed in the unit at the factory with calibration certification provided need not be field calibrated.

B. Calibrate using the methods described below; alternate methods may be used, if approved by Commissioning Authority and Owner beforehand. See PART 2 for test instrument requirements. Record methods used on the relevant Prefunctional Checklist or other suitable forms, documenting initial, intermediate and final results.

C. All Sensors:
   1. Verify that sensor location is appropriate and away from potential causes of erratic operation.
   2. Verify that sensors with shielded cable are grounded only at one end.
   3. For sensor pairs that are used to determine a temperature or pressure difference, for temperature make sure they are reading within 0.2 degree F of each other, and for pressure, within tolerance equal to 2 percent of the reading, of each other.
   4. Tolerances for critical applications may be tighter.

D. Sensors Without Transmitters - Standard Application:
   1. Make a reading with a calibrated test instrument within 6 inches of the site sensor.
   2. Verify that the sensor reading, via the permanent thermostat, gauge or building automation system, is within the tolerances in the table below of the instrument-measured value.
   3. If not, install offset, calibrate or replace sensor.

E. Sensors With Transmitters - Standard Application.
   1. Disconnect sensor.
   2. Connect a signal generator in place of sensor.
   3. Connect ammeter in series between transmitter and building automation system control panel.
   4. Using manufacturer’s resistance-temperature data, simulate minimum desired temperature.
   5. Adjust transmitter potentiometer zero until 4 mA is read by the ammeter.
   6. Repeat for the maximum temperature matching 20 mA to the potentiometer span or maximum and verify at the building automation system.
   7. Record all values and recalibrate controller as necessary to comply with specified control ramps, reset schedules, proportional relationship, reset relationship and P/I reaction.
   8. Reconnect sensor.
   9. Make a reading with a calibrated test instrument within 6 inches of the site sensor.
   10. Verify that the sensor reading, via the permanent thermostat, gauge or building automation system, is within the tolerances in the table below of the instrument-measured value.
   11. If not, replace sensor and repeat.
   12. For pressure sensors, perform a similar process with a suitable signal generator.

F. Sensor Tolerances for Standard Applications: Plus/minus the following maximums:
   1. Watthour, Voltage, Amperage: 1 percent of design.
   2. Pressure, Air, Water, Gas: 3 percent of design.
   3. Air Temperatures (Outside Air, Space Air, Duct Air): 0.4 degrees F.
   4. Relative Humidity: 4 percent of design.
   5. Barometric Pressure: 0.1 inch of Hg.
   6. Flow Rate, Air: 10 percent of design.
   7. Flow Rate, Water: 4 percent of design.

8. AHU Wet Bulb and Dew Point: 2.0 degrees F.

G. Critical Applications: For some applications more rigorous calibration techniques may be required for selected sensors. Describe any such methods used on an attached sheet.

H. Valve/Damper Stroke Setup and Check:
1. For all valve/damper actuator positions checked, verify the actual position against the control system readout.
2. Set pump/fan to normal operating mode.
3. Command valve/damper closed; visually verify that valve/damper is closed and adjust output zero signal as required.
4. Command valve/damper to open; verify position is full open and adjust output signal as required.
5. Command valve/damper to a few intermediate positions.
6. If actual valve/damper position does not reasonably correspond, replace actuator or add pilot positioner (for pneumatics).

I. Isolation Valve or System Valve Leak Check: For valves not associated with coils.
1. With full pressure in the system, command valve closed.
2. Use an ultra-sonic flow meter to detect flow or leakage.

3.06 TEST PROCEDURES - GENERAL

A. Provide skilled technicians to execute starting of equipment and to execute the Functional Tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.

B. Provide all necessary materials and system modifications required to produce the flows, pressures, temperatures, and conditions necessary to execute the test according to the specified conditions. At completion of the test, return all affected equipment and systems to their pre-test condition.

C. Sampling: Where Functional Testing of fewer than the total number of multiple identical or near-identical items is explicitly permitted, perform sampling as follows:
1. Identical Units: Defined as units with same application and sequence of operation; only minor size or capacity difference.
2. Sampling is not allowed for:
   a. Major equipment.
   b. Life-safety-critical equipment.
   c. Prefunctional Checklist execution.
3. XX = the percent of the group of identical equipment to be included in each sample; defined for specific type of equipment.
4. YY = the percent of the sample that if failed will require another sample to be tested; defined for specific type of equipment.
5. Randomly test at least XX percent of each group of identical equipment, but not less than three units. This constitutes the "first sample."
6. If YY percent of the units in the first sample fail, test another XX percent of the remaining identical units.
7. If YY percent of the units in the second sample fail, test all remaining identical units.
8. If frequent failures occur, resulting in more troubleshooting than testing, the Commissioning Authority may stop the testing and require Contractor to perform and document a checkout of the remaining units prior to continuing testing.

D. Manual Testing: Use hand-held instruments, immediate control system readouts, or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the “observation”).

E. Simulating Conditions: Artificially create the necessary condition for the purpose of testing the response of a system; for example apply hot air to a space sensor using a hair dryer to see the response in a VAV box.

F. Simulating Signals: Disconnect the sensor and use a signal generator to send an amperage, resistance or pressure to the transducer and control system to simulate the sensor value.

G. Over-Writing Values: Change the sensor value known to the control system in the control system to see the response of the system; for example, change the outside air temperature value from 50 degrees F to 75 degrees F to verify economizer operation.

H. Indirect Indicators: Remote indicators of a response or condition, such as a reading from a control system screen reporting a damper to be 100 percent closed, are considered indirect indicators.

I. Monitoring: Record parameters (flow, current, status, pressure, etc.) of equipment operation using dataloggers or the trending capabilities of the relevant control systems; where monitoring of specific points is called for in Functional Test Procedures:
   1. All points that are monitored by the relevant control system shall be trended by Contractor; at the Commissioning Authority's request, Contractor shall trend up to 20 percent more points than specified at no extra charge.
   2. Other points will be monitored by the Commissioning Authority using dataloggers.
   3. At the option of the Commissioning Authority, some control system monitoring may be replaced with datalogger monitoring.
   4. Provide hard copies of monitored data in columnar format with time down left column and at least 5 columns of point values on same page.
   5. Graphical output is desirable and is required for all output if the system can produce it.
   6. Monitoring may be used to augment manual testing.

3.07 OPERATION AND MAINTENANCE MANUALS

A. See Section 01 78 00 - Closeout Submittals for additional requirements.

B. Add design intent documentation furnished by Architect to manuals prior to submission to Owner.

C. Submit manuals related to items that were commissioned to Commissioning Authority for review; make changes recommended by Commissioning Authority.

D. Commissioning Authority will add commissioning records to manuals after submission to Owner.

END OF SECTION

SECTION 02 41 00
DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Building demolition excluding removal of hazardous materials and toxic substances.

B. Selective demolition of built site elements.

C. Selective demolition of building elements for alteration purposes.

1.02 RELATED REQUIREMENTS

A. Section 01 10 00 - Summary: Limitations on Contractor's use of site and premises.

B. Section 01 10 00 - Summary: Description of items to be salvaged or removed for re-use by Contractor.

C. Section 01 50 00 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.

D. Section 01 60 00 - Product Requirements: Handling and storage of items removed for salvage and relocation.

E. Section 01 70 00 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.

F. Section 01 74 19 - Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.

1.03 REFERENCE STANDARDS

A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards; current edition.

B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2019.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Site Plan: Showing:
   1. Areas for temporary construction and field offices.

C. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
   1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences.
   2. Identify demolition firm and submit qualifications.
   3. Include a summary of safety procedures.

D. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.01 SCOPE

A. Remove other items indicated, for relocation and recycling.

B. Fill excavations, open pits, and holes in ground areas generated as result of removals, using specified fill; compact fill as required so that required rough grade elevations do not subside within one year after completion.

3.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with other requirements specified in Section 01 70 00.

B. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Obtain required permits.
   2. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
   3. Provide, erect, and maintain temporary barriers and security devices.
   4. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
   5. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
   6. Do not close or obstruct roadways or sidewalks without permit.
   7. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
   8. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.

C. Do not begin removal until receipt of notification to proceed from Owner.

D. Protect existing structures and other elements that are not to be removed.
   1. Provide bracing and shoring.
   2. Prevent movement or settlement of adjacent structures.
   3. Stop work immediately if adjacent structures appear to be in danger.

E. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

F. Hazardous Materials: Comply with 29 CFR 1926 and state and local regulations. Reference Asbestos Abatement Contractor Bid Document and Specifications dated 10/22/2020, provided under seperate header. See Section 01 22 00, Unit Prces for unit abatement costs.

G. Perform demolition in a manner that maximizes salvage and recycling of materials.
   1. Dismantle existing construction and separate materials.
   2. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.

3.03 EXISTING UTILITIES

A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.

E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.

F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

3.04 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that construction and utility arrangements are as indicated.

2. Report discrepancies to Architect before disturbing existing installation.
3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.

B. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.

C. Remove existing work as indicated and as required to accomplish new work.
1. Remove items indicated on drawings.

D. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove existing systems and equipment as indicated.
1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
3. Verify that abandoned services serve only abandoned facilities before removal.
4. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification.

E. Protect existing work to remain.
1. Prevent movement of structure; provide shoring and bracing if necessary.
2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
3. Repair adjacent construction and finishes damaged during removal work.
4. Patch as specified for patching new work.

3.05 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.

B. Remove from site all materials not to be reused on site; comply with requirements of Section 01 74 19 - Waste Management.

C. Leave site in clean condition, ready for subsequent work.

D. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

SECTION 03 10 00 - CONCRETE FORMING AND ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Formwork for cast-in place concrete, with shoring, bracing and anchorage.

B. Openings for other work.

C. Form accessories.

D. Form stripping.

1.02 RELATED REQUIREMENTS

A. Section 03-2000 - Concrete Reinforcing.

B. Section 03-3000 - Cast-in-Place Concrete.

C. Section 05-1200 - Structural Steel Framing: Placement of embedded steel anchors and plates in cast-in-place concrete.

1.03 REFERENCE STANDARDS

A. ACI 117 - Specifications for Tolerances for Concrete Construction and Materials 2010 (Reapproved 2015).

B. ACI 301 - Specifications for Structural Concrete 2016.

C. ACI 318 - Building Code Requirements for Structural Concrete and Commentary 2014 (Errata 2018).

D. ACI 347R - Guide to Formwork for Concrete 2014, with Errata (2017).

E. ASME A17.1 - Safety Code for elevators and escalators 2016.

F. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes 2014.

G. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric) 2013.

1.04 SUBMITTALS

A. See Section 01-3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on void form materials and installation requirements.

C. Shop Drawings: Indicate pertinent dimensions, materials, bracing, and arrangement of joints and ties.

D. Designer's Qualification Statement.

E. Design Data: As required by authorities having jurisdiction.

1.05 QUALITY ASSURANCE

A. Designer Qualifications: Design formwork under direct supervision of a Professional Structural Engineer experienced in design of concrete formwork and licensed in Oregon.

B. Maintain one copy of each installation standard on site throughout the duration of concrete work.

PART 2 PRODUCTS

2.01 FORMWORK - GENERAL

A. Provide concrete forms, accessories, shoring, and bracing as required to accomplish cast-in-place concrete work.

B. Design and construct concrete that complies with design with respect to shape, lines, and dimensions.

C. Chamfer outside corners of beams, joists, columns, and walls.

D. Comply with applicable state and local codes with respect to design, fabrication, erection, and removal of formwork.

E. Comply with relevant portions of ACI 347R, ACI 301 and ACI 318.

2.02 WOOD FORM MATERIALS

A. Form Materials: At the discretion of the CM/GC.

2.03 REMOVABLE PREFABRICATED FORMS

A. Preformed Steel Forms: Minimum 16 gage, 0.0598 inch thick, matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.

B. Preformed Aluminum Forms: ASTM B221 (ASTM B221M), 6061-T6 alloy, matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.

C. Preformed Plastic Forms: Thermoplastic polystyrene form liner, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.

D. Glass Fiber Fabric Reinforced Plastic Forms: Matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished concrete surfaces.

E. Pan Type: Glass fiber, of size and profile indicated.

F. Void Forms: Moisture resistant treated paper faces, biodegradable, structurally sufficient to support weight of wet concrete mix until initial set; 2 inches thick.

2.04 FORMWORK ACCESSORIES

A. Form Ties: Removable type, galvanized metal, fixed length, cone type, with waterproofing washer, free of defects that could leave holes larger than 1 inch in concrete surface.

B. Form Release Agent: Capable of releasing forms from hardened concrete without staining or discoloring concrete or forming bugholes and other surface defects, compatible with concrete and form materials, and not requiring removal for satisfactory bonding of coatings to be applied.
   1. Composition: Colorless reactive, mineral oil-based, soy-based or vegetable-oil based compound.
   2. Do not use materials containing diesel oil or petroleum-based compounds.
   3. VOC Content: None; water-based.

C. Dovetail Anchor Slot: Galvanized steel, at least 22 gage, 0.0299 inch thick, foam filled, release tape sealed slots, anchors for securing to concrete formwork.

D. Flashing Reglets: Galvanized steel, at least 22 gage, 0.0299 inch thick, longest possible lengths, with alignment splines for joints, foam filled, release tape sealed slots, anchors for securing to concrete formwork.

E. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.

F. Embedded Anchor Shapes, Plates, Angles and Bars: As specified in Section 05-1200.

G. Waterstops: Rubber, minimum 1,750 psi tensile strength, minimum 50 degrees F to plus 175 degrees F working temperature range, 4 inch wide, maximum possible lengths, ribbed profile, preformed corner sections, heat welded jointing.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

3.02 EARTH FORMS

A. Earth forms are not permitted.

3.03 ERECTION - FORMWORK

A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301.

B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.

C. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.

D. Align joints and make watertight. Keep form joints to a minimum.

E. Obtain approval before framing openings in structural members that are not indicated on drawings.

F. Install void forms in accordance with manufacturer's recommendations. Protect forms from moisture or crushing.

G. Coordinate this section with other sections of work that require attachment of components to formwork.

H. If formwork is placed after reinforcement, resulting in insufficient concrete cover over reinforcement, request instructions from Architect before proceeding.

3.04 APPLICATION - FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's recommendations.

B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.

C. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings that are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

3.05 INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Provide formed openings where required for items to be embedded in passing through concrete work.

B. Locate and set in place items that will be cast directly into concrete.

C. Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other work.

D. Position recessed anchor slots for brick veneer masonry anchors to spacing and intervals specified in Section 04-2001.

E. Install accessories in accordance with manufacturer's instructions, so they are straight, level, and plumb. Ensure items are not disturbed during concrete placement.

F. Install waterstops in accordance with manufacturer's instructions, so they are continuous without displacing reinforcement. Heat seal joints so they are watertight.

G. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.

H. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.

3.06 FORM CLEANING

A. Clean forms as erection proceeds, to remove foreign matter within forms.

B. Clean and protect permanent insulated concrete foam panel formwork per manufacturer's recommendations.

C. Clean formed cavities of debris prior to placing concrete.
   1. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.
   2. During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter.

3.07 FORMWORK TOLERANCES

A. Construct formwork to maintain tolerances required by ACI 117, unless otherwise indicated.

B. Construct permanent insulated foam panel formwork to maintain tolerances required by ACI 301.

3.08 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01-4000 - Quality Requirements.

B. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and to verify that supports, fastenings, wedges, ties, and items are secure.

3.09 FORM REMOVAL

A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.

B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.

C. Store removed forms to prevent damage to form materials or to fresh concrete. Discard damaged forms.

END OF SECTION

SECTION 03 20 00 - CONCRETE REINFORCING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Reinforcing steel for cast-in-place concrete.

B. Supports and accessories for steel reinforcement.

1.02 RELATED REQUIREMENTS

A. See Structural Drawings for additional specification information.

B. Section 03-1000 - Concrete Forming and Accessories.

C. Section 03-3000 - Cast-in-Place Concrete.

1.03 REFERENCE STANDARDS

A. ACI 301 - Specifications for Structural Concrete 2016.

B. ACI SP-66 - ACI Detailing Manual 2004.

C. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement 2018.

D. ASTM A706/A706M - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement 2016.

E. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete 2018a.

F. AWS D1.4/D1.4M - Structural Welding Code - Reinforcing Steel 2018.

G. CRSI (DA4) - Manual of Standard Practice 2009.

1.04 SUBMITTALS

A. See Section 01-3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Comply with requirements of ACI SP-66. Include bar schedules, shapes of bent bars, spacing of bars, and location of splices.

C. Manufacturer's Certificate: Certify that reinforcing steel and accessories supplied for this project meet or exceed specified requirements.

D. Reports: Submit certified copies of mill test report of reinforcement materials analysis.

1.05 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301.

B. Welders' Certificates: Submit certifications for welders employed on the project, verifying AWS qualification within the previous 12 months.

PART 2 PRODUCTS

2.01 REINFORCEMENT

A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
   1. Deformed billet-steel bars.

B. Reinforcing Steel: ASTM A706/A706M, deformed low-alloy steel bars.
   1. Unfinished.

C. Stirrup Steel: ASTM A1064/A1064M steel wire, unfinished.

D. Reinforcement Accessories:
   1. Tie Wire: Annealed, minimum 16 gage, 0.0508 inch.
   2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.

2.02 RE-BAR SPLICING:

A. Coupler Systems: Mechanical devices for splicing reinforcing bars; capable of developing full steel reinforcing design strength in tension and compression.

B. Dowel Bar Splicer with Dowel-Ins: Mechanical devices for connecting dowels; capable of developing full steel reinforcing design strength in tension and compression.

2.03 FABRICATION

A. Fabricate concrete reinforcing in accordance with CRSI (DA4) - Manual of Standard Practice.

B. Welding of reinforcement is permitted only with the specific approval of Architect. Perform welding in accordance with AWS D1.4/D1.4M.

C. Locate reinforcing splices not indicated on drawings at point of minimum stress.
   1. Review locations of splices with Architect.

PART 3 EXECUTION

3.01 PLACEMENT

A. Place, support and secure reinforcement against displacement. Do not deviate from required position.
   1. All reinforcing bars to be supported on chairs, dobies, or other approved support. "Hooking" and lifting of a reinforcing mat after placement is prohibited.
   2. Do not bend or straighten reinforcing in any manner that will injure the material.
   3. Install splices for reinforcing bars in accordance with drawings and ACI 3018. Stagger splices in adjacent bars 5'-0".

B. Do not displace or damage vapor barrier.

C. Accommodate placement of formed openings.

D. Comply with applicable code for concrete cover over reinforcement.

E. Bond and ground all reinforcement to requirements of Section 26-0526.

3.02 FIELD QUALITY CONTROL

A. An independent testing agency, as specified in Section 01-4000 - Quality Requirements, will inspect installed reinforcement for compliance with contract documents before concrete placement.

END OF SECTION

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete building frame members.

B. Elevated concrete slabs.

C. Floors and slabs on grade.

D. Concrete shear walls and foundation walls.

E. Joint devices associated with concrete work.

F. Miscellaneous concrete elements, including equipment pads, equipment pits, light pole bases, thrust blocks and manholes.

G. Concrete curing.

1.02 RELATED REQUIREMENTS

A. See Specifications on Structural Drawings.

B. Section 01 4000 - Quality Requirements: Testing and Inspections.

C. Section 03-1000 - Concrete Forming and Accessories: Forms and accessories for formwork.

D. Section 03-2000 - Concrete Reinforcing.

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

F. Section 09 9123 - Interior Painting:Sealer.

1.03 REFERENCE STANDARDS

A. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete 1991 (Reapproved 2009).

B. ACI 301 - Specifications for Structural Concrete 2016.

C. ACI 302.1R - Guide to Concrete Floor and Slab Construction 2015.

D. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete 2000 (Reapproved 2009).

E. ACI 305R - Guide to Hot Weather Concreting 2010.

F. ACI 306R - Guide to Cold Weather Concreting 2016.

G. ACI 308R - Guide to External Curing of Concrete 2016.

H. ACI 318 - Building Code Requirements for Structural Concrete and Commentary 2014 (Errata 2018).

I. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete 2012.

J. ASTM C33/C33M - Standard Specification for Concrete Aggregates 2018.

K. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens 2018.

L. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete 2019a.

M. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens) 2016a.

N. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete 2015a.

O. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete 2016.

P. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method 2016.

Q. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete 2010a (Reapproved 2016).

R. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete 2017.

S. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete 2019.

T. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete 2015.

U. ASTM C1059/C1059M - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete 2013.

V. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink) 2017.

W. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures 2015.

X. ASTM D471 - Standard Test Method for Rubber Property--Effect of Liquids 2016a.

Y. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types) 2018.

Z. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs 2018a.

AA. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs 2017.

BB. NSF 61 - Drinking Water System Components - Health Effects 2019.

CC. NSF 372 - Drinking Water System Components - Lead Content 2016.

1.04 SUBMITTALS

A. See Section 01-3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
   1. For curing compounds, provide data on method of removal in the event of incompatibility with floor covering adhesives.
   2. For chemical-resistant waterstops, provide data on ASTM D471 test results.

C. Mix Design: Submit proposed concrete mix design for each element type listed in the Structural General Notes. Provide back-up data indicating that the submitted mixes have a history of achieving the specified strength and shrinkage characteristics (at exposed slabs).
   1. Indicate proposed mix design complies with requirements of ACI 301, Section 4 - Concrete Mixtures.
   2. Indicate proposed mix design complies with requirements of ACI 318, Chapter 5 - Concrete Quality, Mixing and Placing.

D. Samples: Submit samples of underslab vapor retarder to be used.

E. Samples: Submit two, 12 inch long samples of waterstops and construction joint devices.

F. Test Reports: Submit report for each test or series of tests specified.

G. Test Reports: Submit termite-resistant sheet manufacturer's summary of independent laboratory and field testing for effectiveness in subterranean termite exclusion.

H. Manufacturer's Installation Instructions: For concrete accessories, indicate installation procedures and interface required with adjacent construction.

I. Sustainable Design Submittal: If any fly ash, ground granulated blast furnace slag, silica fume, rice hull ash, or other waste material is used in mix designs to replace Portland cement, submit the total volume of concrete cast in place, mix design(s) used showing the quantity of portland cement replaced, reports showing successful cylinder testing, and temperature on day of pour if cold weather mix is used.

J. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.

K. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301 and ACI 318.

B. Follow recommendations of ACI 305R when concreting during hot weather.

C. Follow recommendations of ACI 306R when concreting during cold weather.

D. For slabs required to include moisture vapor reduction admixture (MVRA), do not proceed with placement unless manufacturer's representative is present for every day of placement.

1.06 WARRANTY

A. See Section 01-7800 - Closeout Submittals, for additional warranty requirements.
   1. Include cost of repair or removal of failed flooring, placement of topical moisture remediation system, and replacement of flooring with comparable flooring system.
   2. Provide warranty by manufacturer of MVRA matching terms of flooring adhesive or primer manufacturer's material defect warranty.

B. Moisture Emission Reducing Curing and Sealing Compound: Provide warranty to cost of flooring delamination failures for 10 years.
   1. Include cost of repair or removal of failed flooring, remediation with a moisture vapor impermeable surface coating, and replacement of flooring with comparable flooring system.

PART 2 PRODUCTS

2.01 FORMWORK

A. Comply with requirements of Section 03-1000.

2.02 REINFORCEMENT MATERIALS

A. Comply with requirements of Section 03-2000.

2.03 CONCRETE MATERIALS

A. Cement: ASTM C150/C150M, Type I - Normal Portland type.
   1. Acquire cement for entire project from same source.

B. Fine and Coarse Aggregates: ASTM C33/C33M.

C. Fly Ash: ASTM C618, Class C or F.

D. Calcined Pozzolan: ASTM C618, Class N.

E. Silica Fume: ASTM C1240, proportioned in accordance with ACI 211.1.

F. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

2.04 ADMIXTURES

A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

B. Air Entrainment Admixture: ASTM C260/C260M.

C. High Range Water Reducing and Retarding Admixture: ASTM C494/C494M Type G.

D. High Range Water Reducing Admixture: ASTM C494/C494M Type F.

E. Water Reducing and Accelerating Admixture: ASTM C494/C494M Type E.

F. Water Reducing and Retarding Admixture: ASTM C494/C494M Type D.

G. Accelerating Admixture: ASTM C494/C494M Type C.

H. Retarding Admixture: ASTM C494/C494M Type B.

I. Water Reducing Admixture: ASTM C494/C494M Type A.

J. Shrinkage Reducing Admixture:
   1. ASTM C494/C494M, Type S.

K. Spray-lok SPC 327 or approved equal for vapor transmission mitigation on all slabs to receive flooring.

2.05 ACCESSORY MATERIALS

A. Underslab Vapor Retarder: Sheet material complying with ASTM E1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. The use of single ply polyethylene is prohibited.
   1. Installation: Comply with ASTM E1643.
   2. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.
   3. Manufacturers:
      a. Fortifiber Building Systems Group ; Moistop Ultra 10.
      b. Substitutions: See Section 01-6000 - Product Requirements.

B. Non-Shrink Cementitious Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
   1. Grout: Comply with ASTM C1107/C1107M.
   2. Minimum Compressive Strength at 48 Hours, ASTM C109/C109M: 2,000 pounds per square inch.
   3. Minimum Compressive Strength at 28 Days, ASTM C109/C109M: 7,000 pounds per square inch.

2.06 BONDING AND JOINTING PRODUCTS

A. Latex Bonding Agent: Non-redispersable acrylic latex, complying with ASTM C1059/C1059M, Type II.

B. Epoxy Bonding System:
   1. Complying with ASTM C881/C881M and of Type required for specific application.

C. Waterstops: Bentonite and butyl rubber, complying with NSF 61 and NSF 372.
   1. Configuration: As indicated on drawings.

2. Size: As indicated on drawings.

D. Slab Isolation Joint Filler: 1/2 inch thick, height equal to slab thickness, with removable top section that will form 1/2 inch deep sealant pocket after removal.
   1. Material: ASTM D1751, cellulose fiber.

E. Slab Contraction Joint Device: Preformed linear strip intended for pressing into wet concrete to provide straight route for shrinkage cracking.

F. Slab Construction Joint Devices: Combination keyed joint form and screed, galvanized steel, with rectangular or round knockout holes for conduit or rebar to pass through joint form at 6 inches on center; ribbed steel stakes for setting.
   1. Provide removable plastic cap strip that forms wedge-shaped joint for sealant installation.
   2. Height: To suit slab thickness.

2.07 CURING MATERIALS

A. Evaporation Reducer: Liquid thin-film-forming compound that reduces rapid moisture loss caused by high temperature, low humidity, and high winds; intended for application immediately after concrete placement.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Moisture-Retaining Sheet: ASTM C171.
   1. Curing paper, regular.
   2. Polyethylene film, white opaque, minimum nominal thickness of 4 mil, 0.004 inch.
   3. White-burlap-polyethylene sheet, weighing not less than 3.8 ounces per square yard.

D. Water: Potable, not detrimental to concrete.

2.08 CONCRETE MIX DESIGN

A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.
   1. Replace as much Portland cement as possible with fly ash, ground granulated blast furnace slag, silica fume, or rice hull ash as is consistent with ACI recommendations.

B. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.

C. Normal Weight Concrete:
   1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: See Structural General Notes.
   2. Fly Ash or Slag Content: Maximum 30 percent of cementitious materials by weight.
   3. Calcined Pozzolan Content: Maximum 10 percent of cementitious materials by weight.
   4. Silica Fume Content: Maximum 5 percent of cementitious materials by weight.
   5. Cement Content: As required to achieve specified strength.
   6. Water-Cement Ratio: Maximum 40 percent by weight.
   7. Total Air Content: 4 percent, determined in accordance with ASTM C173/C173M.
   8. Maximum Slump: 4 inches (without add mixtures).
   9. Maximum Aggregate Size: See Structural General Notes

2.09 MIXING

A. Transit Mixers: Comply with ASTM C94/C94M.

B. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.02 PREPARATION

A. Verify that forms are clean and free of rust before applying release agent.

B. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.

C. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in according to bonding agent manufacturer's instructions.
   1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications, and where curing under humid conditions is required.
   2. Use latex bonding agent only for non-load-bearing applications.

D. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Lap joints minimum 6 inches. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.

3.03 PLACING CONCRETE

A. Place concrete in accordance with ACI 304R.

B. Place concrete for floor slabs in accordance with ACI 302.1R.

C. Notify Architect not less than 24 hours prior to commencement of placement operations.

D. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

E. Ensure reinforcement, inserts, waterstops, embedded parts and formed construction joint devices will not be disturbed during concrete placement.

F. Place concrete continuously without construction (cold) joints wherever possible; where construction joints are necessary, before next placement prepare joint surface by removing laitance and exposing the sand and sound surface mortar, by sandblasting or high-pressure water jetting.

G. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

3.04 SLAB JOINTING

A. Locate joints as indicated on drawings.

B. Anchor joint fillers and devices to prevent movement during concrete placement.

C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.
   1. Install wherever necessary to separate slab from other building members, including columns, walls, equipment foundations, footings, stairs, manholes, sumps, and drains.

D. Load Transfer Construction and Contraction Joints: Install load transfer devices as indicated; saw cut joint at surface as indicated for contraction joints.

E. Saw Cut Contraction Joints: Saw cut joints before concrete begins to cool, within 4 to 12 hours after placing; use 3/16 inch thick blade and cut at least 1 inch deep but not less than one quarter (1/4) the depth of the slab.

F. Construction Joints: Where not otherwise indicated, use metal combination screed and key form, with removable top section for joint sealant.

3.05 FLOOR FLATNESS AND LEVELNESS TOLERANCES

A. Maximum Variation of Surface Flatness:
   1. Exposed Concrete Floors: 1/4 inch in 10 feet.
   2. Under Seamless Resilient Flooring: 1/4 inch in 10 feet.
   3. Under Carpeting: 1/4 inch in 10 feet.

B. Correct the slab surface if tolerances are less than specified.

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

3.06 CONCRETE FINISHING

A. Repair surface defects, including tie holes, immediately after removing formwork.

B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch or more in height.

C. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/4 inch or more in height. Provide finish as follows:
   1. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.

D. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:
   1. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI 302.1R; thin floor coverings include carpeting, resilient flooring and seamless flooring.
   2. Other Surfaces to Be Left Exposed: Trowel as described in ACI 302.1R, minimizing burnish marks and other appearance defects.

E. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains at 1:100 nominal.

F. Concrete Polishing: See Section 03-3511.

3.07 CURING AND PROTECTION

A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
   1. Normal concrete: Not less than seven days.

C. Formed Surfaces: Cure by moist curing with forms in place for full curing period.

D. Surfaces Not in Contact with Forms:
   1. Slabs and Floors To Receive Adhesive-Applied Flooring: Curing compounds and other surface coatings are usually considered unacceptable by flooring and adhesive manufacturers. If such materials must be used, either obtain the approval of the flooring and adhesive manufacturers prior to use or remove the surface coating after curing to flooring manufacturer's satisfaction.
   2. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-saturated sand, water-fog spray or saturated burlap.
      a. Ponding: Maintain 100 percent coverage of water over floor slab areas, continuously for 4 days.

b. Spraying: Spray water over floor slab areas and maintain wet.
c. Saturated Burlap: Saturate burlap-polyethylene and place burlap-side down over floor slab areas, lapping ends and sides; maintain in place.

3. Final Curing: Begin after initial curing but before surface is dry.
a. Moisture-Retaining Sheet: Lap strips not less than 3 inches and seal with waterproof tape or adhesive; secure at edges.
b. Curing Compound: Apply in two coats at right angles, using application rate recommended by manufacturer.

3.08 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01-4000 - Quality Requirements.

B. Provide free access to concrete operations at project site and cooperate with appointed firm.

C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.

D. Tests of concrete and concrete materials may be performed at any time to ensure compliance with specified requirements.

E. Compressive Strength Tests: ASTM C39/C39M, for each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cubic yards or less of each class of concrete placed.

F. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.

G. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

H. Slab Testing: Cooperate with manufacturer of specified moisture vapor reduction admixture (MVRA) to allow access for sampling and testing concrete for compliance with warranty requirements.

3.09 DEFECTIVE CONCRETE

A. Test Results: The testing agency shall report test results in writing to Architect and CM/GC within 24 hours of test.

B. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.

C. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by CM/GC when defective concrete is identified.

D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.

3.10 PROTECTION

A. Do not permit traffic over unprotected concrete floor surface until fully cured.

END OF SECTION

SECTION 05 12 00 - STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structural steel framing members, wide flanges, channels, angles, tubes, pipes, plates and their connections..

B. Structural steel support members, suspension cables, sag rods, and struts.

C. Base plates, shear stud connectors and expansion joint plates.

D. Grouting under base plates.

1.02 RELATED REQUIREMENTS

E. Section 05 50 00 - Metal Fabrications: Steel fabrications affecting structural steel work.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 01 22 00 - Unit Prices, for additional unit price requirements.

B. Structural Steel Framing:
   1. Basis of Measurement: By the ton.
   2. Basis of Payment: Includes structural members fabricated, placed and anchored.

1.04 REFERENCE STANDARDS

A. AISC (MAN) - Steel Construction Manual; 2011.

B. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges; 2016.

C. AISC S303 - Code of Standard Practice for Steel Buildings and Bridges; 2010.

E. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

F. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

G. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold Finished; 2013.

H. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.

I. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

J. ASTM A242/A242M - Standard Specification for High-Strength Low-Alloy Structural Steel; 2004 (Reapproved 2009).

K. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014.

L. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2014.

M. ASTM A449 - Standard Specification for Hex Cap Screws, Bolts and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use; 2010.

N. ASTM A490 - Standard Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength; 2014a.

O. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.

P. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2014.

Q. ASTM A514/A514M - Standard Specification for High-Yield-Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding; 2014.

R. ASTM A529/A529M - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality; 2014.

S. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts; 2007a (Reapproved 2014).

T. ASTM A563M - Standard Specification for Carbon and Alloy Steel Nuts [Metric]; 2007.

U. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel; 2015.

V. ASTM A588/A588M - Standard Specification for High-Strength Low-Alloy Structural Steel, up to 50 ksi (345 MPa) Minimum Yield Point, with Atmospheric Corrosion Resistance; 2015.

X. ASTM A992/A992M - Standard Specification for Structural Steel Shapes; 2011 (Reapproved 2015).

Y. ASTM A1008/A1008M - 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; 2015.

Z. ASTM A1011/A1011M - 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; 2014.

AA. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2014.

AB. ASTM C827/C827M - Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures; 2010.

AC. ASTM E94 - Standard Guide for Radiographic Examination; 2004 (Reapproved 2010).

AD. ASTM E164 - Standard Practice for Contact Ultrasonic Testing of Weldments; 2013.

AE. ASTM E165/E165M - Standard Test Method for Liquid Penetrant Examination for General Industry; 2012.

AF. ASTM E709 - Standard Guide for Magnetic Particle Testing; 2014.

AG. ASTM F3125/F3125M - 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; 2015a.

AH. ASTM F436/F436M - Standard Specification for Hardened Steel Washers Inch and Metric Dimensions; 2016.

AI. ASTM F959/F959M - Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners, Inch and Metric Series; 2017a.

AJ. ASTM F436 - Standard Specification for Hardened Steel Washers; 2011.

AK. ASTM F959 - Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners; 2013.

AL. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength; 2007a.

AM. ASTM F1852 - Standard Specification for "Twist Off" Type Tension Control Structural Bolt/Nut/Washer Assemblies, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2011.

AN. ASTM F2280 - Standard Specification for “Twist Off” Type Tension Control Structural Bolt/Nut/Washer Assemblies, Steel, Heat Treated, 150 ksi Minimum Tensile Strength; 2012.

AO. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.

AP. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015.

AQ. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel; International Accreditation Service, Inc; 2011.

AR. ITS (DIR) - Directory of Listed Products; current edition.

AS. RCSC (HSBOLT) - Specification for Structural Joints Using High-Strength Bolts; Research Council on Structural Connections; 2009.

AT. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

AU. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

AV. SSPC-SP 1 - Solvent Cleaning; 2015.

AW. SSPC-SP 2 - Hand Tool Cleaning; 1982 (Ed. 2004).

AX. SSPC-SP 3 - Power Tool Cleaning; 1982 (Ed. 2004).

AY. SSPC-SP 5 - White Metal Blast Cleaning; 2007.

AZ. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

BA. SSPC-SP 7 - Brush-Off Blast Cleaning; 2007.

BB. SSPC-SP 10 - Near-White Blast Cleaning; 2007.

BC. SSPC-SP 11 - Power Tool Cleaning to Bare Metal; 2012 (Ed. 2013).

BD. SSPC-SP 13 - Surface Preparation of Concrete; (Reaffirmed 2015); 2003.

BE. UL (FRD) - Fire Resistance Directory; current edition.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:
   1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.
   2. Connections not detailed.
   3. Indicate cambers.
   4. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.
   5. ASTM material designation for members and their connectors.
   6. Indicate components designated as Architecturally Exposed Structural Steel (AESS) on the Architectural drawings. Coordinate with Section 05 12 13.

C. Manufacturer's Mill Certificate: Certify that products meet or exceed specified requirements.

D. Mill Test Reports: Indicate structural strength, destructive test analysis and non-destructive test analysis.

E. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.

F. Designer's Qualification Statement.

G. Fabricator's Qualification Statement.

H. Design-build steel elements: submit structural drawings and calculations for the design-build steel elements. The design shall conform to the current edition of the Oregon Structural Specialty Code and project specific requirements noted on the structural and architectural drawings. The drawings and calculations shall be wet signed and stamped by a professional engineer licensed in the state of Oregon. The drawings and calculations shall be reviewed for general conformance with the stated design criteria not numerical accuracy or correctness. The drawings and calculations shall be concurrently submitted to the permitting authority for the purpose of obtaining a building permit.

I. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172 or provide shop inspection per IBC/OSSC requirements.

J. Provide quality assurance plan in accordance with Appendix Q of AISC 341

1.06 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with AISC (MAN) "Steel Construction Manual."

B. Comply with Section 10 of AISC S303 "Code of Standard Practice for Steel Buildings and Bridges" and Section 05 12 13 for architecturally exposed structural steel.

C. Maintain one copy of each document on site.

D. Fabricator: Company specializing in performing the work of this section with minimum 10 years of documented experience.

E. Fabricator Qualifications: A qualified steel fabricator that is accredited by the International Accreditation Service (IAS) Fabricator Inspection Program for Structural Steel in accordance with IAS AC172 or provide shop inspection per IBC/OSSC requirements.

F. Erector: Company specializing in performing the work of this section with minimum 10 years of documented experience.

G. Design connections not detailed on drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in Oregon.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Comply with UL (FRD) Assembly Design as shown on the drawings

2.02 MATERIALS

A. Steel Angles and Channels: ASTM A36/A36M

B. Steel W Shapes and Tees: ASTM A992/A992M.

C. Rolled Steel Structural Shapes: ASTM A992/A992M.

D. Steel Shapes, Plates, and Bars: ASTM A242/A242M high-strength, corrosion-resistant structural steel.

E. Steel Shapes, Plates, and Bars: ASTM A529/A529M high-strength, carbon-manganese structural steel, Grade 50.

F. Steel Plates: ASTM A572/A572M, Grade 50 (345) high-strength, columbium-vanadium steel. All gusset plates and collector connection plates.

G. Cold-Formed Structural Tubing: ASTM A500/A500M, Grade B.

H. Hot-Formed Structural Tubing: ASTM A501/A501M, seamless or welded.

I. Steel Sheet: ASTM A1011/A1011M, Designation SS, Grade 30 hot-rolled, or ASTM A1008/A1008M, Designation SS, Grade 30 cold-rolled.

J. Pipe: ASTM A53/A53M, Grade B, Finish black.

K. Shear Stud Connectors: Made from ASTM A108 Grade 1015 bars.

L. Structural Bolts and Nuts: Carbon steel, ASTM A307, Grade A with Weldability Supplement S1 and galvanized in compliance with ASTM A153/A153M, Class C.

M. High-Strength Structural Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, with matching compatible ASTM A563 or ASTM A563M nuts and ASTM F436/F436M washers.

N. High-Strength Structural Bolts: ASTM A490 or ASTM A490M; Type 1 alloy steel, with matching compatible ASTM A563 or ASTM A563M nuts and ASTM F436 washers.

O. Tension Control Bolts: Twist-off type; ASTM F3125/F3125M.

P. Unheaded Anchor Rods: ASTM F1554, Grade 55, plain with Weladability Supplement S1, with matching ASTM A563 or ASTM A563M nuts and ASTM F436 Type 1 washers.

Q. Headed Anchor Rods: ASTM F1554, Grade 55, plain with Weldability Supplement S1.

R. Load Indicator Washers: Provide washers complying with ASTM F959/F959M at connections requiring high-strength bolts.

S. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

T. Grout: ASTM C1107/C1107M; Non-shrink; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
   1. Minimum Compressive Strength at 48 Hours: 2,000 pounds per square inch.
   2. Minimum Compressive Strength at 28 Days: 7,000 pounds per square inch.
   3. Height Change, Plastic State; when tested according to ASTM C827/C827M:
      a. Maximum: Plus 4 percent.
      b. Minimum: Plus 1 percent.

U. Grout: Non-shrink, non-metallic aggregate type, complying with ASTM C1107/C1107M and capable of developing a minimum compressive strength of 6000 psi at 28 days. Provide EUCO-NS or EUCO HI-FLOW manufactured by Euclid Chemical Company.

V. Shop and Touch-Up Primer: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

W. Touch-Up Primer for Galvanized Surfaces: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

X. Thermal Break Plate: Fiberglass-reinforced laminate composite thermal break plate
   1. Basis-of-Design Product: FRR by Armatherm; www.armatherm.com
   2. Other Approved Manufacturer: Fabreeka-TIM by Fabreeka International, Inc.; www.fabreeka.com
   3. Load Requirements: Refer to Structural Drawings.
   4. Performance Requirements:
      a. Tensile Strength: ASTM D638, 11,000 psi.
      b. Flexural Strength: ASTM D790, 25,000 psi.
      c. Compressive Strength: ASTM D695, 38,900 psi.
      d. Thermal Conductivity: ASTM C177 1.8 BTU/Hr/ft2/in/°F.

2.03 FABRICATION

A. Shop fabricate to greatest extent possible.

B. Space shear stud connectors as specified on plan.

C. Continuously seal joined members by continuous welds. Grind exposed welds smooth.

D. Fabricate connections for bolt, nut, and washer connectors.

E. All work shall be performed in accordance with the latest AISC 'Specifications' for design, fabrication, and erection of structural steel for buildings.

F. Welding shall conform with the latest edition of the A.N.S.I./A.W.S. D1.1 structural welding code. Use E70XX electrodes.

2.04 FINISH

A. Coordinate with Section 05 12 13 for Architecturally Exposed Structural Steel Framing (AESS). The following sub-sections indicate minimum finish requirements, unless otherwise noted.

B. Prepare structural component surfaces in accordance with SSPC-SP 3.

C. Paint steel (except galvanized steel and portions to be encased in concrete) with one coat of primer standard tnemec P10-99 or equivalent subject to engineer's approval. Alternates will be considered upon request and submission of the manufacturer's specifications. Do not paint surfaces that will be fireproofed, field welded, in contact with concrete, or high strength bolted.

D. All structural steel members exposed to weather or called out as hot dip galvanized (HDG) on plan or structural steel members located in exterior environments shall be HDF in accordance with ASTM A 123. Any member that has its HDF coating damaged or removed during transport

or erection shall have its coating repaired using ZRC Galvilite repair compound or equal. Repair galvanizing after welding in accordance with ASTM A780.

E. All bolts for exterior use shall be zinc-coated by the bolt manufacturer by either the hot-dip process in accordance with ASTM A153, class C or the mechanical deposit process in accordance with the ASTM B695, class 50.

F. Leave structural steel members un-primed.

G. Galvanize structural steel members to comply with ASTM A123/A123M. Provide minimum 1.7 oz/sq ft galvanized coating.

H. Steel scheduled to receive "high performance paint," shall be primed with Carboline "859," Tnemec "90-97" or PPG “Amercoat 68 HS " at 3 mils dry film thickness after being surface prepared in accordance with SSPC SP-6.”

2.05 SOURCE QUALITY CONTROL

A. Provide shop testing and analysis of structural steel per IBC and OSSC requirements.

B. High-Strength Bolts: Provide testing and verification of shop-bolted connections in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts", testing at bolts at each connection per IBC requirements.

C. Welded Connections: Visually inspect all shop-welded connections and test at least 10 percent of welds using one of the following:
   1. Radiographic testing performed in accordance with ASTM E94.
   2. Ultrasonic testing performed in accordance with ASTM E164.
   3. Liquid penetrant inspection performed in accordance with ASTM E165/E165M.
   4. Magnetic particle inspection performed in accordance with ASTM E709.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that conditions are appropriate for erection of structural steel and that the work may properly proceed.

3.02 ERECTION

A. Erect structural steel in compliance with AISC 303.

B. Allow for erection loads, and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing.

C. Field weld components and shear studs indicated on shop drawings.

D. Use carbon steel bolts only for temporary bracing during construction, unless otherwise specifically permitted on drawings. Install high-strength bolts in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts".

E. Do not field cut or alter structural members without approval of Structural Engineer.

F. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

G. Grout solidly between column plates and bearing surfaces, complying with manufacturer's instructions for nonshrink grout. Trowel grouted surfaces smooth, splaying neatly to 45 degrees.

H. Locate and install all anchor bolts, epoxy anchors, and mechanical anchors before fabricating steel connection elements.

3.03 TOLERANCES

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

B. Maximum Offset From True Alignment: 1/4 inch.

3.04 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.

B. High-Strength Bolts: Provide testing and verification of field-bolted connections in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts", testing at bolts per IBC requiements.

C. Welded Connections: Visually inspect all field-welded connections and test at least 100 percent of welds using one of the following:
   1. Radiographic testing performed in accordance with ASTM E94.
   2. Ultrasonic testing performed in accordance with ASTM E164.
   3. Liquid penetrant inspection performed in accordance with ASTM E165/E165M.
   4. Magnetic particle inspection performed in accordance with ASTM E709.

D. Galvanized Steel:
   1. Any member that has had its hot dip galvanized coating damaged or removed during transport or erection shall have its coating repaired using ZRG galvilite repair compound or equal.
   2. Repair galvanizing after welding in accordance with ASTM A780
   3. Steel encased in concrete shall be clean of grease, paint, and other contaminants

END OF SECTION

SECTION 05 50 00 - METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop fabricated steel items.

B. Downspout boots.

1.02 RELATED REQUIREMENTS

A. Section 03-3000 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.

1.03 REFERENCE STANDARDS

A. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements 2018.

B. ASTM A6/A6M - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling; 2014.

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2014.

D. ASTM A48/A48M - Standard Specification for Gray Iron Castings 2003 (Reapproved 2016).

E. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless 2018.

F. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates 2018.

G. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes 2018.

H. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing 2014.

I. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2019a.

J. ASTM A780/A780M-09 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

K. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings; 2000 (Reapproved 2006).

L. ASTM A1011/A1011M - 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 2017.

M. ASTM D6386 - Practice for Preparation of Zinc (Hot-Dip Galvanized) Coating Iron and Steel Product and Hardware Surfaces for Painting.

N. ASTM D7803 - Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Powder Coating.

O. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength 2019.

P. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination 2012.

Q. AWS D1.1/D1.1M - Structural Welding Code - Steel 2015 (with March 2016 Errata).

R. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel; International Accreditation Service, Inc. 2017.

S. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer 1999 (Ed. 2004).

T. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic") 2002 (Ed. 2004).

U. SSPC-SP 2 - Hand Tool Cleaning 2018.

1.04 SUBMITTALS

A. See Section 01-3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

C. Welders' Certificates: Submit certification for welders employed on the project, verifying AWS qualification within the previous 12 months.

D. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

1.05 QUALITY ASSURANCE

A. Design elements that are not fully detailed to meet AHJ requirements, under direct supervision of a Professional Engineer experienced in design of this Work and licensed in Oregon.

B. Fabricator Qualifications: A qualified steel fabricator that is accredited by IAS AC172.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.

C. Steel Plates: ASTM A6/A6M or ASTM A283/A283M.

D. Plates: ASTM A283/A283M.

E. Stainless Steel: ASTM A276/A276M.

F. Fasteners: If not otherwise specified, then as required for each application.

G. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, plain.

H. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

I. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

J. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

K. Anchors: As required to suit and complete application.

2.02 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Continuously seal joined members by intermittent welds and plastic filler.

D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

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

2.03 MISCELLANEOUS FABRICATED ITEMS

A. Miscellaneous architectural and structural components as identified in drawings.

B. Ledge Angles, Shelf Angles, Channels, Plates and HSS tubes, and other shapes for support of brick and other ancillary construction; galvanized finish for items not within heated space.
   1. Exposed portions of these components to be field painted (such as exposed angle at masonry veneer window heads).

C. Countertop support brackets and plates: steel plate.

2.04 ARCHITECTURAL FABRICATED ITEMS

A. Miscellaneous architectural components as identified in Drawings.
   1. Exterior Fabricated Items Paint System: See Section 09-9113 Exterior Painting.

2.05 DOWNSPOUT BOOTS

A. Downspout Boots: Smooth interior without boxed corners or choke points; include integral lug slots, integral cleanout, cleanout cover and tamper proof fasteners.
   1. Configuration: See Drawings.
   2. Material: Cast iron; ASTM A48/A48M; casting thickness 3/8 inch (9.5 mm), minimum.
   3. Color: To be selected by Architect from manufacturer's standard range.

2.06 FINISHES - STEEL

A. Prime paint steel items.
   1. Exceptions: Galvanize items to be embedded in concrete, items to be imbedded in masonry and items specified for Galvanized finish.
   2. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.
   3. Prepare surfaces to be primed in accordance with SSPC-SP2.
   4. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
   5. Prime Painting: One coat.
   6. See Section 09-9113 Exterior Paint, for Exterior Exposed Steel Paint Systems.

2.07 FABRICATION TOLERANCES

A. Squareness: 1/8 inch maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch.

C. Maximum Misalignment of Adjacent Members: 1/16 inch.

D. Maximum Bow: 1/8 inch in 48 inches.

E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.03 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Field weld components as indicated on drawings.

D. Perform field welding in accordance with AWS D1.1/D1.1M.

E. Obtain approval prior to site cutting or making adjustments not scheduled.

F. After erection, prime welds, abrasions and surfaces not shop primed or galvanized , except surfaces to be in contact with concrete.

3.04 TOLERANCES

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

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 06 10 00 - ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structural dimension lumber framing.

B. Non-structural dimension lumber framing.

C. Rough opening framing for doors, windows, and roof openings.

D. Subflooring.

E. Roof-mounted curbs.

F. Roofing nailers.

G. Roofing cant strips.

H. Preservative treated wood materials.

I. Fire retardant treated wood materials.

J. Communications and electrical room mounting boards.

K. Concealed wood blocking, nailers, and supports.

L. Miscellaneous wood nailers, furring, and grounds.

1.02 RELATED REQUIREMENTS

A. Section 07-2500 - Weather Barriers: Water-resistive barrier over sheathing.

B. Section 07-6200 - Sheet Metal Flashing and Trim: Sill flashings.

1.03 REFERENCE STANDARDS

A. AWC (WFCM) - Wood Frame Construction Manual for One- and Two-Family Dwellings 2015.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2019a.

D. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing 2003 (Reapproved 2017).

E. ASTM D3498 - Standard Specification for Adhesives for Field-Gluing Wood Structural Panels (Plywood or Oriented Strand Board) to Wood Based Floor System Framing 2018a.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2018b.

G. AWPA U1 - Use Category System: User Specification for Treated Wood 2018.

H. PS 1 - Structural Plywood 2009.

I. PS 2 - Performance Standard for Wood-Based Structural-Use Panels 2010.

J. PS 20 - American Softwood Lumber Standard 2015.

K. WWPA G-5 - Western Lumber Grading Rules 2017.

1.04 SUBMITTALS

A. See Section 01-3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide technical data on insulated sheathing, wood preservative materials and application instructions.

C. Structural Composite Lumber: Submit manufacturer's published structural data including span tables, marked to indicate which sizes and grades are being used; if structural composite lumber is being substituted for dimension lumber or timbers, submit grading agency structural tables marked for comparison.

1.05 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, or installation.

1.06 WARRANTY

A. See Section 01-7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
   1. Species: Douglas Fir, unless otherwise indicated.
   2. If no species is specified, provide any species graded by the agency specified; if no grading agency is specified, provide lumber graded by any grading agency meeting the specified requirements.
   3. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

A. Grading Agency: Western Wood Products Association; WWPA G-5.

B. Sizes: Nominal sizes as indicated on drawings, S4S.

C. Moisture Content: Kiln-dry or MC15.

D. Stud Framing (2 by 4 through 2 by 6):
   1. Species: Douglas Fir.
   2. Grade: No. 2.

E. Joist, Rafter and Small Beam Framing (2 by 6 through 4 by 16):
   1. Species: Douglas Fir-Larch.
   2. Grade: No. 1 and Better.
   3. Species and Grades: As indicated on drawings for various locations.

F. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
   1. Lumber: S4S, No. 2 or Standard Grade.
   2. Boards: Standard or No. 3.

2.03 TIMBERS FOR CONCEALED APPLICATIONS

A. Grading Agency: Western Wood Products Association; WWPA G-5.

B. Sizes: Nominal sizes as indicated on drawings, S4S.

C. Moisture Content: S-dry (23 percent maximum).

D. Beams and Posts 5 inches and over in thickness:

1. Grade: Select Structural.

2.04 STRUCTURAL COMPOSITE LUMBER

A. At CM/GC's option, structural composite lumber may be substituted for concealed dimension lumber and timbers.

B. Structural Composite Lumber: Factory fabricated beams, headers, and columns, of sizes and types indicated on drawings; structural capacity as published by manufacturer.

2.05 CONSTRUCTION PANELS

A. Subfloor/Underlayment Combination: Any PS 2 type, rated Single Floor.
1. Bond Classification: Exterior.
2. Span Rating: 48.
3. Performance Category: 1-1/8 PERF CAT.
4. Edges: Tongue and groove.

B. Wall Sheathing: Any PS 2 type.
1. Bond Classification: Exterior.
2. Grade: Structural I Sheathing.
3. Span Rating: 24.
4. Performance Category: 5/16 PERF CAT.
5. Edge Profile: Square edge.

C. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

D. Other Applications:
1. Plywood Concealed From View But Located Within Exterior Enclosure: PS 1, C-C Plugged or better, Exterior grade.
2. Plywood Exposed to View But Not Exposed to Weather: PS 1, A-D, or better.
3. Plywood Below Grade With Fluid-Applied Waterproofing: PS 1, A-C, A side to the exterior, Exterior Grade.
4. Other Locations: PS 1, C-D Plugged or better.
5. Plywood as part of Fire Rated Wall Assembly: As per above and treated with Pyro-Guard or equivalent.

2.06 ACCESSORIES

A. Fasteners and Anchors:

1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.

2. Drywall Screws: Bugle head, hardened steel, power driven type, length three times thickness of sheathing.

3. Anchors: Toggle bolt type for anchorage to hollow masonry.

B. Die-Stamped Connectors: Hot dipped galvanized steel, sized to suit framing conditions.

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

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

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

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

E. Sill Flashing: As specified in Section 07-6200.

F. Subfloor Adhesives: Waterproof, air cure type, cartridge dispensed; adhesives designed for subfloor applications and complying with either ASTM C557 or ASTM D3498.

G. Construction Adhesives: Adhesives complying with ASTM C557 or ASTM D3498.

H. Water-Resistive Barrier: As specified in Section 07-2500.

2.07 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.

1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.

2. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

B. Fire Retardant Treatment:

1. Interior Type A: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.

a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.

b. Treat rough carpentry items as indicated .

c. Do not use treated wood in applications exposed to weather or where the wood may become wet.

C. Preservative Treatment:

1. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.

a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.

b. Treat lumber exposed to weather.

c. Treat lumber in contact with roofing, flashing or waterproofing.

d. Treat lumber in contact with masonry or concrete.

e. Treat lumber less than 18 inches above grade.

f. Treat lumber in other locations as indicated.

2. Preservative Pressure Treatment of Plywood Above Grade: AWPA U1, Use Category UC2 and UC3B, Commodity Specification F using waterborne preservative.

a. Kiln dry plywood after treatment to maximum moisture content of 19 percent.

b. Treat plywood in contact with roofing, flashing or waterproofing.

c. Treat plywood in contact with masonry or concrete.

d. Treat plywood less than 18 inches above grade.

e. Treat plywood in other locations as indicated.

PART 3 EXECUTION

3.01 PREPARATION

A. Where wood framing bears on cementitious foundations, install full width sill flashing continuous over top of foundation, lap ends of flashing minimum of 4 inches and seal.

B. Install sill gasket under sill plate of framed walls bearing on foundations; puncture gasket cleanly to fit tightly around protruding anchor bolts.

C. Coordinate installation of rough carpentry members specified in other sections.

3.02 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.03 FRAMING INSTALLATION

A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members.

B. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.

C. Install structural members full length without splices unless otherwise specifically detailed.

D. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes, AWC (WFCM) Wood Frame Construction Manual.

E. Install horizontal spanning members with crown edge up and not less than 1-1/2 inches of bearing at each end.

F. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.

G. Provide bridging at joists in excess of 8 feet span as detailed. Fit solid blocking at ends of members.

H. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.

3.04 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to code authorities may be used in lieu of solid wood blocking.

C. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.

D. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

E. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

F. Provide the following specific non-structural framing and blocking:

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

3.05 ROOF-RELATED CARPENTRY

A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

B. Provide wood curb at all roof openings except where specifically indicated otherwise. Form corners by alternating lapping side members.

3.06 INSTALLATION OF CONSTRUCTION PANELS

A. Subflooring/Underlayment Combination: Glue and nail to framing; staples are not permitted.

B. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails, screws or staples.

C. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.

1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
3. Install adjacent boards without gaps.
4. Size and Location: As indicated on drawings.

3.07 SITE APPLIED WOOD TREATMENT

A. Apply preservative treatment compatible with factory applied treatment at site-sawn cuts, complying with manufacturer's instructions.

B. Allow preservative to dry prior to erecting members.

3.08 TOLERANCES

A. Framing Members: 1/4 inch from true position, maximum.

B. Surface Flatness of Floor: 1/8 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

C. Variation from Plane (Other than Floors): 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.09 FIELD QUALITY CONTROL

A. See Section 01-4000 - Quality Requirements, for additional requirements.

3.10 CLEANING

A. Waste Disposal: Comply with the requirements of Section 01-7419 - Construction Waste Management and Disposal.

1. Comply with applicable regulations.
2. Do not burn scrap on project site.
3. Do not burn scraps that have been pressure treated.
4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.

B. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.

C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 06 20 00
FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Finish carpentry items.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Support framing, grounds, and concealed blocking.

B. Section 09 91 13 - Exterior Painting: Painting of finish carpentry items.

C. Section 09 91 23 - Interior Painting: Painting of finish carpentry items.

1.03 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.

B. AWI (QCP) - Quality Certification Program; Current Edition.

C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2018).

D. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1; 2017, with Errata (2019).

E. AWPA U1 - Use Category System: User Specification for Treated Wood; 2018.

F. BHMA A156.9 - American National Standard for Cabinet Hardware; 2015.

G. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

H. PS 1 - Structural Plywood; 2009.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with plumbing rough-in, electrical rough-in, and installation of associated and adjacent components.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
   1. Provide the information required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).
   2. Include certification program label.

C. Samples: Submit one samples of finish plywood, 12 x 12 inch in size illustrating wood grain and specified finish.

D. Samples: Submit two samples of wood trim 12 inch long.

E. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

F. Manufacturer's Instructions: Provide manufacturer's installation instructions for factory-fabricated units.

1.06 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
   1. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.

B. Quality Certification:
   1. Provide labels or certificates indicating that the work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
   2. Provide designated labels on shop drawings as required by certification program.

3. Provide designated labels on installed products as required by certification program.
4. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

1.07 MOCK-UP

A. Locate as indicated on drawings.

B. Mock-up may remain as part of the Work.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Store finish carpentry items under cover, elevated above grade, and in a dry, well-ventilated area not exposed to heat or sunlight.

B. Protect from moisture damage.

C. Handle materials and products to prevent damage to edges, ends, or surfaces.

PART 2 PRODUCTS

2.01 FINISH CARPENTRY ITEMS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Exterior Woodwork Items:
1. Window Casings and Moldings: Softwood; prepare for paint finish.
2. Fascias: Prepare for paint finish.

C. Interior Woodwork Items:
1. Moldings, Bases, Casings, and Miscellaneous Trim: Clear white pine; prepare for paint finish.

2.02 SHEET MATERIALS

A. Softwood Plywood, Exposed to View: Face species as indicated, plain sawn, medium density fiberboard core; PS 1 Grade A-B, glue type as recommended for application.

2.03 PLASTIC LAMINATE MATERIALS

A. Plastic Laminate: NEMA LD 3; color as selected by Architect. Refer 09 06 00, Schedule of Finishes.

2.04 FASTENINGS

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

B. Adhesive for factory-fabricated units: Manufacturer's recommended adhesive for application.

C. Concealed Joint Fasteners: Threaded steel.

2.05 HARDWARE

A. Hardware: Comply with BHMA A156.9.

B. Standard Shelf, Countertop, and Workstation Brackets:
1. Material: Steel.
2. Finish: Manufacturer's standard, factory-applied primer.

2.06 WOOD TREATMENT

A. Factory-Treated Lumber: Comply with requirements of AWPA U1 - Use Category System for pressure impregnated wood treatments determined by use categories, expected service conditions, and specific applications.

B. Wood Preservative by Pressure Treatment (PT Type): Provide AWPA U1 treatment using waterborne preservative with 0.25 percent retainage.

2.07 SITE FINISHING MATERIALS

2.08 FABRICATION

A. Shop assemble work for delivery to site, permitting passage through building openings.

B. Cap exposed plastic laminate finish edges with material of same finish and pattern.

C. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

D. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.

2.09 SHOP FINISHING

A. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.02 INSTALLATION

A. Install custom fabrications in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.

B. Install factory-fabricated units in accordance with manufacturer's printed installation instructions.

C. Set and secure materials and components in place, plumb and level.

D. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

END OF SECTION

SECTION 06 41 00
ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Specially fabricated cabinet units.

B. Hardware.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Support framing, grounds, and concealed blocking.

B. Section 09 91 23 - Interior Painting: Field finishing of cabinet exterior.

C. Section 12 36 00 - Countertops.

1.03 REFERENCE STANDARDS

A. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1; 2017, with Errata (2019).

B. BHMA A156.9 - American National Standard for Cabinet Hardware; 2015.

C. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; 2016.

D. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.

C. Samples: Submit actual samples of architectural cabinet construction, minimum 12 inches square, illustrating proposed cabinet, countertop, and shelf unit substrate and finish.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

1. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.

B. Quality Certification:

1. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
2. Provide designated labels on shop drawings as required by certification program.
3. Provide designated labels on installed products as required by certification program.
4. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.
5. Replace, repair, or rework all work for which certification is refused.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect units from moisture damage.

1.07 FIELD CONDITIONS

A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

PART 2 PRODUCTS

2.01 CABINETS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Paint grade
   1. Exposed Surfaces: HPVA HP-1 Grade A, Ash, plain sliced, random-matched.
   2. Semi-Exposed Surfaces: HPVA HP-1 Grade B, Ash, plain sliced, random-matched.

C. Cabinets at Music Room:
   1. Finish - Exposed Exterior Surfaces: Wood.
   2. Finish - Exposed Interior Surfaces: Wood.
   3. Finish - Semi-Exposed Surfaces: Wood
   4. Door and Drawer Front Edge Profiles: Square with T molding edge band unless noted otherwise.

2.02 WOOD-BASED COMPONENTS

A. Wood fabricated from old growth timber is not permitted.

2.03 LAMINATE MATERIALS

A. Manufacturers:
   1. Wilsonart LLC; High Pressure Laminate: www.wilsonart.com/#sle.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Thermally Fused Laminate (TFL): Melamine resin, NEMA LD 3, Type VGL laminate panels.
   1. Manufacturers:
      a. Wilsonart LLC: www.wilsonart.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

C. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.

2.04 COUNTERTOPS

A. Plastic Laminate Countertops: Medium density fiberboard substrate covered with HPDL, with beveled hardwood edge.

2.05 ACCESSORIES

A. Adhesive: Type recommended by fabricator to suit application.

B. Fasteners: Size and type to suit application.

C. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.

D. Adjustable Drawer Organization Systems: Drawer trays, dividers, and connectors.
   1. Products:
      a. Blum, Inc; AMBIA-LINE; www.blum.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

2.06 HARDWARE

A. Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified.

B. Adjustable Shelf Supports: Standard side-mounted system using multiple holes for 2-pin locking shelf support and coordinated self rests, polished chrome or satin chrome finish, for nominal 1 inch spacing adjustments.

C. Drawer and Door Pulls: "U" shaped wire pull, steel with satin finish, 4 inch centers.

D. Cabinet Locks: Keyed cylinder, two keys per lock, master keyed, steel with satin finish.
   1. Product: 100DR, 200DW manufactured by Olympus.

E. Drawer Slides:
   1. Type: Full extension.
   2. Static Load Capacity: min. 75 lbs.
   3. Mounting: Side mounted.
   4. Stops: Integral type.

5. Features: Provide self closing/stay closed type.
6. Manufacturers:
    a. Knape & Vogt Manufacturing Company; Medium-Duty Drawer Slides: www.knapeandvogt.com/#sle.
    b. Fulterer FR; Medium-Duty Drawer Slides: www.fultererusa.com
    c. Accuride, Medium-Duty Drawer Slides: www.accuride.com
    d. Substitutions: See Section 01 60 00 - Product Requirements.

F. Hinges: Semiconcealed type, RPC 374-26D or equal, steel with satin finish.
1. Manufacturers:
    a. Blum, Inc; CLIP top BLUMOTION: www.blum.com/#sle.
    b. Blum, Inc; COMPACT BLUMOTION: www.blum.com/#sle.
    c. Grass America Inc: www.grassusa.com/#sle.
    d. Hardware Resources: www.hardwareresources.com/#sle.
    e. Hettich America, LP: www.hettich.com/#sle.
    f. Substitutions: See Section 01 60 00 - Product Requirements.

2.07 SITE FINISHING MATERIALS

A. Stain, Shellac, Varnish, and Finishing Materials: In compliance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

2.08 FABRICATION

A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.

B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

C. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.

D. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.
1. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
2. Cap exposed plastic laminate finish edges with material of same finish and pattern.

E. Matching Wood Grain: Comply with requirements of quality standard for specified Grade and as follows:
1. Provide center matched panels at each elevation.
2. Provide sequence matching across each elevation.

F. Mechanically fasten back splash to countertops as recommended by laminate manufacturer at 16 inches on center.

G. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.

2.09 SHOP FINISHING

A. Sand work smooth and set exposed nails and screws.

B. For opaque finishes, apply wood filler in exposed nail and screw indentations and sand smooth.

C. On items to receive transparent finishes, use wood filler matching or blending with surrounding surfaces and of types recommended for applied finishes.

D. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
1. Opaque:
    a. System - 4, Latex Acrylic, Water-based.
    b. Color: As selected by Architect.
    c. Sheen: Flat.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify location and sizes of utility rough-in associated with work of this section.

3.02 INSTALLATION

A. Install work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.

B. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.

C. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.

D. Secure cabinets to floor using appropriate angles and anchorages.

E. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.

3.03 CLEANING

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

END OF SECTION

SECTION 07 01 50.19
PREPARATION FOR RE-ROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Partial replacement of existing roofing system in preparation for replacement roofing system in designated areas as indicated on drawings.

B. Removal of existing flashing and counterflashings.

C. Temporary roofing protection.

1.02 RELATED REQUIREMENTS

A. Section 07 54 00 - Thermoplastic Membrane Roofing.

B. Section 07 62 00 - Sheet Metal Flashing and Trim: Replacement of flashing and counterflashings.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with affected mechanical and electrical work associated with roof penetrations.

B. Preinstallation Meeting: Convene one week before starting work of this section.
   1. Attendees:
      a. Architect.
      b. Contractor.
      c. Owner.
      d. Installer.
   2. Meeting Agenda: Provide agenda to participants prior to meeting in preparation for discussions on the following:
      a. Removal and installation schedule.
      b. Necessary preparatory work.
      c. 3-Part Moisture Mitigation Plan.
      d. Protection before, during, and after roofing system installation.
      e. Removal of existing roofing system.
      f. Installation of new roofing system.
      g. Temporary roofing and daily terminations.
      h. Transitions and connection to and with other work.

C. 3-Part Moisture Mitigation Plan: Submit for review and approval by the Architect and Owner. To include:
   1. Part 1: Prevention of moisture intrusion to open structures including weatherizing and action plan for potential moisture in forecast.
   2. Part 2: Response plan for implementing action plan provided in "Part 1."
   3. Part 3: Moisture and Mold intrusion mitigation plan to include response measures following rain events to ensure success of action plan, and in the event that moisture is found to have affected the building, provide the means and methods of addressing moisture. To be reviewed and accepted prior to construction activities.

D. Schedule work to coincide with commencement of installation of new roofing system.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Ensure storage and staging of materials does not exceed static and dynamic load-bearing capacities of roof decking.

1.06 FIELD CONDITIONS

A. Do not remove existing roofing membrane when weather conditions threaten the integrity of building contents or intended continued occupancy.

B. Maintain continuous temporary protection prior to and during installation of new roofing system.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 COMPONENTS

A. Refer to following sections for additional information on components relating to this work:
   1. Partial removal of existing roofing system in preparation for new roofing system in designated areas as indicated on drawings, see Section 07 51 00.
   2. Remove existing flashing and counterflashings in preparation for replacement of these materials as part of this work, see Section 07 62 00 for material requirements.

2.02 MATERIALS

A. Temporary Roofing Protection Materials:
   1. Contractor's responsibility to select appropriate materials for temporary protection of roofing areas as determined necessary for this work.

B. Roofing Recover Materials:
   1. Contractor's responsibility to select appropriate materials for roofing re-cover as determined necessary for this work.

2.03 ACCESSORIES

A. Fasteners: Type and size as required and compatible with existing and new roofing system to resist local wind uplift.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that existing roof surface has been cleared of materials being removed from existing roofing system and ready for next phase of work as required.

3.02 PREPARATION

A. Sweep roof surface clean of loose matter.

B. Remove loose refuse and dispose of properly off-site.

3.03 MATERIAL REMOVAL

A. Remove metal counter flashings.

B. Repair existing wood deck surface to provide smooth working surface for new roof system.

3.04 INSTALLATION

A. Coordinate scope of this work with requirements for installation of new roofing system, see Section 07 51 00 for additional requirements.

3.05 PROTECTION

A. Provide protection of existing roofing system that is not having work performed on it.

B. Do not permit traffic over unprotected or repaired deck surface.

C. Install recover board over existing membrane.

END OF SECTION

SECTION 07 14 00
FLUID-APPLIED WATERPROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fluid-Applied Waterproofing:
   1. Cold-applied polyurethane-methacrylate (PUMA) waterproofing system.

1.02 RELATED REQUIREMENTS

A. Section 07 62 00 - Sheet Metal Flashing and Trim: Metal counterflashings.

B. Section 07 92 00 - Joint Sealants: Sealing moving joints in waterproofed surfaces that are not part of work in this section.

1.03 ABBREVIATIONS

A. CSPE - Chlorosulfonated Polyethylene.

B. HDPE - High-Density Polyethylene.

C. NRCA - National Roofing Contractors Association.

D. SBS - Styrene-Butadiene-Styrene.

1.04 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. ASTM D638 - Standard Test Method for Tensile Properties of Plastics; 2014.

C. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness; 2015, with Editorial Revision (2017).

D. NRCA (WM) - The NRCA Waterproofing Manual; 2005.

E. ASTM C 920 - Standard Specification for Elastomeric Joint Sealants

F. ASTM C 1193 - Standard Guide for Use of Joint Sealants

G. ASTM C 1127 - Standard Guide for Use of High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane with an Integral Wearing Surface

H. ASTM C1305 Standard Test Method for Crack Bridging Ability of Liquid-Applied Waterproofing Membrane

I. ASTM D638 Standard Test Method for Tensile Properties of Plastics

J. ASTM D1353 Standard Test Method for Nonvolatile Matter in Volatile Solvents for Use in Paint, Varnish, Lacquer, and Related Products

K. ASTM D1640 Standard Test Methods for Drying, Curing, or Film Formation of Organic Coatings

L. ASTM D2240 Standard Test Method for Rubber Property—Durometer Hardness

M. CSA S413 for Parking Structures

N. ASTM C 957 - Standard Specification for High-Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane With Integral Wearing Surface

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention, and acceptable installation temperatures.

C. Testing Firm's Qualification Statement.

D. Warranty:

1. Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
2. Submit installer's certification that installation complies with warranty conditions for the waterproofing membrane.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.
   1. Approval of Manufacturers and Comparable Products: Submit the following in accordance with project substitution requirements, within time allowed for substitution review:
      a. Completed and signed Substitution Request form.
      b. Product data, including certified independent test data indicating compliance with requirements.
      c. Sample shop drawings from similar project.
      d. Project references: Minimum of five installations of similar system not less than five years old, with Owner and Architect contact information.
      e. Name and resume of proposed qualified Inspector.
      f. Sample warranty.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience and approved by manufacturer.

C. Waterproofing Inspector Qualifications: A technical representative of manufacturer not engaged in the sale of products and experienced in the installation and maintenance of the specified waterproofing system, qualified to perform observation and inspection specified in Field Quality Control Article, to determine Installer’s compliance with the requirements of this Project, and approved by the manufacturer to issue warranty certification. The Inspector shall be one of the following:
   1. An authorized full-time technical employee of the manufacturer.
   2. An independent party certified as a waterproofing inspector acceptable to Architect, retained by the Contractor.

D. Testing Firm Qualifications: Company specializing in performing work of the type specified and approved by manufacturer.

1.07 DELIVERY, STORAGE AND HANDLING

A. Accept materials on site in manufacturer's unopened original packaging.

B. Store products in weather protected environment, clear of ground and moisture, within temperature ranges recommended by waterproofing manufacturer.

C. Construction Waste: Store and dispose of packaging materials and construction waste in accordance with requirements of Section 01 74 19 - Construction Waste Management.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by manufacturer.
   1. Protect substrates from environmental conditions that affect membrane performance.
   2. Do not apply waterproofing to a damp or wet substrate or during snow, rain, fog, or mist.

1.09 SCHEDULING

A. Coordinate installation of waterproofing with completion and coordination of interfacing trades with waterproofing.

B. Schedule work so waterproofing applications may be inspected prior to concealment.

C. Ensure waterproofing materials are cured before covering with other materials.

1.10 WARRANTY

A. Applicator: Company specializing in performing the work of this section qualified by system manufacturer for warranted membrane installation. Applicator shall submit the following certification for review:
   1. Applicator shall submit documentation from the membrane manufacturer to verify contractor's status as a qualified approved applicator for warranted installations

B. Special Manufacturer's Warranty: Manufacturer's standard form in which waterproofing manufacturer agrees to furnish and install waterproofing material to repair or replace those materials installed according to manufacturer's written instructions that exhibit material defects or otherwise fail to remain watertight as specified under normal use within warranty period specified.
   1. Access for Repair: Owner shall provide unimpeded access to the Project and the waterproofing system for purposes of testing, leak investigation, and repair, and shall reinstall removed cladding and overburden materials upon completion of repair.
   2. Cost Limitation: Manufacturer's obligation for repair or replacement shall be limited to the original installed cost of the work.
   3. Warranty Period: [Twenty] years date of Substantial Completion.

C.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Cold-Applied Polyurethane-Methacrylate (PUMA) Waterproofing System:
   1. Tremco Commercial Sealants & Waterproofing; TREMproof PUMA Below-Grade Membrane (Asphalt Overlay): www.tremcosealants.com/#sle.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 WATERPROOFING APPLICATIONS

A. Cold-Applied Polyurethane-Methacrylate (PUMA) Waterproofing System:
   1. Location: See drawings.
   2. Cover with asphalt overlay.

2.03 FLUID APPLIED WATERPROOFING MATERIALS

A. Cold-Applied Polyurethane-Methacrylate (PUMA) Waterproofing System: Consists of a primer, base coat, and topcoat.
   1. Cured Thickness: 97 mils, 0.097 inch, minimum, with applied base coat and top coat.
   2. Suitable for installation over concrete substrates properly prepared in accordance with manufacturers requirements.
   3. Primer: Two-component, methyl-methacrylate (MMA) based.
   4. Base Coat: Modified polyurethane-methacrylate (PUMA) that bonds firmly to primer.
      a. Elongation: 407 percent, minimum, measured in accordance with ASTM D638.
      b. Tensile Strength: 1,680 psi, minimum, at 75 degrees F, measured in accordance with ASTM D638.
      c. Durometer Hardness, Type D: 35, minimum, measured in accordance with ASTM D2240.
   5. Top Coat: Methyl-methacrylate (MMA) based, with excellent abrasion resistance, UV stability and chemical resistance.
      a. Elongation: 130 percent, minimum, measured in accordance with ASTM D638.
      b. Tensile Strength: 986 psi, minimum, at 75 degrees F, measured in accordance with ASTM D638.
      c. Durometer Hardness, Type D: 55, minimum, measured in accordance with ASTM D2240.
      d. Color: Gray.
   6. Products:

a. Tremco Commercial Sealants & Waterproofing; TREMproof PUMA Below-Grade Membrane (Ideal for Asphalt Overlay): www.tremcosealants.com/#sle.
b. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 ACCESSORIES

A. General: Accessory materials as described in manufacturer's written installation instructions, recommended to produce complete waterproofing system meeting performance requirements, and compatible with waterproofing material and adjacent materials.

B. Substrate Patching Material: Waterproofing manufacturer's standard trowel-grade filler material.

C. Primer: Tremco PUMA Primer.

D. Detailing Membrane: Tremco PUMA BC T thixotropic polyurethane methacrylate based membrane for use in detailing and field applied cant beads.

E. Flashing Membrane for Vertical and penetration applications: Tremco PUMA BC R

F. Crack filler and Patching material; Tremco PUMA WC and silica

G. Top Coat: Tremco PUMA TC to be utilized in areas exposed to pedestrian traffic and long-term UV exposure greater than 3 weeks

H. Initiator: Tremco PUMA Initiator, used to catalyze all EWS resins

I. Cleaner: Tremco PUMA Cleaner

J. Joint Sealant: ASTM C 920, approved by waterproofing manufacturer for adhesion and compatibility with waterproofing and accessories.
1. Basis of Design Product: Tremco, Dymonic 100.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify substrate surfaces are free of frozen matter, dampness, loose particles, cracks, pits, projections, penetrations, or foreign matter detrimental to adhesion or application of waterproofing system.

C. Verify that substrate surfaces are smooth, free of honeycomb or pitting, and not detrimental to full contact bond of waterproofing materials.

D. Verify items that penetrate surfaces to receive waterproofing are securely installed.

3.02 INTERFACE WITH OTHER WORK

A. Sequencing of Work: Coordinate sequencing of waterproofing work with work of other sections that form portions of building envelope moisture control to ensure that flashings and transition materials can be properly installed and inspected.

B. Subsequent Work: Coordinate waterproofing work with work of other sections installed subsequent to waterproofing to ensure complete inspection of installed waterproofing and sealing of waterproofing penetrations necessitated by subsequent work.

3.03 PREPARATION

A. Protect adjacent surfaces from damage not designated to receive waterproofing.

B. Clean, prepare, and treat substrates in accordance with waterproofing manufacturer's written instructions.
1. Mask adjacent finished surfaces.
2. Remote contaminants and film-forming coatings from substrates.
3. Remove projections and excess materials and fill voids with substrate patching material.
4. Prepare and treat joints and cracks in substrate per ASTM D 4258 and waterproofing manufacturer's written instructions.

C. Detail Preparation: Prepare non-moving shrinkage cracks, large cracks, construction joints, expansion joints, projections and protrusions, penetrations, drains, and changes in plane in

accordance with waterproofing manufacturer's written instructions and details, using accessory materials specified.

D. Install cant strips at inside corners.

E.

3.04 INSTALLATION

A. Install waterproofing to specified minimum thickness in accordance with manufacturers instructions and NRCA (WM) applicable requirements.

B. Apply primer or surface conditioner at a rate recommended by manufacturer, and protect conditioner from rain or frost until dry.

C. Seal membrane and flashings to adjoining surfaces.

D. Apply waterproofing material within manufacturer’s recommended application temperature ranges.

E. Primer: Apply primer to substrates at required rate, using a roller or brush. Allow to dry.

F. Start application with manufacturer's authorized representative present.

G. Cold Fluid-Applied Waterproofing: Apply waterproofing in total wet film thickness and with methods recommended in writing by waterproofing manufacturer’s application instructions.

H. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates and reapply waterproofing components.
   1.

3.05 FIELD QUALITY CONTROL

A. Contractor's Inspector: Contractor shall engage manufacturer's qualified representative during the work to perform tests, including documenting of waterproofing prior to concealment.
   1. Contractor's Inspector shall measure membrane thickness with mil gauge at least once for every 100 sq. ft. (10 sq. m).
   2. Provide written report of tests and inspections.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

C. Coordination of Inspection: Cooperate with testing agency. Allow access to work areas and staging. Notify testing agency in writing of schedule for Work of this Section to allow sufficient time for testing and inspection.
   1. Do not cover Work until testing and inspection is completed and accepted.

D. Reporting: Forward written inspection reports to the Architect within 10 working days of the inspection and test being performed.

E. Correction of Work: Correct deficient applications not passing tests and inspections, make necessary repairs, and retest as required to demonstrate compliance with requirements.

3.06 PROTECTION

A. Clean spills, stains, and overspray resulting application utilizing cleaning agents recommended by manufacturers of affected construction. Remove masking materials.

B. Protect waterproofing from damage from subsequent work. Protect waterproofing materials from exposure to UV light for period in excess of that acceptable to waterproofing manufacturer; replace overexposed materials and retest.

END OF SECTION

SECTION 07 21 00
THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Batt insulation and vapor retarder in exterior wall and floor construction.

B. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

1.02 RELATED REQUIREMENTS

A. Section 07 25 00 - Weather Barriers: Separate air barrier and vapor retarder materials.

1.03 REFERENCE STANDARDS

A. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2017.

B. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2019.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.

D. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C; 2019a.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

C. ABAA Field Quality Control Submittals: Submit third-party reports of testing and inspection required by ABAA QAP.

D. ABAA Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.

E. ABAA Installer Qualification: Submit documentation of current contractor accreditation and current installer certification. Keep copies of contractor accreditation and installer certification on project site during and after installation. Present on-site documentation upon request.

1.05 QUALITY ASSURANCE

A. Air Barrier Association of America (ABAA) Quality Assurance Program (QAP); www.airbarrier.org/#sle:
   1. Installer Qualification: Use accredited contractors, certified installers, evaluated materials, and third-party field quality control audit.
   2. Manufacturer Qualification: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture. Use secondary materials approved in writing by primary material manufacturer.

1.06 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Insulation in Wood Framed Walls and Floors: Batt insulation with integral vapor retarder.

B. Insulation Over Roof Deck: Extruded polystyrene (XPS) board.

2.02 FOAM BOARD INSULATION MATERIALS

A. Polyisocyanurate (ISO) Board Insulation: Rigid cellular foam, complying with ASTM C1289. See Section 07 54 00 Thermoplastic Membrane Roofing.
   1. Board Size: 48 inch by 96 inch.
   2. Board Thickness: 1.5 inch.

2.03 BATT INSULATION MATERIALS

A. Glass Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C665; friction fit.
   1. Flame Spread Index: 15 to 25, when tested in accordance with ASTM E84.
   2. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
   3. Formaldehyde Content: Zero.
   4. Thermal Resistance: R-value of Wall: R-20 Min, Floor: R-30 Min..
   5. Facing: Aluminum foil, flame spread 25 rated; one side.

2.04 ACCESSORIES

A. Sheet Vapor Retarder: See Section 07 25 00.

B. Tape: Reinforced polyethylene film with acrylic pressure sensitive adhesive.
   1. Application: Sealing of interior circular penetrations, such as pipes or cables.
   2. Width: Are required for application.

C. Flashing Tape: Special reinforced film with high performance adhesive.
   1. Application: Window and door opening flashing tape.
   2. Width: As required for application.
   3. Primer: Tape manufacturer's recommended product.
   4. Products:
      a. Protecto Wrap Company; Protecto Super Stick Building Tape: www.protectowrap.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

D. Tape joints of rigid insulation in accordance with roofing and insulation manufacturers' instructions.

E. Insulation Fasteners: Appropriate for purpose intended and approved by roofing manufacturer.
   1. Length as required for thickness of insulation material and penetration of deck substrate.

F. Nails or Staples: Steel wire; electroplated or galvanized; type and size to suit application.

G. Adhesive: Type recommended by insulation manufacturer for application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.02 BOARD INSTALLATION OVER LOW SLOPE ROOF DECK

A. Board Installation Over Roof Deck, General:
   1. See applicable roofing specification section for specific board installation requirements.
   2. Fasten insulation to deck in accordance with roofing manufacturer's written instructions and applicable Factory Mutual requirements.
   3. Do not apply more insulation than can be covered with roofing on the same day.

3.03 BATT INSTALLATION

A. Install insulation and vapor retarder in accordance with manufacturer's instructions.

B. Install in exterior wall and raised floor spaces without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements for additional requirements.

B. Coordination of Air Barrier Association of America (ABAA) Tests and Inspections:
   1. Provide testing and inspection required by ABAA Quality Assurance Program (QAP).
   2. Notify ABAA in writing of schedule for air barrier work, and allow adequate time for testing and inspection.
   3. Cooperate with ABAA testing agency.
   4. Allow access to air barrier work areas and staging.
   5. Do not cover air barrier work until tested, inspected, and accepted.

3.05 PROTECTION

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

END OF SECTION

SECTION 07 25 00
WEATHER BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water-Resistive Barrier: Under exterior wall cladding, over sheathing or other substrate; not air tight or vapor retardant.

B. Air Barriers: Materials that form a system to stop passage of air through exterior walls, joints between exterior walls and roof, and joints around frames of openings in exterior walls.

1.02 DEFINITIONS

A. Weather Barrier: Assemblies that form either water-resistive barriers, air barriers, or vapor retarders.

B. Air Barrier: Air tight barrier made of material that is relatively air impermeable but water vapor permeable, both to the degree specified, with sealed seams and with sealed joints to adjacent surfaces. Note: For the purposes of this specification, vapor impermeable air barriers are classified as vapor retarders.

C. Water-Resistive Barrier: Water-shedding barrier made of material that is moisture resistant, to the degree specified, intended to be installed to shed water without sealed seams.

1.03 REFERENCE STANDARDS

A. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2019.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.

C. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.

D. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials; 2013.

E. ICC-ES AC38 - Acceptance Criteria for Water-Resistive Barriers; 2016.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. ABAA Field Quality Control Submittals: Submit third-party reports of testing and inspection required by ABAA QAP.

C. ABAA Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.

D. ABAA Installer Qualification: Submit documentation of current contractor accreditation and current installer certification; keep copies of each contractor accreditation and installer certification on site during and after installation, and present on-site documentation upon request.

1.05 QUALITY ASSURANCE

A. Air Barrier Association of America (ABAA) Quality Assurance Program (QAP); www.airbarrier.org/#sle:
   1. Installer Qualification: Use accredited contractor, certified installers, evaluated materials, and third-party field quality control audit.
   2. Manufacturer Qualification: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture, and use secondary materials approved in writing by primary material manufacturer.

1.06 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by the materials manufacturers before, during and after installation.

PART 2 PRODUCTS

2.01 WEATHER BARRIER ASSEMBLIES

A. Water-Resistive Barrier: Provide on exterior walls under exterior cladding.
   1. Under Portland cement stucco, use two separate layers of building paper.

B. Air Barrier:
   1. On outside surface of sheathing of exterior walls use air barrier coating, fluid applied type.

2.02 WATER-RESISTIVE BARRIER MATERIALS (NEITHER AIR BARRIER OR VAPOR RETARDER)

A. Building Paper: Asphalt-saturated Kraft building paper complying with requirements of ICC-ES AC38 Grade D.

2.03 AIR BARRIER MATERIALS (WATER VAPOR PERMEABLE AND WATER-RESISTIVE)

A. Air Barrier, Fluid Applied: Vapor permeable, elastomeric waterproofing.
   1. Air Barrier Coating:
      a. Air Permeance: 0.004 cfm/sq ft, maximum, when tested in accordance with ASTM E2178.
      b. Water Vapor Permeance: 5 perms, minimum, when tested in accordance with ASTM E96/E96M Procedure B (Water Method) at 73.4 degrees F.

2.04 AIR BARRIER MATERIALS (AIR AND VAPOR BARRIER)

A. Air and Vapor Barrier Sheet, Fluid-Applied:
   1. Air Permeance: 0.004 cfm/sq ft, maximum, when tested in accordance with ASTM E2178.
   2. Water Vapor Permeance: 1 perm, maximum, when tested in accordance with ASTM E96/E96M Procedure A (Desiccant Method) at 73.4 degrees F.
   3. Water Penetration Resistance Around Nails: Pass, when tested in accordance with ASTM D1970/D1970M.
   4. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less (Class A), when tested in accordance with ASTM E84.
   5. Seam and Perimeter Tape: As recommended by sheet manufacturer.

2.05 ACCESSORIES

A. Flexible Flashing: Self-adhesive sheet flashing complying with ASTM D1970/D1970M, except slip resistance requirement is waived if not installed on a roof.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and conditions are ready to accept the work of this section.

3.02 PREPARATION

A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

3.03 INSTALLATION

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

B. Water-Resistive Barriers: Install continuous barrier over surfaces indicated, with sheets lapped to shed water but with seams not sealed.

C. Air Barriers: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.

D. Mechanically Fastened Sheets - On Exterior:
   1. Install sheets shingle-fashion to shed water, with seams generally horizontal.
   2. Overlap seams as recommended by manufacturer but at least 6 inches.
   3. Overlap at outside and inside corners as recommended by manufacturer but at least 12 inches.
   4. Install water-resistive barrier over jamb flashings.

5. Install air barrier and vapor retarder underneath the jamb flashings.
6. Install head flashings under weather barrier.
7. At openings to be filled with frames having nailing flanges, wrap excess sheet into opening; at head, seal sheet over flange and flashing.

E. Coatings:
1. Prepare substrate in manner recommended by coating manufacturer; treat joints in substrate and between dissimilar materials as recommended by manufacturer.
2. Use flashing to seal to adjacent construction and to bridge joints.

F. Openings and Penetrations in Exterior Weather Barriers:
1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches onto weather barrier and at least 6 inches up jambs; mechanically fasten stretched edges.
2. At openings to be filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches wide; do not seal sill flange.
3. At openings to be filled with non-flanged frames, seal weather barrier to each side of opening framing, using flashing at least 9 inches wide, covering entire depth of framing.
4. At head of openings, install flashing under weather barrier extending at least 2 inches beyond face of jambs; seal weather barrier to flashing.
5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
6. Service and Other Penetrations: Form flashing around penetrating item and seal to weather barrier surface.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements for additional requirements.

B. Coordination of ABAA Tests and Inspections:
1. Provide testing and inspection required by ABAA QAP.
2. Notify ABAA in writing of schedule for air barrier work, and allow adequate time for testing and inspection.
3. Cooperate with ABAA testing agency.
4. Allow access to air barrier work areas and staging.
5. Do not cover air barrier work until tested, inspected, and accepted.

3.05 PROTECTION

A. Do not leave materials exposed to weather longer than recommended by manufacturer.

B. Do not leave paper- or felt-based barriers exposed to weather for longer than one week.

END OF SECTION

SECTION 07 46 46
FIBER-CEMENT SIDING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fiber-cement siding.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Siding substrate.

B. Section 07 25 00 - Weather Barriers: Weather barrier under siding.

C. Section 07 92 00 - Joint Sealants: Sealing joints between siding and adjacent construction and fixtures.

1.03 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2019a.

B. ASTM C1185 - Standard Test Methods for Sampling and Testing Non Asbestos Fiber Cement Flat Sheet, Roofing and Siding Shingles, and Clapboards.

C. ASTM C1186 - Standard Specification for Flat Fiber Cement Sheets; 2008 (Reapproved 2016).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturer's data sheets on each product to be used, including:
   1. Manufacturer's requirements for related materials to be installed by others.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Installation methods, including nail patterns.

C. Shop Drawings: Indicate panel dimensions, layout, joints, construction details, support clips, and methods of anchorage.

D. Samples for Verification: Submit two samples of each sidign type, 12 by 12 inches in size illustrating texture and color. Provide samples of each type of fastener and trim pieces to be used.

E. In-place Mockup: Complete exterior assembly, inlcuding weather barrier, clips, panel spacing, fastening paterns, trim, and all other related components. Install mockup components for review and approval by design team prior to installing remainder of system. Location of mockup per drawings.

F. Test Report: Applicable model code authority evaluation report (e.g. ICC-ES).

G. Installer's Qualification Statement.

H. Maintenance Instructions: Periodic inspection recommendations and maintenance procedures.

I. Warranty: Submit copy of manufacturer’s warranty, made out in Owner’s name, showing that it has been registered with manufacturer.

J. Warranty Documentation for Installation of Building Rainscreen Assembly: Submit installer warranty and ensure that forms have been completed in Owner's name and registered with installer.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified in this section with minimum three years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store products under waterproof cover and elevated above grade, on a flat surface.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective work within a five year period after Date of Substantial Completion.

C. Provide multi-year manufacturer warranty as indicated under Siding article sub-heading "Warranty".

D. Installation Warranty for Building Rainscreen Assembly: Installer of exterior rainscreen assembly (including air/vapor barrier and attachments, framing, and exterior panels) to provide 10-year warranty that includes coverage for defective materials and/or workmanship. This warranty will also clearly include materials, labor, necessary activity to access these areas, and removal of any materials to effect repairs and restore to watertight conditions. www.edacontractors.com/#sle

PART 2 PRODUCTS

2.01 FIBER-CEMENT SIDING

A. Lap Siding: Individual horizontal boards made of portland cement, ground limestone, polyvinyl alocohol fibers and cellulose fibers formed under high pressure with integral surface texture, complying with ASTM C1186, Type A, Grade II; with machined edges, for nail attachment.
   1. Basis of Design: Swisspearl Modula Carat
   2. Style: Standard lap style.
   3. Texture: Smooth.
   4. Length: 8 ft, nominal.
   5. Width (Height), Overall: 12 inches, nominal.
   6. Width (Height), Exposed: Per drawings
   7. Thickness: 5/16 inch, nominal.
   8. Finish: Carat HR.
   9. Color: Through-colored, As indicated on drawings.
   10. Warranty: 50 year limited; transferable.
   11. Manufacturers:
      a. Swisspearl, Modula: www.swisspearl.com.
      b. Cembrit: www.cembrit.com.
      c. Substitutions: See Section 01 60 00 - Product Requirements.

B. Panel Siding: Vertically oriented panels made of portland cement, ground limestone, polyvinyl alocohol fibers and cellulose fibers formed under high pressure with integral surface texture, complying with ASTM C1186, Type A, Grade II; with machined edges, for nail attachment.
   1. Basis of Design: Swisspearl Largo Carat
   2. Texture: Smooth.
   3. Length (Height): 120 inches, nominal, maximum.
   4. Width: 50 inches, nominal, maximum.
   5. Thickness: 5/16 inch, nominal.
   6. Finish: Carat HR.
   7. Color: Through-colored, As indicated on drawings.
   8. Warranty: 50 year limited; transferable.
   9. Manufacturers:
      a. Swisspearl, Largo: www.swisspearl.com.
      b. Cembrit: www.cembrit.com
      c. Substitutions: See Section 01 60 00 - Product Requirements.

C. Soffit Panels: Panels made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C1186, Type A, Grade II; with machined edges, for nail attachment.
   1. Texture: Smooth.
   2. Length: 96 inches, nominal.
   3. Width: 48 inches, nominal.

4. Thickness: 5/16 inch, nominal.
5. Finish: Unfinished.
6. Color: As indicated on drawings.
7. Manufacturer:
   a. James Hardie Building Products, Inc;: www.jameshardie.com/#sle.
   b. Allura, a division of Plycem USA, Inc;: www.allurausa.com/#sle.

2.02 ACCESSORIES

A. Cladding Support Furring Strips: Galvanized metal channels.

B. Trim: Same material and texture as siding.

C. Fiber-Cement Siding Metal Trim: Extruded aluminum alloy 6063-T5 temper.
   1. Dimension and Layout: As indicated on drawings.
   2. Finish: Clear anodized.

D. Fasteners: Rivets, color matched to siding panels; length as required to penetrate minimum 1-1/4 inch.

E. Exterior Soffit Vents: One piece, perforated, ASTM B221 (ASTM B221M), 6063 alloy, T5 temper, aluminum, with edge suitable for direct application to gypsum board and manufactured especially for soffit application, and provide continuous vent.

F. Sealant: Elastomeric, polyurethane or silyl-terminated polyether/polyurethane, and capable of being painted.

G. Finish Paint: Latex house paint acceptable to siding manufacturer; primer recommended by paint manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrate, clean and repair as required to eliminate conditions that would be detrimental to proper installation.

B. Verify that weather barrier has been installed over substrate completely and correctly.

C. Do not begin until unacceptable conditions have been corrected.

D. If substrate preparation is responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Install Sheet Metal Flashing:
   1. Above door and window trim and casings.
   2. Above horizontal trim in field of siding.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions and recommendations.
   1. Read warranty and comply with terms necessary to maintain warranty coverage.
   2. Install in accordance with conditions stated in model code evaluation report applicable to location of project.
   3. Use trim details indicated on drawings.
   4. Touch up field cut edges before installing.
   5. Pre-drill nail holes if necessary to prevent breakage.

B. Allow space for thermal movement between both ends of siding panels that butt against trim; seal joint between panel and trim with specified sealant.

C. Joints in Horizontal Siding: Avoid joints in lap siding except at corners; where joints are inevitable stagger joints between successive courses.

D. Joints in Vertical Siding: Install Z-flashing in horizontal joints between successive courses of vertical siding.

E. Do not install siding less than 6 inches from surface of ground nor closer than 1 inch to roofs, patios, porches, and other surfaces where water may collect.

F. Exterior Soffit Vents: Install according to manufacturer's written instructions and in locations indicated on drawings, and provide vent area specified.

G. After installation, seal joints except lap joints of lap siding; seal around penetrations, and paint exposed cut edges.

H. Finish Painting: Within one week after installation, paint unfinished siding and trim with one coat primer and two coats finish paint.

3.04 PROTECTION

A. Protect installed products until Date of Substantial Completion.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 07 54 00
THERMOPLASTIC MEMBRANE ROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Mechanically attached system with thermoplastic roofing membrane.

B. Fully adhered system with thremoplastic roofing membrane at parapets, curbs, and vertical surfaces.

C. Insulation, flat and tapered.

D. Vapor retarder.

E. Cover boards.

F. Flashings.

G. Roofing cant strips, stack boots, roofing expansion joints, and walkway pads.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Wood nailers and curbs.

B. Section 07 62 00 - Sheet Metal Flashing and Trim: Counterflashings and reglets.

C. Section 07 72 00 - Roof Accessories: Roof-mounted units; prefabricated curbs.

1.03 REFERENCE STANDARDS

A. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2017.

B. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2019.

C. ASTM D6878/D6878M - Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing; 2019.

D. FM (AG) - FM Approval Guide; current edition.

E. FM DS 1-28 - Wind Design; 2016.

F. NRCA (RM) - The NRCA Roofing Manual; 2019.

G. NRCA (WM) - The NRCA Waterproofing Manual; 2005.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.
   1. Review preparation and installation procedures and coordinating and scheduling required with related work.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data indicating membrane materials, flashing materials, insulation, vapor retarder, surfacing, and fasteners.

C. Shop Drawings: Submit drawings that indicate joint or termination detail conditions, conditions of interface with other materials, and paver layout.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Manufacturer's Installation Instructions: Indicate membrane seaming precautions and perimeter conditions requiring special attention.

F. Manufacturer's Field Reports: Indicate procedures followed, ambient temperatures, humidity, wind velocity during application, and supplementary instructions given.

G. Installer's qualification statement.

H. Warranty Documentation:

1. Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
2. Submit installer's certification that installation complies with warranty conditions for waterproof membrane.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of this section with at least five years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original containers, dry and undamaged, with seals and labels intact.

B. Store materials in weather protected environment, clear of ground and moisture.

C. Ensure storage and staging of materials does not exceed static and dynamic load-bearing capacities of roof decking.

D. Protect foam insulation from direct exposure to sunlight.

1.08 FIELD CONDITIONS

A. Do not apply roofing membrane during unsuitable weather.

B. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.

C. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

D. Schedule applications so that no partially completed sections of roof are left exposed at end of workday.

1.09 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Material Warranty: Provide membrane manufacturer's warranty agreeing to replace material that shows manufacturing defects within five years after installation.

C. System Warranty: Provide manufacturer's system warranty agreeing to repair or replace roofing that leaks or is damaged due to wind or other natural causes.
   1. Warranty Term: 30 years.
   2. For repair and replacement include costs of both material and labor in warranty.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Thermoplastic Polyolefin (TPO) Membrane Roofing Materials:
   1. Carlisle Roofing Systems, Inc; Sure-Weld EXTRA 80 mil: www.carlisle-syntec.com/#sle.
   2. Firestone Building Products, LLC; Platinum TPO: www.firestonebpco.com/#sle.
   3. Johns Manville; JM TPO - 80 mil: www.jm.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MEMBRANE ROOFING AND ASSOCIATED MATERIALS

A. Membrane Roofing Materials:
   1. TPO: Thermoplastic polyolefin (TPO) complying with ASTM D6878/D6878M, sheet contains reinforcing fabrics or scrims.
      a. Thickness: 80 mil, 0.080 inch, minimum.
   2. Sheet Width: Factory fabricated into largest sheets possible.
   3. Thermal Emissivity: 0.80, minimum, initial, and 0.79, minimum, 3-year, certified by Cool Roof Rating Council.
   4. Color: White.

B. Seaming Materials: As recommended by membrane manufacturer.

C. Membrane Fasteners: As recommended and approved by membrane manufacturer.

D. Vapor Retarder: Material approved by roof manufacturer complying with requirements of fire rating classification; compatible with roofing and insulation materials.
   1. Fire-retardant adhesive.

E. Flexible Flashing Material: Same material as membrane.

F. Sheet Metal Through-Wall Flashing: TPO Coated Metal.

G. Sheet Metal Drip and Rake Edge: TPO Coated Metal. Provide continuous cleat.

H. Through-Wall Flashing with Termination Bar: At least 40 mil, 0.040 inch thick poly-reinforced membrane with extruded termination bar and drip-edge.
   1. Width: 18 inches, minimum.

2.03 COVER BOARDS

A. Cover Boards: Glass-mat faced gypsum panels complying with ASTM C1177/C1177M.
   1. Thickness: 5/8 inch, Type X, fire-resistant.
   2. Products:
      a. Georgia-Pacific; DensDeck Prime with EONIC Technology: www.densdeck.com/#sle.
      b. or approved equal.

2.04 INSULATION

A. Polyisocyanurate (ISO) Board Insulation: Rigid cellular foam, complying with ASTM C1289.
   1. Classifications:
      a. Type II:
         1) Class 1 - Faced with glass fiber reinforced cellulosic felt facers on both major surfaces of core foam.
         2) Compressive Strength: Classes 1-2-3, Grade 2 - 20 psi (138 kPa), minimum.
         3) R-Value: R-30 minimum
   2. Board Size: 48 by 96 inches.
   3. Tapered Board: Slope as indicated; minimum thickness 1/2 inch; fabricate of fewest layers possible.
   4. Board Edges: Square.
   5. Products:
      a. Johns Manville ENRGY 3.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

2.05 ACCESSORIES

A. Stack Boots: Prefabricated flexible boot and collar for pipe stacks through membrane; same material as membrane.

B. Cant and Edge Strips: Wood fiberboard, compatible with roofing materials; cants formed to 45 degree angle.

C. Insulation Joint Tape: Glass fiber reinforced type as recommended by insulation manufacturer, compatible with roofing materials; 6 inches wide; self adhering.

D. Insulation Fasteners: Appropriate for purpose intended and approved by roofing manufacturer.

E. Membrane Adhesive: As recommended by membrane manufacturer.

F. Insulation Adhesive: As recommended by insulation manufacturer.

G. Roofing Nails: Galvanized, hot-dipped type, size and configuration as required to suit application.

H. Walkway Pads: Suitable for maintenance traffic, contrasting color or otherwise visually distinctive from roof membrane.
   1. Composition: Roofing membrane manufacturer's standard.
   2. Size: Manufacturer's standard size.

3. Surface Color: White or Yellow.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and site conditions are ready to receive work.

B. Verify deck is supported and secure.

C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.

D. Verify deck surfaces are dry and free of snow or ice.

E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and cant strips are in place.

3.02 PREPARATION - WOOD DECK

A. Verify flatness and tightness of joints of wood decking. Fill knot holes with latex filler.

3.03 INSTALLATION, GENERAL

A. Perform work in accordance with manufacturer's instructions, NRCA (RM), and NRCA (WM) applicable requirements.

B. Do not apply roofing membrane during cold or wet weather conditions.

C. Do not apply roofing membrane when ambient temperature is outside the temperature range recommended by manufacturer.

D. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.

E. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

3.04 INSTALLATION - VAPOR RETARDER AND INSULATION, UNDER MEMBRANE

A. Install vapor retarder to deck surface with adhesive in accordance with manufacturer's instructions.
   1. Extend vapor retarder under cant strips and blocking to deck edge.
   2. Install flexible flashing from vapor retarder to air seal material of wall construction, lap and seal to provide continuity of the air barrier plane.

B. Attachment of Insulation:
   1. Mechanically fasten insulation to deck in accordance with roofing manufacturer's instructions and FM DS 1-28 Factory Mutual requirements.

C. Cover Boards: Mechanically fasten cover boards in accordance with roofing manufacturer's instructions and FM (AG) Factory Mutual requirements.

D. Lay subsequent layers of insulation with joints staggered minimum 6 inches from joints of preceding layer.

E. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions.

F. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.

G. Tape joints of insulation in accordance with roofing and insulation manufacturers' instructions.

H. Do not install more insulation than can be covered with membrane in same day.

3.05 INSTALLATION - MEMBRANE

A. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.

B. Shingle joints on sloped substrate in direction of drainage.

C. Fully Adhered Application: At parapets and curbs, install adhesive to substrate at rate of ____ gal/sq ft. Fully embed membrane in adhesive except in areas directly over or within 3 inches of expansion joints. Fully adhere one roll before proceeding to adjacent rolls.

D. Overlap edges and ends and seal seams by contact adhesive, minimum 3 inches. Seal permanently waterproof. Apply uniform bead of sealant to joint edge.

E. Mechanical Attachment: Install membrane and mechanical attachment devices in accordance with manufacturer's instructions.

F. At intersections with vertical surfaces:
   1. Extend membrane over cant strips and up a minimum of 8 inches onto vertical surfaces.
   2. Fully wrap and adhere membrane over tops of curbs and parapet walls.
   3. Fully adhere flexible flashing over membrane and up to nailing strips.

G. Around roof penetrations, seal flanges and flashings with flexible flashing.

H. Coordinate installation of roof drains and sumps and related flashings.

3.06 CLEANING

A. See Section 01 74 19 - Construction Waste Management and Disposal for additional requirements.

B. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and comply with their documented instructions.

C. Repair or replace defaced or damaged finishes caused by work of this section.

3.07 PROTECTION

A. Protect installed roofing and flashings from construction operations.

B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

END OF SECTION

SECTION 07 62 00
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings, counterflashings, gutters, downspouts, sheet metal roofing, exterior penetrations, and other items indicated in Schedule.

B. Sealants for joints within sheet metal fabrications.

C. Precast concrete splash pads.

1.02 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2019a.

C. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).

D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

E. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007 (Reapproved 2018).

F. CDA A4050 - Copper in Architecture - Handbook; current edition.

G. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

1.04 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.

PART 2 PRODUCTS

2.01 SHEET MATERIALS

A. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24 gauge, (0.0239) inch thick base metal, shop pre-coated with Kynar 500 fluorocarbon coating.

B. Finish: Minimum thickness 0.70-mil over 0.25 mil prime coat.
   1. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.
   2. Color: As selected by Architect from manufacturer's full colors.

2.02 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Form pieces in longest possible lengths.

C. Hem exposed edges on underside 1/2 inch; miter and seam corners.

D. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

E. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.

F. Fabricate flashings to allow toe to extend 2 inches over roofing gravel. Return and brake edges.

2.03 GUTTER AND DOWNSPOUT FABRICATION

A. Gutters: K-style Rectangular profile.

B. Downspouts: Rectangular profile.

C. Gutters and Downspouts: Size for rainfall intensity determined by a storm occurrence of 1 in 10 years in accordance with SMACNA (ASMM); minimum 5".

D. Splash Pads: Precast concrete type, of size and profiles indicated; minimum 3000 psi at 28 days, with minimum 5 percent air entrainment.

E. Downspout Boots: Steel.

F. Seal metal joints.

2.04 EXTERIOR PENETRATION FLASHING PANELS

A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.

2.05 ACCESSORIES

A. Concealed Fasteners: Hot-dipped galvanized nails, cadmium plated screws.

B. Exposed Fasteners: Neoprene gasketed screws. Finish to match flashing.

C. Sheet Metal Underlayment: Minimum 40-mil, self-adhering, high temp butyl rubber flexible membrane flashing.

D. Primer: Zinc chromate type.

E. Protective Backing Paint: Zinc molybdate alkyd.

F. Flashing Tape; Butyl tape.

G. Concealed Sealants: Non-curing butyl sealant.

H. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.

I. Plastic Cement: ASTM D4586/D4586M, Type I.

J. Reglets: Surface mounted type, galvanized steel; face and ends covered with plastic tape.

K. Solder: ASTM B32; typy suitable for application and material being soldered.

L. Leaf and debris gutter guard.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

3.03 INSTALLATION

A. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted..

B. Apply plastic cement compound between metal flashings and felt flashings.

C. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.

D. Solder metal joints for full metal surface contact, and after soldering wash metal clean with neutralizing solution and rinse with water.

E. Secure gutters and downspouts in place with concealed fasteners.

F. Connect downspouts to downspout boots, and grout connection watertight.

G. Set splash pads under downspouts.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for field inspection requirements.

B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

3.05 SCHEDULE

A. Coping: 24 gauge.

B. Gravel Stops: 24 guage.

C. Reglets: 24 gauge.

D. Parapet Flashing: 24 gauge.

E. Counterflashings at Roofing Terminations (over roofing base flashings): 22 gauge.

F. Counterflashings at Curb-Mounted Roof Items: 22 gauge.

G. Miscellaneous Flashings and Trim: 24 gauge.

H. Term-bar retainer: 20 gauge.

I. Through-wall Scuppers: 24 gauge.

END OF SECTION

SECTION 07 72 00
ROOF ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Curbs.

B. Roof Hatch Railing

C. Non-penetrating pedestals.

1.02 REFERENCE STANDARDS

A. 29 CFR 1910.23 - Ladders; current edition.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used.
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
   4. Maintenance requirements.

PART 2 PRODUCTS

2.01 ROOF HATCHES AND VENTS, MANUAL AND AUTOMATIC OPERATION

A. Frames and Curbs: One-piece curb and frame with integral cap flashing to receive roof flashings; extended bottom flange to suit mounting.
   1. Material: Galvanized steel, 14 gauge, 0.0747 inch thick.
   2. Finish: Factory prime paint.
   3. Insulation: Manufacturer's standard; 1 inch rigid polyisocyanurate, located on outside face of curb.

B. Safety Railing System: Roof hatch manufacturer's standard accessory safety rail system mounted directly to curb.
   1. Railing: Comply with 29 CFR 1910.23 for ladder safety, with a safety factor of two.
   2. Manufacturers:
      a. BILCO Company; Bil-Guard 2.0: www.bilco.com/#sle.
      b. KeeHatch Railing System by Safety Rail Source.

2.02 LADDER SAFETY POST

A. High-strength ladder safety post, pre-assembled from Manufacturer.
   1. Performance Characteristics
      a. Tubular posts shall lock automatically when fully extended.
      b. Safety post shall have controlled upward and downward movement.
      c. Release lever shall disengage the post to allow it to be returned to its lowered position.
      d. Post shall have adjustable mounting brackets to fit ladder rung spacing up to 14" on center and clamp brackets to accommodate ladder rungs up to 1-3/4" in diameter.
   2. Material of construction: Steel.
   3. Finish: Factory finish shall be yellow powder coat steel.
   4. Manufacturer:
      a. BILCO Company; Model LU-1: www.bilco.com/#sle.
      b. No substitutions allowed.

2.03 NON-PENETRATING ROOFTOP SUPPORTS/ASSEMBLIES

A. Non-Penetrating Rooftop Support/Assemblies: Manufacturer-engineered and factory-fabricated, with pedestal bases that rest on top of roofing membrane, and not requiring any attachment to roof structure and not penetrating roofing assembly.
   1. Design Loadings and Configurations: As required by applicable codes.
   2. Height: Provide minimum clearance of 6 inches under supported items to top of roofing.
   3. Support Spacing and Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
   4. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
   5. Hardware, Bolts, Nuts, and Washers: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A153/A153M.

B. Non-Penetrating Pedestals: Steel pedestals with square, round, or rectangular bases.
   1. Bases: High density polypropylene.
   2. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
   3. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using methods recommended by manufacturer for achieving acceptable results for applicable substrate under project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions, in manner that maintains roofing system weather-tight integrity.

3.04 CLEANING

A. Clean installed work to like-new condition.

3.05 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 07 81 23
INTUMESCENT FIRE PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Thin-film intumescent fire protection.

B. Compressible-rod intumescent fire protection.

1.02 RELATED REQUIREMENTS

A. Section 09 91 23 - Interior Painting: Field-applied paints matching intumescent fireproofing.

1.03 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.

C. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2019.

D. SSPC-PA 2 - Procedure For Determining Conformance To Dry Coating Thickness Requirements; 2015, with Editorial Revision (2018).

E. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittals procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Performance characteristics and test results.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Installation methods.

C. Test Reports: Published fire resistive designs for structural elements of the types required for the project, indicating hourly ratings of each assembly.

D. Field Quality Control Submittals: Submit field test report.

E. Manufacturer's Qualification Statement.

F. Installer's Qualification Statement.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer’s original, unopened containers with identification labels and testing agency markings intact and legible.

B. Store products in manufacturer's unopened packaging until ready for installation.
   1. Store at temperatures not less than 50 degrees F in dry, protected area.
   2. Protect from freezing, and do not store in direct sunlight.
   3. Dispose of any materials that have come into contact with contaminants of any kind prior to application.

C. Dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.06 FIELD CONDITIONS

A. Protect areas of application from windblown dust and rain.

B. Maintain ambient field conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under ambient conditions outside manufacturer's absolute limits.

1. Provide temporary enclosures as required to control ambient conditions.
2. Do not apply intumescent fireproofing when ambient temperatures are below 50 degrees F without specific approval from manufacturer.
3. Maintain relative humidity between 40 and 60 percent in areas of application.
4. Maintain ventilation in enclosed spaces during application and for not less than 72 hours afterward.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Intumescent Thin-Film Fire Protection:
   1. Albi Manufacturing Division of StanChem Inc: www.albi.com/#sle.
   2. Hilti, Inc; Fire Finish Steel Protection Spray CFP-SP WB: www.us.hilti.com/#sle.
   3. Substitutions: See Section 01 60 00 - Product Requirements.

B. Intumescent Smoke and Flame Protective Top Coating for Wood:
   1. Quantum Chemical; SafeCoat Clear II: www.quantumchemical.com/#sle.
   2. Quantum Chemical; SafeCoat Latex: www.quantumchemical.com/#sle.
   3. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 SYSTEM REQUIREMENTS

A. Fireproofing: Provide intumescent thin-film fire protection systems tested by an independent testing agency in accordance with ASTM E119 and acceptable to authorities having jurisdiction (AHJ).
   1. Provide assemblies listed by UL or FM and bearing listing agency label or mark.

B. Exposed Interior Wood Surfaces: Class A, flame spread index (FSI) and smoke developed index (SDI), tested in accordance with ASTM E84.

2.03 MATERIALS

A. Fire Resistive Coating System: Thin-film intumescent fire protection system for structural steel, gypsum board, wood, oriented strand board (OSB), concrete, and concrete masonry units (CMU).
   1. For Interior Use:
      a. Use only water-based products.
      b. VOC Content: Less than 500 g per L when tested in accordance with 40 CFR 59, Subpart D (EPA Method 24).
      c. Basis of Design: Hilti, Inc; Fire Finish Steel Protection Spray CFP-SP WB: www.hilti.com/#sle.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

B. Fire Resistive Compressible-Rod System: Compressible intumescent fire protection system for structural steel, gypsum board, wood, oriented strand board (OSB), concrete, and concrete masonry units (CMU).
   1. Size: As required for application.
   2. Fire Rating: As indicated on drawings for both static and dynamic joints in accordance with UL 2079.
   3. UL Assembly Rating: WW-S-0057 Vertical tie in to concrete slab, HW-D-0624 Standard wall, concrete slab, BW-S-0024 Bottom of wall, HW-D-0550 Standard wall, gypsum wallboard ceiling, and HW-D-0625 Shaft wall, concrete slab.

C. Sealers and Primer: As required by tested and listed assemblies, and recommended by fireproofing manufacturer to suit specific substrate conditions.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates to determine if they are in satisfactory condition to receive intumescent fire protection; verify that substrates are clean and free of oil, grease, incompatible primers, or other foreign substances capable of impairing bond to fireproofing system.

B. Do not begin installation until substrates have been properly prepared.

C. If substrate preparation is responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Thoroughly clean surfaces to receive fireproofing.

B. Repair substrates to remove surface imperfections that could effect uniformity of texture and thickness of fireproofing system, and remove minor projections and fill voids that could telegraph through finished work.

C. Cover or otherwise protect other work that might be damaged by fallout or overspray of fireproofing system, and provide temporary enclosures as necessary to confine operations and maintain required ambient field conditions.

3.03 APPLICATION

A. Comply with manufacturer's instructions for each particular intumescent fire protection system installation application as indicated.

B. Apply manufacturer’s recommended primer to required coating thickness.

C. Apply fireproofing to full thickness over entire area of each substrate to be protected.

D. Apply coats at manufacturer’s recommended rate to achieve dry film thickness (DFT) as required for fire resistance ratings designated for each condition.

E. Apply intumescent fire protection by spraying to maximum extent possible, and as necessary complete coverage by roller application or other method acceptable to manufacturer.

3.04 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 01 40 00 - Quality Requirements.

1. Arrange for testing of installed intumescent fire protection by an independent testing laboratory using magnetic pull-off dry film thickness gauge in accordance with SSPC-PA 2, and ensure it meets requirements of authorities having jurisdiction (AHJ).
2. Submit field test reports promptly to Contractor and Architect.

B. Repair or replace intumescent fire protection at locations where test results indicate fireproofing does not meet specified requirements.

3.05 CLEANING

A. Immediately after installation of fireproofing in each area, remove overspray and fallout from other surfaces and clean soiled areas.

3.06 PROTECTION

A. Protect installed intumescent fire protection from damage due to subsequent construction activities, so fireproofing is without damage or deterioration before Date of Substantial Completion.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 07 84 00
FIRESTOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Firestopping systems.

B. Firestopping of joints and penetrations in fire-resistance-rated and smoke-resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.02 RELATED REQUIREMENTS

A. Section 09 21 16 - Gypsum Board Assemblies: Gypsum wallboard fireproofing.

1.03 REFERENCE STANDARDS

A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2019.

B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).

C. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems; 2015 (Reapproved 2019).

D. ASTM E2174 - Standard Practice for On-Site Inspection of Installed Firestops; 2019.

E. ASTM E2393 - Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers; 2010a (Reapproved 2015).

F. ASTM E2837 - Standard Test Method for Determining the Fire Resistance of Continuity Head-of-Wall Joint Systems Installed Between Rated Wall Assemblies and Nonrated Horizontal Assemblies; 2013 (Reapproved 2017).

G. ITS (DIR) - Directory of Listed Products; current edition.

H. FM (AG) - FM Approval Guide; current edition.

I. SCAQMD 1168 - Adhesive and Sealant Applications; 1989 (Amended 2017).

J. UL 1479 - Standard for Fire Tests of Penetration Firestops; Current Edition, Including All Revisions.

K. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems; Current Edition, Including All Revisions.

L. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.

C. Product Data: Provide data on product characteristics, performance ratings, and limitations.

D. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Manufacturer's qualification statement.

G. Installer's qualification statement.

1.05 QUALITY ASSURANCE

A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.

1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section and:
   1. Trained by manufacturer.

1.06 FIELD CONDITIONS

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Firestopping Manufacturers:
   1. 3M Fire Protection Products: www.3m.com/firestop/#sle.
   2. Hilti, Inc: www.us.hilti.com/#sle.
   3. HoldRite, a Brand of Reliance Worldwide Corporation; HydroFlame 100 Firestop Sealant: www.holdrite.com/#sle.
   4. Passive Fire Protection Partners; Firestop 3600EX: www.firestop.com/#sle.
   5. Tremco Commercial Sealants & Waterproofing; TREMstop Acrylic: www.tremcosealants.com/#sle.
   6. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MATERIALS

A. Firestopping Materials: Any materials meeting requirements.

B. Volatile Organic Compound (VOC) Content: Provide products having VOC content lower than that required by SCAQMD 1168.

C. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.

D. Fire Ratings: Refer to drawings for required systems and ratings.

2.03 FIRESTOPPING ASSEMBLY REQUIREMENTS

A. Head-of-Wall (HW) Joint System Firestopping at Joints Between Fire-Rated Wall Assemblies and Non-Rated Horizontal Assemblies: Use system that has been tested according to ASTM E2837 to have fire resistance F Rating equal to required fire rating of wall assembly.

B. Floor-to-Floor (FF), Floor-to-Wall (FW), Head-of-Wall (HW), and Wall-to-Wall (WW) Joints, Except Perimeter, Where Both Are Fire-Rated: Use system that has been tested according to ASTM E1966 or UL 2079 to have fire resistance F Rating equal to required fire rating of the assembly in which the joint occurs.

C. Through Penetration Firestopping: Use system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.

2.04 FIRESTOPPING SYSTEMS

A. Firestopping: Any material meeting requirements.
   1. Fire Ratings: Use system that is listed by FM (AG), ITS (DIR), or UL (FRD) and tested in accordance with ASTM E814, ASTM E119, or UL 1479 with F Rating equal to fire rating of penetrated assembly and minimum T Rating Equal to F Rating and in compliance with other specified requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify openings are ready to receive the work of this section.

3.02 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.

B. Remove incompatible materials that could adversely affect bond.

3.03 INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

B. Install labeling required by code.

3.04 FIELD QUALITY CONTROL

A. Independent Testing Agency: Inspection agency employed and paid by Owner, will examine penetration firestopping in accordance with ASTM E2174, and ASTM E2393.

B. Repair or replace penetration firestopping and joints at locations where inspection results indicate firestopping or joints do not meet specified requirements.

3.05 CLEANING

A. Clean adjacent surfaces of firestopping materials.

3.06 PROTECTION

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 07 92 00
JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nonsag gunnable joint sealants.

B. Joint backings and accessories.

1.02 REFERENCE STANDARDS

A. ASTM C794 - Standard Test Method for Adhesion-In-Peel of Elastomeric Joint Sealants; 2018.

B. ASTM C834 - Standard Specification for Latex Sealants; 2017.

C. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2018.

D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

E. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems; 2016.

F. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.

G. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2018.

H. SCAQMD 1168 - Adhesive and Sealant Applications; 1989 (Amended 2017).

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes the following.
   1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
   2. List of backing materials approved for use with the specific product.
   3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
   4. Substrates the product should not be used on.

C. Preconstruction Laboratory Test Reports: Submit at least four weeks prior to start of installation.

1.04 QUALITY ASSURANCE

A. Preconstruction Laboratory Testing: Arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories.
   1. Adhesion Testing: In accordance with ASTM C794.
   2. Compatibility Testing: In accordance with ASTM C1087.
   3. Allow sufficient time for testing to avoid delaying the work.
   4. Deliver to manufacturer sufficient samples for testing.
   5. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.
   6. Testing is not required if sealant manufacturer provides data showing previous testing, not older than 24 months, that shows satisfactory adhesion, lack of staining, and compatibility.

1.05 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective work within a five year period after Date of Substantial Completion.

C. Warranty: Include coverage for installed sealants and accessories that fail to achieve watertight seal , exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Non-Sag Sealants: Permits application in joints on vertical surfaces without sagging or slumping.
   1. Dow Chemical Company; 795: consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.
   2. Sika Corporation; Sikaflex-1a: www.usa-sika.com/#sle.
   3. Tremco Commercial Sealants & Waterproofing; Vulkem 921: www.tremcosealants.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 JOINT SEALANT APPLICATIONS

A. Scope:
   1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to, the following items.
      a. Wall expansion and control joints.
      b. Joints between door, window, and other frames and adjacent construction.
      c. Joints between different exposed materials.
      d. Openings below ledge angles in masonry.
      e. Other joints indicated below.
   2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
      a. Joints between door, window, and other frames and adjacent construction.
      b. Other joints indicated below.
   3. Do not seal the following types of joints.
      a. Intentional weepholes in masonry.
      b. Joints indicated to be treated with manufactured expansion joint cover or some other type of sealing device.
      c. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
      d. Joints where installation of sealant is specified in another section.
      e. Joints between suspended panel ceilings/grid and walls.

B. Exterior Joints: Use non-sag non-staining silicone sealant, unless otherwise indicated.

C. Interior Joints: Use non-sag polyurethane sealant, unless otherwise indicated.

D. Interior Wet Areas: Bathrooms, restrooms, kitchens, food service areas, and food processing areas; fixtures in wet areas include plumbing fixtures, food service equipment, countertops, cabinets, and other similar items.

2.03 JOINT SEALANTS - GENERAL

A. Sealants and Primers: Provide products having lower volatile organic compound (VOC) content than indicated in SCAQMD 1168.

2.04 NONSAG JOINT SEALANTS

A. Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus ____ percent, minimum.
   2. Non-Staining To Porous Stone: Non-staining to light-colored natural stone when tested in accordance with ASTM C1248.
   3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
   4. Color: To be selected by Architect from manufacturer's full range.
   5. Manufacturers:

a. Dow Chemical Company; DOWSIL 795 Silicone Building Sealant: consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.
b. Substitutions: See Section 01 60 00 - Product Requirements.

B. Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 25 percent, minimum.
2. Color: To be selected by Architect from manufacturer's standard range.
3. Manufacturers:
a. Sika Corporation; Sikaflex-1a: www.usa-sika.com/#sle.
b. Substitutions: See Section 01 60 00 - Product Requirements.

C. Polyurethane Sealant for Continuous Water Immersion: ASTM C920, Grade NS, Uses M and A; single or multi-component; explicitly approved by manufacturer for continuous water immersion; suitable for traffic exposure when recessed below traffic surface.
1. Movement Capability: Plus and minus 35 percent, minimum.
2. Color: To be selected by Architect from manufacturer's standard range.
3. Manufacturers:
a. Sika Corporation; Sikaflex-1a: www.usa-sika.com/#sle.
b. Substitutions: See Section 01 60 00 - Product Requirements.

2.05 ACCESSORIES

A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.
1. Manufacturers:
a. ADFAST Corporation; ADSEAL BR-2600 (Backer Rod): www.adfastcorp.com/#sle.
b. Substitutions: See Section 01 60 00 - Product Requirements.

B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.

C. Masking Tape: Self-adhesive, nonabsorbent, non-staining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.

D. Joint Cleaner: Non-corrosive and non-staining type, type recommended by sealant manufacturer; compatible with joint forming materials.

E. Primers: Type recommended by sealant manufacturer to suit application; non-staining.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Verify that backer rods are of the correct size.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

3.03 INSTALLATION

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Perform installation in accordance with ASTM C1193.

C. Install bond breaker backing tape where backer rod cannot be used.

D. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

E. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

F. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

3.04 FIELD QUALITY CONTROL

A. Perform field quality control inspection/testing as specified in PART 1 under QUALITY ASSURANCE article.

B. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

END OF SECTION

SECTION 08 31 00
ACCESS DOORS AND PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall and ceiling mounted access units.

1.02 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.

C. Shop Drawings: Indicate exact position of each access door and/or panel unit.

PART 2 PRODUCTS

2.01 ACCESS DOORS AND PANELS ASSEMBLIES

A. Wall-Mounted Units with Return Air Grille:
   1. Size: 18 by 18 inches.
   2. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
   3. Wall Mounting Criteria: Provide surface-mounted face frame and door surface flush with frame surface.
   4. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.
   5. Plaster Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.

B. Wall-Mounted Units in Wet Areas:
   1. Size: 12 by 12 inches.

C. Fire-Rated Wall-Mounted Units:
   1. Wall Fire-Rating: As indicated on drawings.
   2. Size: 12 by 12 inches.

D. Ceiling-Mounted Units with Return Air Grille:
   1. Panel Material: Aluminum extrusion with gypsum board inlay.
   2. Size - Lay-In Grid Ceilings: To match module of ceiling grid.
   3. Size - Other Ceilings: 24 by 24 inches.

E. Interior Floor-Mounted Access Units:
   1. Size: 24 by 24 inches.

2.02 WALL AND CEILING MOUNTED ACCESS UNITS

A. Wall and Ceiling Mounted Units: Factory fabricated door and frame, fully assembled units with corner joints welded, filled and ground flush; square and without rack or warp; coordinate requirements with type of installation assembly being used for each unit.
   1. Material: Steel.
   2. Style: Exposed frame with door surface flush with frame surface.
      a. Gypsum Board Mounting Criteria: Use drywall bead type frame.
   3. Door Style: Single thickness with rolled or turned in edges.
   4. Frames: 16 gauge, 0.0598 inch, minimum thickness.
   5. Units in Fire-Rated Assemblies: Fire rating as required by applicable code for fire-rated assembly that access doors are being installed.
   6. Steel Finish: Primed.
   7. Location: As required to service access valves, controls, filters, fire dampers, electrical junction boxes, and equipment.
   8. Size: As required to for servicing and replacement of equipment. No smaller than 12 x 12 inches.
   9. Hardware:

a. Hardware for Fire-Rated Units: As required for listing.
b. Hinges for Non-Fire-Rated Units: Concealed, constant force closure spring type.
c. Latch/Lock:
    1) At ceiling locations: Screw driver slot for quarter turn cam latch.
    2) At wall locations: Cylinder lock-operated cam latch, two keys for each unit.

2.03 WALL MOUNTED ACCESS UNITS WITH RETURN AIR GRILLES

A. Gypsum Board Inlay Access Panels: Provide rectangular and square access panel with recessed and gasketed aluminum perimeter frame that acts as finishing edge and having concealed mechanical touch-latch with safety cable and free-pivoting hinge.
    1. Rectangular Panel Frame Size: 24 by 36 inches set within 1/2 inch thick gypsum board.
    2. Square Panel Frame Size: 24 by 24 inches set within 1/2 inch thick gypsum board.
    3. Panel Frame: 1 inch margin with concealed countersunk screw mounting.

B. Air Return Grille: Linear bar grille fitted with flush and concealed perimeter frame.
    1. Grille: Fixed grilles with 1/4 inch thick by 5/8 inch deep bars at 1/2 inch on center providing 48 percent free space opening.
    2. Grille Size: 12 by 12 inches set within 1/2 inch thick gypsum board.
    3. Fabrication: Aluminum with factory powder coated finish.
    4. Grille Frame: 1 inch margin with concealed countersunk screw mounting.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings are correctly sized and located.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to proceeding with this work.

B. Prepare surfaces using methods recommended by manufacturer for applicable substrates in accordance with project conditions.

3.03 INSTALLATION

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

B. Install frames plumb and level in openings, and secure units rigidly in place.

C. Position units to provide convenient access to concealed equipment when necessary.

END OF SECTION

SECTION 09 05 61

COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This section applies to floors identified in Contract Documents that are receiving the following types of floor coverings:

B. Removal of existing floor coverings.

C. Preparation of existing concrete floor slabs for installation of floor coverings.

D. Testing of concrete floor slabs for moisture and alkalinity (pH).

E. Patching compound.

F. Remedial floor coatings.

1.02 REFERENCE STANDARDS

A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens); 2016a.

B. ASTM C472 - Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters and Gypsum Concrete; 1999 (Reapproved 2014).

C. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2016a.

D. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings; 2011.

1.03 SUBMITTALS

A. Visual Observation Report: For existing floor coverings to be removed.

B. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:
   1. Moisture and alkalinity (pH) limits and test methods.
   2. Manufacturer's required bond/compatibility test procedure.

C. Testing Agency's Report:
   1. Description of areas tested; include floor plans and photographs if helpful.
   2. Summary of conditions encountered.
   3. Moisture and alkalinity (pH) test reports.
   4. Copies of specified test methods.
   5. Recommendations for remediation of unsatisfactory surfaces.
   6. Submit report to Architect.
   7. Submit report not more than two business days after conclusion of testing.

D. Adhesive Bond and Compatibility Test Report.

E. Copy of RFCI (RWP).

1.04 QUALITY ASSURANCE

A. Moisture and alkalinity (pH) testing shall be performed by an independent testing agency employed and paid by Contractor.

B. Contractor may perform adhesive and bond test with Contractor's own personnel or hire a testing agency.

C. Testing Agency Qualifications: Independent testing agency experienced in the types of testing specified.
   1. Submit evidence of experience consisting of at least 3 test reports of the type required, with project Owner's project contact information.

D. Contractor's Responsibility Relating to Independent Agency Testing:
   1. Provide access for and cooperate with testing agency.

2. Confirm date of start of testing at least 10 days prior to actual start.
3. Allow at least 4 business days on site for testing agency activities.
4. Achieve and maintain specified ambient conditions.
5. Notify Architect when specified ambient conditions have been achieved and when testing will start.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, handle, and protect products in accordance with manufacturer's instructions and recommendations.

B. Deliver materials in manufacturer's packaging; include installation instructions.

C. Keep materials from freezing.

1.06 FIELD CONDITIONS

A. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F or more than 85 degrees F.

B. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

PART 2 PRODUCTS

2.01 MATERIALS

A. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:
   1. Cementitious moisture-, mildew-, and alkali-resistant compound, compatible with floor, floor covering, and floor covering adhesive, and capable of being feathered to nothing at edges.
   2. Compressive Strength: 3000 psi, minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.

B. Alternate Flooring Adhesive: Floor covering manufacturer's recommended product, suitable for the moisture and pH conditions present; low-VOC. In the absence of any recommendation from flooring manufacturer, provide a product recommended by adhesive manufacturer as suitable for substrate and floor covering and for conditions present.

C. Remedial Floor Coating: Single- or multi-layer coating or coating/overlay combination intended by its manufacturer to resist water vapor transmission to degree sufficient to meet flooring manufacturer's emission limits, resistant to the level of alkalinity (pH) found, and suitable for adhesion of flooring without further treatment.

PART 3 EXECUTION

3.01 CONCRETE SLAB PREPARATION

A. Perform following operations in the order indicated:
   1. Existing concrete slabs (on-grade and elevated) with existing floor coverings:
      a. Visual observation of existing floor covering, for adhesion, water damage, alkaline deposits, and other defects.
      b. Removal of existing floor covering.
   2. Preliminary cleaning.
   3. Moisture vapor emission tests; 3 tests in the first 1000 square feet and one test in each additional 1000 square feet, unless otherwise indicated or required by flooring manufacturer.
   4. Internal relative humidity tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
   5. Alkalinity (pH) tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
   6. Specified remediation, if required.

7. Patching, smoothing, and leveling, as required.
8. Other preparation specified.
9. Adhesive bond and compatibility test.
10. Protection.

B. Remediations:
1. Active Water Leaks or Continuing Moisture Migration to Surface of Slab: Correct this condition before doing any other remediation; re-test after correction.
2. Excessive Moisture Emission or Relative Humidity: If an adhesive that is resistant to the level of moisture present is available and acceptable to flooring manufacturer, use that adhesive for installation of the flooring; if not, apply remedial floor coating or remedial sheet membrane over entire suspect floor area.

3.02 REMOVAL OF EXISTING FLOOR COVERINGS

A. Comply with local, State, and federal regulations and recommendations of RFCI Recommended Work Practices for Removal of Resilient Floor Coverings, as applicable to floor covering being removed.

B. Dispose of removed materials in accordance with local, State, and federal regulations and as specified.

3.03 PRELIMINARY CLEANING

A. Clean floors of dust, solvents, paint, wax, oil, grease, asphalt, residual adhesive, adhesive removers, film-forming curing compounds, sealing compounds, alkaline salts, excessive laitance, mold, mildew, and other materials that might prevent adhesive bond.

B. Do not use solvents or other chemicals for cleaning.

3.04 MOISTURE VAPOR EMISSION TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.

C. Test in accordance with ASTM F1869 and as follows.

D. Plastic sheet test and mat bond test may not be substituted for the specified ASTM test method, as those methods do not quantify the moisture content sufficiently.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if test values exceed 3 pounds per 1000 square feet per 24 hours.

F. Report: Report the information required by the test method.

3.05 ALKALINITY TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if alkalinity (pH) test value is over 10.

3.06 PREPARATION

A. See individual floor covering section(s) for additional requirements.

B. Comply with requirements and recommendations of floor covering manufacturer.

C. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.

D. Do not fill expansion joints, isolation joints, or other moving joints.

3.07 ADHESIVE BOND AND COMPATIBILITY TESTING

A. Comply with requirements and recommendations of floor covering manufacturer.

3.08 APPLICATION OF REMEDIAL FLOOR COATING

A. Comply with requirements and recommendations of coating manufacturer.

3.09 INSTALLATION OF REMEDIAL FLOOR SHEET MEMBRANE

A. Install in accordance with sheet membrane manufacturer's instructions.

3.10 PROTECTION

A. Cover prepared floors with building paper or other durable covering.

END OF SECTION

DIVISION	MARK	PRODUCT INFORMATION		NOTES
06 40 00				
6	PL-1	MANUFACTURER	WILSONART	MUSIC ROOM COUNTERTOP
		PRODUCT	HIGH PRESSURE LAMINATE	
		THICKNESS	0.048"	
		COLOR	BATTLESHIP	
		FINISH	19 LENO WEAVE	
09 51 00				
9	ACT-1	MANUFACTURER	ARMSTRONG	TYPICAL
		PRODUCT	SCHOOL ZONE - FINE FISSURED	
		DIMENSIONS	24X48	
		THICKNESS	15/16"	
		COLOR	WHITE	
		FINISH	STANDARD	
09 51 00				
9	ACT-2	MANUFACTURER	ARMSTRONG	CLASSROOMS
		PRODUCT	SCHOOL ZONE - FINE FISSURED	
		DIMENSIONS	24X24	
		THICKNESS	15/16"	
		COLOR	WHITE	
		FINISH	STANDARD	
09 65 00				
9	VCT-1	MANUFACTURER	ARMSTRONG	CORRIDORS, LOUNGE, MUSIC ROOM
		PRODUCT	STANDARD EXCELON IMPERIAL TEXTURE	
		SIZE	12" X 12"	
		THICKNESS	1/8"	
		COLOR	SANDRIFT WHITE	
9	VCT-2	MANUFACTURER	ARMSTRONG	CORRIDORS
		PRODUCT	STANDARD EXCELON IMPERIAL TEXTURE	
		SIZE	12"X 12"	
		THICKNESS	1/8"	
		COLOR	SMOKEY BROWN	
9	VCT-3	MANUFACTURER	ARMSTRONG	CAFETERIA
		PRODUCT	STANDARD EXCELON IMPERIAL TEXTURE	
		SIZE	12" X 12"	
		THICKNESS	1/8"	
		COLOR	LUNAR BLUE	

DIVISION	MARK	PRODUCT INFORMATION		NOTES
9	RB-1	MANUFACTURER	ROPPE	ALL
		PRODUCT	RUBBER BASE	
		SIZE	4" HEIGHT	
		STYLE	700 SERIES STANDARD TOE BASE	
		COLOR	100 BLACK	
9	TS-1	MANUFACTURER		MODULAR CLASSROOMS
		PRODUCT	ALUMINUM TRANSITION	
		STYLE		
		COLOR		

09 68 13

9	CPT-1	MANUFACTURER	MOHAWK	MODULAR CLASSROOMS
		PRODUCT	FLAMESTITCH III TILE GT168	
		COLOR	PATCHWORK 984	
		DIMENSIONS	24" X 24" TILE	
		INSTALLATION	VERTICAL ASHLAR	
		FIBER	DURACOLOR PREMIUM NYLON	
		DYE METHOD	SOLUTION DYED / YARN DYED	
		BACKING	ECOFLEX NXT	

09 72 00

9	WC-1	MANUFACTURER	GUILFORD OF MAINE	CAFETERIA, MUSIC ROOM
		PRODUCT	FR701 2100 ACOUSTIC PANEL	
		COLOR	WEDGEWOOD 150	
		CONTENT	100% POST-CONSUMER RECYCLED	
		ACCESSORIES		

09 90 00

9	P-1	MANUFACTURER	REFER 09 91 23	MUSIC ROOM CABINETS
		BINDER	REFER 09 91 23	
		COLOR	SW7103 WHITETAIL	
		GLOSS/SHEEN	REFER 09 91 23	
		PRIMER	REFER 09 91 23	
9	P-2	MANUFACTURER	REFER 09 91 23	MUSIC ROOM
		BINDER	REFER 09 91 23	
		COLOR	SW9145 SLEEPY HOLLOW	
		GLOSS/SHEEN	REFER 09 91 23	
		PRIMER	REFER 09 91 23	

DIVISION	MARK	PRODUCT INFORMATION		NOTES
9	P-3	MANUFACTURER	REFER 09 96 00	COVERED PLAY, COLUMN BASE
		BINDER	REFER 09 96 00	
		COLOR	SW6907 FORSYTHIA	
		GLOSS/SHEEN	REFER 09 96 00	
		PRIMER	REFER 09 96 00	
9	P-4	MANUFACTURER	REFER 09 91 13/09 96 00	AREA D: CMU WALL, GUTTER, & DOWNSPOUTS
		BINDER	REFER 09 91 13/09 96 00	
		COLOR	SW7671 ON THE ROCKS	
		GLOSS/SHEEN	REFER 09 91 13/09 96 00	
		PRIMER	REFER 09 91 13/09 96 00	

SECTION 09 21 16
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal stud wall framing.

B. Metal channel ceiling framing.

C. Gypsum wallboard.

D. Joint treatment and accessories.

E. Textured finish system.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Wood blocking product and execution requirements.

1.03 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2019a.

B. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

C. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017.

D. ASTM C514 - Standard Specification for Nails for the Application of Gypsum Board; 2004 (Reapproved 2014).

E. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2018.

F. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2018.

G. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2019b.

H. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2018.

I. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base; 2019.

J. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.

K. ASTM C1658/C1658M - Standard Specification for Glass Mat Gypsum Panels; 2019.

L. GA-216 - Application and Finishing of Gypsum Panel Products; 2016.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate special details associated with fireproofing and acoustic seals.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

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

2.02 METAL FRAMING MATERIALS

A. Manufacturers - Metal Framing, Connectors, and Accessories:
   1. ClarkDietrich: www.clarkdietrich.com/#sle.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Non-structural Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/120 at 5 psf.

1. Studs: C-shaped with knurled or embossed faces.
2. Runners: U shaped, sized to match studs.

C. Partition Head To Structure Connections: Provide track fastened to structure with legs of sufficient length to accommodate deflection, for friction fit of studs cut short and fastened as indicated on drawings.

D. Deflection and Firestop Track: Intumescent strip factory-applied to track flanges expands when exposed to heat or flames to provide a perimeter joint seal.

E. Non-structural Framing Accessories:
1. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.
2. Framing Connectors: ASTM A653/A653M G90 galvanized steel clips; secures cold rolled channel to wall studs for lateral bracing.

F. Grid Suspension Systems: Steel grid system of main tees and support bars connected to structure using hanging wire.
1. Products:
a. USG Corporation; Drywall Suspension System: www.usg.com/#sle.
b. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:
1. American Gypsum Company: www.americangypsum.com/#sle.
2. CertainTeed Corporation: www.certainteed.com/#sle.
3. Georgia-Pacific Gypsum: www.gpgypsum.com/#sle.
4. USG Corporation: www.usg.com/#sle.
5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
2. Glass mat faced gypsum panels, as defined in ASTM C1658/C1658M, suitable for paint finish, of the same core type and thickness may be substituted for paper-faced board.
3. At Assemblies Indicated with Fire-Resistance Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
4. Thickness:
5. Paper-Faced Products:
a. American Gypsum Company; LightRoc Gypsum Wallboard: www.americangypsum.com/#sle.
b. American Gypsum Company; FireBloc Type X Gypsum Wallboard: www.americangypsum.com/#sle.
c. CertainTeed Corporation; Type C Drywall: www.certainteed.com/#sle.
d. CertainTeed Corporation; Type X Drywall: www.certainteed.com/#sle.
e. Georgia-Pacific Gypsum; ToughRock: www.gpgypsum.com/#sle.
f. Georgia-Pacific Gypsum; ToughRock Fireguard X: www.gpgypsum.com/#sle.
g. USG Corporation; USG Sheetrock Brand EcoSmart Panels Firecode X: www.usg.com/#sle.
h. USG Corporation; USG Sheetrock Brand Firecode X Panels: www.usg.com/#sle.
i. Substitutions: See Section 01 60 00 - Product Requirements.
6. Mold Resistant Paper Faced Products:
a. American Gypsum Company; M-Bloc: www.americangypsum.com/#sle.
b. CertainTeed Corporation; M2Tech 5/8" Type C Moisture & Mold Resistant Drywall: www.certainteed.com/#sle.
c. Georgia-Pacific Gypsum; ToughRock Mold-Guard: www.gpgypsum.com/#sle.
d. USG Corporation; USG Sheetrock Brand EcoSmart Panels Mold Tough Firecode X: www.usg.com/#sle.
e. Substitutions: See Section 01 60 00 - Product Requirements.

7. Glass Mat Faced Products:
    a. USG Corporation; USG Sheetrock Brand Glass-Mat Panels Mold Tough.

C. Ceiling Board: Special sag resistant gypsum ceiling board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
1. Application: Ceilings, unless otherwise indicated.
2. Thickness: 1/2 inch.
3. Edges: Tapered.
4. Products:
    a. CertainTeed Corporation; Interior Ceiling Drywall: www.certainteed.com/#sle.
    b. Georgia-Pacific Gypsum; ToughRock Span 24 Ceiling Board: www.gpgypsum.com/#sle.
    c. USG Corporation; 1/2 Inch Sheetrock Brand UltraLight Panels: www.usg.com/#sle.
    d. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 GYPSUM WALLBOARD ACCESSORIES

A. Beads, Joint Accessories, and Other Trim: ASTM C1047, rigid plastic, galvanized steel, or rolled zinc, unless noted otherwise.
1. Corner Beads: Low profile, for 90 degree outside corners.
    a. Products:
        1) CertainTeed Corporation; No-Coat Drywall Corner: www.certainteed.com/#sle.
        2) ClarkDietrich; Strait-Flex Big-Stick: www.clarkdietrich.com/#sle.
        3) Substitutions: See Section 01 60 00 - Product Requirements.
2. Expansion Joints:
    a. Type: V-shaped PVC with tear away fins.

B. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.

C. Finishing Compound: Surface coat and primer, takes the place of skim coating.

D. Textured Finish Materials: Latex-based compound; plain.

E. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.

F. Nails for Attachment to Wood Members: ASTM C514.

G. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

H. Exterior Soffit Vents: One piece, perforated, ASTM B221 6063 T5 alloy aluminum, with edge suitable for direct application to gypsum board and manufactured especially for soffit application. Provide continuous vent.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.02 FRAMING INSTALLATION

A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.

B. Suspended Ceilings and Soffits: Space framing and furring members as indicated.

C. Studs: Space studs at 16 inches on center.
1. Extend partition framing to structure where indicated and to ceiling in other locations.
2. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
3. Partitions Terminating at Structure: Attach extended leg top runner to structure, maintain clearance between top of studs and structure, and brace both flanges of studs with continuous bridging.

D. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.

E. Blocking: Install wood blocking for support of:
   1. Framed openings.
   2. Wall-mounted cabinets.
   3. Plumbing fixtures.

3.03 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Single-Layer Nonrated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.

C. Fire-Resistance-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

D. Installation on Wood Framing: For rated assemblies, comply with requirements of listing authority. For nonrated assemblies, install as follows:
   1. Single-Layer Applications: Screw attachment.

3.04 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as follows:
   1. Not more than 30 feet apart on walls and ceilings over 50 feet long.
   2. At exterior soffits, not more than 30 feet apart in both directions.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

D. Decorative Trim: Install at locations shown on drawings and in accordance with manufacturer's instructions.

E. Exterior Soffit Vents: Install according to manufacturer's written instructions and in locations indicated on drawings. Provide vent area specified.

3.05 JOINT TREATMENT

A. Glass Mat Faced Gypsum Board and Exterior Glass Mat Faced Sheathing: Use fiberglass joint tape, embed and finish with setting type joint compound.

B. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
   1. Level 5: Walls and ceilings to receive semi-gloss or gloss paint finish and other areas specifically indicated.
   2. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
   3. Level 1: Fire-resistance-rated wall areas above finished ceilings, whether or not accessible in the completed construction.

C. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch.

D. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.

3.06 TEXTURE FINISH

A. Apply finish texture coating by means of spraying apparatus in accordance with manufacturer's instructions and to match approved sample.

END OF SECTION

SECTION 09 22 36

LATH

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal lath for cement and gypsum plaster.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Sheathing on exterior walls.

B. Section 09 24 00 - Cement Plastering.

1.03 REFERENCE STANDARDS

A. ASTM C841 - Standard Specification for Installation of Interior Lathing and Furring; 2003 (Reapproved 2018).

B. ASTM C847 - Standard Specification for Metal Lath; 2018.

C. ASTM C933 - Standard Specification for Welded Wire Lath; 2018.

D. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2018.

E. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2018.

F. ASTM C1032 - Standard Specification for Woven Wire Plaster Base; 2018.

G. ASTM C1063 - Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster; 2019a.

H. ASTM C1787 - Standard Specification for Installation of Non Metallic Plaster Bases (Lath) Used with Portland Cement Based Plaster in Vertical Wall Applications; 2014 (Reapproved 2019).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on furring and lathing components, structural characteristics, material limitations, and finish.

1.05 QUALITY ASSURANCE

A. Maintain one copy of each installation standard referenced on site throughout the duration of lathing and plastering work.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Lath and Accessories:
   1. Clarkwestern Dietrich Building Systems LLC: www.clarkdietrich.com/#sle.
   2. Semco Southeastern Metals: www.semetals.com/#sle.
   3. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 LATH ASSEMBLIES

A. Provide completed assemblies with the following characteristics:
   1. Maximum Deflection of Vertical Assemblies: 1:360 under lateral point load of 100 lbs.
   2. Maximum Deflection of Horizontal Assemblies: 1:240 deflection under dead loads and wind uplift.

2.03 LATH

A. Diamond Mesh Metal Lath: ASTM C847, galvanized; self-furring.

1. Weight: To suit application and as specified in ASTM C841 or ASTM C1063 for framing spacing.
2. Weight: 2.5 lb/sq yd.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that substrates are ready to receive work and conditions are suitable for application.

C. For exterior plaster and stucco on stud walls, verify that water-resistive barrier has been installed over sheathing substrate completely and correctly.

D. Do not begin until unacceptable conditions have been corrected.

E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 INSTALLATION - GENERAL

A. Install metal lath and furring for Portland cement plaster in accordance with ASTM C1063.

B. Install lath and furring for fire-rated assemblies in accordance with requirements of assembly as indicated.

3.03 CONTROL AND EXPANSION JOINT INSTALLATION

A. Locate joints as indicated on drawings and comply with ASTM C1063.
1. Area of plaster panel not to exceed 144 sq ft for vertical surfaces.
2. Area of plaster panel not to exceed 100 sq ft for horizontal, curved or angled surfaces.
3. Spacing between control joints not to exceed 18 ft in each direction.
4. Area bounded by control joints not to exceed a length-to-width ratio of 2-1/2 to 1.

3.04 LATH INSTALLATION

A. Apply lath taut, with long dimension perpendicular to supports.

B. Lap or nest ends of metal lath in accordance with ASTM C841.

C. Lap ends of non-metallic lath in accordance with ASTM C1787.

D. Continuously reinforce internal angles with corner mesh, except where the metal lath returns 3 inches from corner to form the angle reinforcement; fasten at perimeter edges only.

E. Place corner bead at external wall corners; fasten at outer edges of lath only.

F. Place base screeds at termination of plaster areas; secure rigidly in place.

G. Place lath vertically above each top corner and each side of door frames to 6 inches above ceiling line.

H. Place casing beads at terminations of plaster finish. Butt and align ends. Secure rigidly in place.

I. Place additional strip mesh diagonally at corners of lathed openings. Secure rigidly in place.

3.05 TOLERANCES

A. Maximum Variation from True Lines and Levels: 1/8 inch in 10 feet.

B. Maximum Variation from True Position: 1/8 inch.

END OF SECTION

SECTION 09 24 00
CEMENT PLASTERING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cement plastering.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Wood stud framing for plaster.

B. Section 07 25 00 - Weather Barriers.

C. Section 09 22 36 - Lath: Lath, beads, screeds, and joint accessories for plaster base.

D. Section 09 91 13 - Exterior Painting.

1.03 REFERENCE STANDARDS

A. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar

B. ASTM C578 - Specification for Preformed, Cellular Polystyrene Thermal Insulation

C. ASTM C847 - Standard Specification for Metal Lath

D. ASTM C897 - Standard Specification for Aggregate for Job-Mixed Portland Cement-Based Plaster

E. ASTM C926 - Standard Specification for Application of Portland Cement-Based Plaster

F. ASTM C933 - Standard Specification for Welded Wire Lath

G. ASTM C1032 - Standard Specification for Woven Wire Plaster Base

H. ASTM C1063 - Standard Specification for Installation of Lathing and Furring for Portland Cement Based Plaster

I. ASTM C1177 - Specification for Glass Mat Gypsum for Use as Sheathing

J. ASTM C1278 - Specification for Fiber-Reinforced Gypsum Panel

K. ASTM C1396 - Standard Specification for Gypsum Board

L. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials

M. ASTM E119 - Method for Fire Tests of Building Construction and Materials

N. ASTM E330 - Test Method for Structural Performance of Windows, Curtain Walls, and Doors by Uniform Static air Pressure Difference

O. ASTM G153 - Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials

P. ICC Acceptance Criteriia 212 - Acceptance Criteria For Water-Resistive Coatings Used As Water-Resistive Barriers Over Exterior Sheathing

Q. ICC Acceptance Criteria 219 - Acceptance Criteria for Exterior Insulation And Finish Systems

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittals procedures.

B. Samples:

C. General: Submit Samples, Water resistive barrier coating Evaluation Reports and manufacturers' product datasheets in accordance with Division 1 General Requirements Submittal Section.

D. Samples: Submit samples for approval. Samples shall be of materials specified and of suitable size as required to accurately represent each color and texture used on project. Prepare each sample using same tools and techniques for actual project application. Maintain and make available, at job site, approved samples.

E. Manufacturer's Warranty: Submit sample copies of Manufacturer's Warranty indicating Single Source Responsibility for Water Resistive Barrier coating, Stucco Base coat, finish coat, optional Primer, level coat and reinforcing mesh as specified.

1.05 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer: Shall have marketed stucco assemblies in United States for at least five years and shall have completed projects of same general scope and complexity.
   2. Applicator: Shall be experienced and competent in installation of stucco materials, and shall provide evidence of a minimum of 5 years experience in work similar to that required by this section.

B. Substrate Conditions:
   1. Substrate materials and construction shall conform to the the building code having jurisdiction
   2. Substrates shall be sound, dry and free of dust, dirt, laitance, efflorescence and other harmful contaminants.
   3. Substrate Dimensional Tolerances: Flat with ¼ in (6.4 mm) within any 4 ft (1220 mm) radius.
   4. Maximum deflection of substrate system under positive or negative design loads shall not exceed L/360 of span.

C. Expansion and Control Joints: Continuous expansion and control joints shall be installed at locations in accordance with ASTM C1063 and ASTM C926.
   1. Substrate movement, and expansion and contraction of LaHabra FastWall 100 WaterMaster Stucco Assembly and adjacent materials shall be taken into account in design of expansion joints, with proper consideration given to sealant properties, installation conditions, temperature range, coefficients of expansion of materials, joint width to depth ratios, and other material factors. Minimum width of expansion joints shall be as specified by the designer or shown on the project drawings.
      a. In accordance with ASTM C1063, expansion or control joints shall be installed in walls not more than 144 ft² (13.4 m²) in area, and not more than 100 ft² (9.3 m²) in area for all non-vertical applications. The distance between joints shall not exceed 18 ft (5.5 m) in either direction or a length-to-width ratio of 2-½ to 1.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver LaHabra FastWall 100 WaterMaster Stucco Assembly products in original packaging with manufacturer's identification.

B. Storage: Store LaHabra FastWall 100 WaterMaster Stucco Assembly products in a dry location, out of direct sunlight, off the ground, and protected from moisture.

1.07 SITE / ENVIRONMENTAL CONDITIONS

A. Substrate Temperature: Do not apply LaHabra products to substrates whose temperature are below 40°F (4°C) or contain frost or ice.

B. Inclement Weather: Do not apply LaHabra products during inclement weather, unless appropriate protection is employed.

C. Sunlight Exposure: Avoid, when possible, installation of the LaHabra products in direct sunlight. Application of LaHabra Finishes in direct sunlight in hot weather may adversely affect aesthetics.

D. Do not apply stucco base coats or finishes if ambient temperature falls below 40ºF (4ºC) within 24 hours of application. Protect stucco from uneven and excessive evaporation during dry weather and strong blasts of dry air.

E. Prior to installation, the wall shall be inspected for surface contamination, or other conditions that may adversely affect the performance of the LaHabra FastWall 100 WaterMaster Stucco Assembly, and shall be free of residual moisture.

1.08 COORDINATION AND SCHEDULING:

A. Coordination: Coordinate LaHabra FastWall 100 WaterMaster Stucco Assembly installation with other construction operations.

PART 2 PRODUCTS

2.01 CEMENT PLASTER APPLICATIONS

A. Lath Plaster Base: Metal lath.
   1. Plaster Type: Factory prepared plaster mix.
   2. Number of Coats: Three.
   3. First Coat: Apply to a nominal thickness of 3/8 inch.
   4. Second Coat: Apply to a nominal thickness of 3/8 inch.
   5. Leveling Coat: Apply to a nominal thickness of 1/32 to 1/16 inch.
   6. Finish Coat: Apply to a nominal thickness of 1/8 inch.
      a. Texture: To match existing.

2.02 FACTORY PREPARED CEMENT PLASTER

A. Exterior Portland cement plaster system made of scratch and brown base coat, leveling coat with reinforcing mesh, and acrylic finish coat; install in accordance with ASTM C926.
   1. Provide weather resistive barrier as part of the system.
   2. Manufacturer - Basis of Design:
      a. LaHabra; FastWall 300: www.lahabrastucco.com/#sle.
      b. Parex USA, Inc; Armourwall 300: www.parexusa.com/#sle.
   3. Other Acceptable Manufacturers:
      a. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 ACCESSORIES

A. Lath: As specified in Section 09 22 36.

B. Water Resistive Barrier: As specified in Section 07 25 00.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions are acceptable prior to starting this work.

B. Verify lath is flat, secured to substrate, and joint and surface perimeter accessories are properly in place.

C. Verify mechanical and electrical equipment and services located within areas to receive this work have been properly tested and approved.

3.02 PREPARATION

3.03 INSTALLATION - WATER-RESISTIVE BARRIER

A. Where the cement plaster is installed as part of a barrier wall system, install 2 layers of water-resistive barrier in accordance with water-resistive barrier manufacturer's instructions. Integrate water-resistive barrier with all flashing accessories, adjacent water-resistive barriers, doors, windows, penetrations, and cladding transitions.

3.04 MIXING

A. Mix only as much plaster as can be used prior to initial set.

B. Mix materials dry, to uniform color and consistency, before adding water.

C. Protect mixtures from frost or freezing temperatures, contamination, and excessive evaporation.

3.05 APPLICATION

A. Apply plaster in accordance with manufacturer's written instructions and comply with ASTM C926.

B. Base Coats:
   1. Apply base coat(s) to fully embed lath and to specified thickness.
   2. Follow guidelines in ASTM C926 and manufacturer's written installation instructions for moist curing base coats and application of subsequent coats.

C. Leveling Coat:
   1. Apply leveling coat to specified thickness.

D. Finish Coats:
   1. Cement Plaster:
      a. Apply with sufficient material and pressure to ensure complete coverage of base to specified thickness.
      b. Apply desired surface texture while mix is still workable.
   2. Primer and Acrylic Coatings:
      a. Remove surface contaminants such as dust and dirt without damaging substrate.
      b. Apply primer in accordance with manufacturer's instructions.
      c. Apply finish coating in number of coats and to thickness recommended by manufacturer.

3.06 TOLERANCES

A. Maximum Variation from True Flatness: 1/4 inch in 10 feet.

3.07 REPAIR

A. Patching: Remove loose, damaged or defective plaster and replace with plaster of same composition; finish to match surrounding area.

END OF SECTION

SECTION 09 51 00
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

B. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2017.

C. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2013.

D. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2017.

E. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2014.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.

B. Do not install acoustical units until after interior wet work is dry.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate grid layout and related dimensioning.

C. Product Data: Provide data on suspension system components and acoustical units.

D. Samples: Submit two samples 6 by 6 inch in size illustrating material and finish of acoustical units.

1.06 QUALITY ASSURANCE

1.07 FIELD CONDITIONS

A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acoustic Tiles/Panels:
   1. Armstrong World Industries, Inc: www.armstrongceilings.com/#sle.
   2. CertainTeed Corporation: www.certainteed.com/#sle.
   3. USG Corporation: www.usg.com/ceilings/#sle.

B. Suspension Systems:
   1. Same as for acoustical units.

2.02 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Ceiling systems designed to withstand the effects of earthquake motions determined according to ASCE 7 for Seismic Design Category D, E, or F and complying with the following:

2.03 ACOUSTICAL UNITS

A. Acoustical Panels, Type ACT-1: Painted mineral fiber, with the following characteristics:
   1. Classification: ASTM E1264 Type III.
      a. Pattern: "D" - fissured.
   2. Size: 24 by 48 inch.
   3. Panel Edge: Square.
   4. Color: White.
   5. Suspension System: Exposed grid.
   6. Products:
      a. Armstrong World Industries, Inc; School Zone Fine Fissured 1714: www.armstrongceilings.com/#sle.
      b. Armstrong World Insudtries, Inc; Prelude XL Seismic Rx

B. Acoustical Panels, Type ACT-2: Painted mineral fiber, with the following characteristics:
   1. Classification: ASTM E1264 Type III.
      a. Pattern: "D" - fissured.
   2. Size: 24 by 24 inches.
   3. Panel Edge: Square.
   4. Color: White.
   5. Suspension System: Exposed grid.
   6. Products:
      a. Armstrong World Industries, Inc; Fine Fissured 1734A: www.armstrongceilings.com/#sle..
      b. Armstrong World Insudtries, Inc; Prelude XL Seismic Rx

2.04 SUSPENSION SYSTEM(S)

A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.

2.05 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

B. Hanger Wire: 12 gauge, 0.08 inch galvanized steel wire.

C. Seismic Clips: Manufacturer's standard clips for seismic conditions and to suit application.

D. Perimeter Moldings: Same metal and finish as grid.
   1. Size: As required for installation conditions and specified Seismic Design Category.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.02 PREPARATION

A. Install after major above-ceiling work is complete.

B. Coordinate the location of hangers with other work.

3.03 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.

B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

C. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
   1. Use longest practical lengths.

D. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

E. Seismic Suspension System, Seismic Design Categories D, E, F: Hang suspension system with grid ends attached to the perimeter molding on two adjacent walls; on opposite walls, maintain a 3/4 inch clearance between grid ends and wall.

F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

H. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

I. Do not eccentrically load system or induce rotation of runners.

3.04 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Fit border trim neatly against abutting surfaces.

D. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

E. Cutting Acoustical Units:
   1. Make field cut edges of same profile as factory edges.

END OF SECTION

SECTION 09 65 00
RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient tile flooring.

B. Resilient base.

C. Installation accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied resilient flooring.

1.03 REFERENCE STANDARDS

A. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2019a, with Editorial Revision (2020).

B. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2019, with Editorial Revision (2020).

C. ASTM F1066 - Standard Specification for Vinyl Composition Floor Tile; 2004 (Reapproved 2018).

D. ASTM F1861 - Standard Specification for Resilient Wall Base; 2016.

E. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2016a.

F. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.

G. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2019.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Shop Drawings: Indicate seaming plans and floor patterns.

D. Verification Samples: Submit two samples, 12 by 12 inch in size illustrating color and pattern for each resilient flooring product specified.

E. Manufacturer's Qualification Statement.

F. Installer's Qualification Statement.

G. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Flooring Material: 5% of total installed square feet of each type and color.
   3. Extra Wall Base: 5% of total linear feet of each type and color.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum three years documented experience.

B. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.

B. Store all materials off of the floor in an acclimatized, weather-tight space.

C. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

1.07 FIELD CONDITIONS

A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

PART 2 PRODUCTS

2.01 TILE FLOORING

A. Vinyl Composition Tile: Homogeneous, with color extending throughout thickness.
   1. Manufacturers:
      a. Armstrong Flooring, Inc; Excelon SDT: www.armstrongflooring.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.
   2. Minimum Requirements: Comply with ASTM F1066, of Class corresponding to type specified.
   3. Size: 12 by 12 inch.
   4. Thickness: 0.125 inch.
   5. Pattern: As indicated on Drawings.
   6. Color: As indicated.

2.02 RESILIENT BASE

A. Resilient Base: ASTM F1861, Type TS rubber, vulcanized thermoset; style as scheduled.
   1. Manufacturers:
      a. Johnsonite, a Tarkett Company: www.johnsonite.com/#sle.
      b. Roppe Corporation; Contours Profiled Wall Base System: www.roppe.com/#sle.
   2. Height: 4 inch.
   3. Thickness: 0.125 inch.
   4. Finish: Satin.
   5. Length: Roll.
   6. Color: As indicated.
   7. Accessories: Premolded external corners and internal corners.

2.03 ACCESSORIES

A. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.

B. Moldings and Edge Strips: Same material as flooring.

C. Transition Strips: Aluminum, mechanically attached.

D. Sealer and Wax: Types recommended by flooring manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
   1. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

B. Remove subfloor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with subfloor filler to achieve smooth, flat, hard surface.

C. Prohibit traffic until filler is fully cured.

D. Clean substrate.

3.03 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

C. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.

D. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.

1. Resilient Strips: Attach to substrate using adhesive.

E. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

F. Install flooring in recessed floor access covers, maintaining floor pattern.

3.04 INSTALLATION - TILE FLOORING

A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

B. Lay flooring with joints and seams parallel to building lines to produce symmetrical pattern.

3.05 INSTALLATION - RESILIENT BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.

B. Miter internal corners. At external corners, use premolded units. At exposed ends, use premolded units.

C. Install base on solid backing. Bond tightly to wall and floor surfaces.

D. Scribe and fit to door frames and other interruptions.

3.06 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

3.07 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION

SECTION 09 68 13
TILE CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Carpet tile, fully adhered.

B. Removal of existing carpet tile.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied flooring.

1.03 REFERENCE STANDARDS

A. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.

B. CRI 104 - Standard for Installation of Commercial Carpet; 2015.

C. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2019.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

C. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.

D. Submit two, 12 inch long samples of transition strip.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

F. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Carpet Tiles: Quantity equal to 5 percent of total installed of each color and pattern installed.

1.05 FIELD CONDITIONS

A. Store materials in area of installation for minimum period of 24 hours prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Tile Carpeting:
   1. Mohawk Group: www.mohawkgroup.com/#sle.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MATERIALS

A. Tile Carpeting: Tufted, manufactured in one color dye lot.
   1. Product: See 09 06 00 - Sechedule of Finishes_____.

2.03 ACCESSORIES

A. Transition Strips: Aluminum, mechanically attached.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.

B. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to subfloor surfaces.

C. Cementitious Subfloor Surfaces: Verify that substrates are ready for flooring installation by testing for moisture and alkalinity (pH).
   1. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

A. Remove existing carpet tile.

B. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

C. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install carpet tile in accordance with manufacturer's instructions.

C. Blend carpet from different cartons to ensure minimal variation in color match.

D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.

E. Lay carpet tile in square pattern, with pile direction parallel to next unit, set parallel to building lines.

F. Locate change of color or pattern between rooms under door centerline.

G. Fully adhere carpet tile to substrate.

H. Trim carpet tile neatly at walls and around interruptions.

I. Complete installation of edge strips, concealing exposed edges.

3.04 CLEANING

A. Remove excess adhesive without damage, from floor, base, and wall surfaces.

B. Clean and vacuum carpet surfaces.

END OF SECTION

SECTION 09 78 00
INTERIOR WALL PANELING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fiberglass reinforced plastic (FRP) wall paneling.

1.02 REFERENCE STANDARDS

A. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics; 2010 (Reapproved 2018).

B. ASTM D2583 - Standard Test Method for Indentation Hardness of Rigid Plastics by Means of Barcol Impressor; 2013a.

C. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2016.

D. ASTM D5319 - Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels; 2017.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.

F. ISO 2812-1 - Paints and varnishes -- Determination of resistance to liquids -- Part 1: Immersion in liquids other than water; 2017.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturer's descriptive literature for each specified product. Include anchorage devices specific to project substrate types.

C. Samples: Submit two samples 12 by 12 inches in size, indicating finish, surface design, and color for each type of panels.

D. Maintenance Data: Include recommended instructions, methods, and materials for cleaning glass, aluminum framing, and FRP panels.

E. Warranty Documentation: Manufacturer warranty; ensure that forms have been completed in Owner's name and registered with manufacturer.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to project site in manufacturer's original packaging, marked with manufacturer's product identification.

B. Store panels flat, indoors, on a clean, dry surface. Remove packaging and allow panels to acclimate to room temperature for 48 hours prior to installation.

1.05 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Decorative FRP Wall Paneling:
   1. Crane Composites, Inc: www.cranecomposites.com/#sle.
   2. Marlite, Inc: www.marlite.com/#sle.
   3. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 REGULATORY REQUIREMENTS

A. Surface Burning Classification: Provide wall paneling assemblies meeting Class A when tested in accordance with ASTM E84.

2.03 FRP WALL PANELING

A. Type: Manufacturer's standard scratch-resistant, UV-resistant protective coating.
   1. Panel Size: 4 by 8 feet.
   2. Panel Thickness: To match existing inch.
   3. Pattern: To match existing..
   4. Material: Fiberglass reinforced plastic (FRP), complying with ASTM D5319.
      a. Scratch Resistance: Barcol hardness score greater than 25, when tested in accordance with ASTM D2583.
      b. Impact Strength: Greater than 6 ft lb force per inch, when tested in accordance with ASTM D256.
      c. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
      d. Chemical Cleanability: Excellent chemical resistance to common cleaners and detergents when tested in accordance with ISO 2812-1.
   5. Panel Manufacturing Tolerances:
      a. Thickness: Plus or minus ten percent.
      b. Width and Length: 1/8 inch variation in panel lengths up to and including 12 feet.
      c. Squareness: Not more than 1/8 inch out of square in any direction.

B. Accessories:
   1. Trim:
      a. Material: Polypropylene/PVC.
      b. Color/Finish: To match existing.
   2. Adhesive: Type recommended by panel manufacturer.
   3. Sealant: Type recommended by paneling manufacturer; clear.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions and substrate flatness before starting work.

B. Verify that substrate surfaces for adhered items are clean and smooth.

C. Start of installation constitutes acceptance of project conditions.

3.02 INSTALLATION

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

B. Apply adhesive to the back side of the panel using trowel recommended by adhesive manufacturer.

C. Apply panels to wall with vertical joints plumb and horizontal joints level and pattern aligned with adjoining panels.

D. Using a roller, apply pressure to panel face to ensure proper adhesion between surfaces.

E. Install panels with manufacturer's recommended gaps for panel field and corner joints.

F. Install trim with adhesive.

G. Seal joints at wall base and between panels with approved sealant to prevent moisture intrusion.

H. Remove excess sealant after paneling is installed and prior to curing.

3.03 ADJUSTING

A. Replace paneling installed out of plumb and/or not aligned with adjacent panels or construction.

3.04 CLEANING

A. Clean panel faces using cleaning agents and methods recommended by manufacturer to remove soiling.

3.05 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals for closeout submittals.

3.06 PROTECTION

A. Protect installed interior wall paneling from subsequent construction operations.

END OF SECTION

SECTION 09 84 30

SOUND-ABSORBING WALL AND CEILING UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sound-absorbing panels.

1.02 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Verification Samples: Fabricated samples of each type of panel specified; 12 by 12 inch, showing construction, edge details, and fabric covering.

PART 2 PRODUCTS

2.01 FABRIC-COVERED SOUND-ABSORBING UNITS

A. General:
   1. Prefinished, factory assembled fabric-covered panels.

B. Fabric-Covered Acoustical Panels for Walls:
   1. Panel Core: Manufacturer's standard rigid or semi-rigid fiberglass core.
   2. Corners: Square.
   3. Color: As indicated.
   4. Mounting Method: Back-mounted with mechanical fasteners.

2.02 ACCESSORIES

A. Back-Mounting Accessories: Manufacturer's standard accessories for concealed support, designed to allow panel removal, and as follows:

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates for conditions detrimental to installation of acoustical units. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install acoustical units in locations as indicated, following manufacturer's installation instructions.

B. Align panels accurately, with edges plumb and top edges level. Scribe to fit accurately at adjoining work and penetrations.

3.03 CLEANING

A. Clean fabric facing upon completion of installation from dust and other foreign materials, following manufacturer's instructions.

3.04 PROTECTION

A. Provide protection of installed acoustical panels until Date of Substantial Completion.

B. Replace panels that cannot be cleaned and repaired to satisfaction of the Architect.

END OF SECTION

SECTION 09 91 13
EXTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
   5. Floors, unless specifically indicated.
   6. Glass.
   7. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section 09 91 23 - Interior Painting.

B. Section 09 96 00 - High-Performance Coatings.

1.03 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. ASTM D4258 - Standard Practice for Surface Cleaning Concrete for Coating; 2005 (Reapproved 2017).

C. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2016.

D. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

E. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

F. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

G. SSPC-SP 13 - Surface Preparation of Concrete; 1997 (Reaffirmed 2003).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. MPI product number (e.g. MPI #47).
   3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.

D. Samples: Submit two paper chip samples, _8.5___by__11__ inch in size illustrating range of colors and textures available for each surface finishing product scheduled.

E. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
   3. Label each container with color in addition to the manufacturer's label.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years experience and approved by manufacturer.

1.06 MOCK-UP

A. See Section 01 40 00 - Quality Requirements, for general requirements for mock-up.

B. Locate where directed by Architect.

C. Mock-up may remain as part of the work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.08 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

D. Minimum Application Temperatures for Latex Paints: 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and finishes from the same manufacturer to the greatest extent possible.
   1. Substitution of MPI-approved products by a different manufacturer is preferred over substitution of unapproved products by the same manufacturer.

B. Paints:
   1. Rodda Paint Company: www.roddapaint.com/#sle.
   2. Sherwin-Williams Company: www.sherwin-williams.com/#sle.

C. Primer Sealers: Same manufacturer as top coats.

D. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready mixed, unless required to be a field-catalyzed paint.
   1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Supply each paint material in quantity required to complete entire project's work from a single production run.
   3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content:
   1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
      a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
   2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

C. Flammability: Comply with applicable code for surface burning characteristics.

D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

E. Colors: As indicated in 09 06 00 Schedule of Finishes.

2.03 PAINT SYSTEMS - EXTERIOR

A. Exterior Surfaces to be Painted, Unless Otherwise Indicated: Including Wood, Fiber-Cement Panels/Lap-siding, and Hollow Metal(Pre-Primed).
   1. Two top coats and one coat primer.
   2. Wood and Fiber-Cement Panels/Lap-siding, Top Coat(s): Exterior Latex; MPI #10.
      a. Products:
         1) Sherwin-Williams Resilience, Flat. (MPI #10)
         2) Rodda CoverCoat Velvet, 511101 AC-911 (MPI #10).
         3) Substitutions: Section 01 60 00 - Product Requirements.
   3. Hollow-Metal (Pre-Primed), Top Coat(s): Light Industrial Coating, Water Based; MPI #163.
      a. Products:
         1) Rodda Multi Master DTM Acrylic Semi-Gloss Enamel, 548901. (MPI #163)
         2) Substitutions: Section 01 60 00 - Product Requirements.
   4. Top Coat Sheen: to match existing.
   5. Primer: As recommended by top coat manufacturer for specific substrate.

2.04 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Anti-Graffiti Coating:
   1. Products:
      a. Protectosil; Antigraffiti. www.protectosil.com
         1) Follow all manufacture's specifications for application.
      b. Substitutions: Section 01 60 00 - Product Requirements.

C. Patching Material: As recommended by manufacturer.

D. Fastener Head Cover Material: As recommended by manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

D. Test shop-applied primer for compatibility with subsequent cover materials.

E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
   1. Exterior Plaster and Stucco: 12 percent.
   2. Fiber Cement Siding: 12 percent.
   3. Exterior Wood: 15 percent, measured in accordance with ASTM D4442.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or repair existing paints or finishes that exhibit surface defects.

D. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.

E. Seal surfaces that might cause bleed through or staining of topcoat.

F. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

G. Concrete:
   1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
   2. Clean concrete according to ASTM D4258. Allow to dry.
   3. Prepare surface as recommended by top coat manufacturer and according to SSPC-SP 13.

H. Masonry:
   1. Prepare surface as recommended by top coat manufacturer.

I. Fiber Cement Siding: Remove dirt, dust and other foreign matter with a stiff fiber brush. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.

J. Exterior Gypsum Board: Fill minor defects with exterior filler compound. Spot prime defects after repair.

K. Exterior Plaster: Fill hairline cracks, small holes, and imperfections with exterior patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.

L. Ferrous Metal:
   1. Solvent clean according to SSPC-SP 1.
   2. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.

M. Exterior Wood Surfaces to Receive Opaque Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior calking

compound after prime coat has been applied. Back prime concealed surfaces before installation.

N. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Exterior Wood to Receive Opaque Finish: If final painting must be delayed more than 2 weeks after installation of woodwork, apply primer within 2 weeks and final coating within 4 weeks.

C. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

E. Apply each coat to uniform appearance.

F. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply additional coats until complete hide is achieved.

G. Sand wood and metal surfaces lightly between coats to achieve required finish.

H. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

I. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

END OF SECTION

SECTION 09 91 23
INTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
   1. Surfaces inside cabinets.
   2. Prime surfaces to receive wall coverings.

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
   5. Floors, unless specifically indicated.
   6. Glass.
   7. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section 09 91 13 - Exterior Painting.

B. Section 09 96 00 - High-Performance Coatings.

1.03 DEFINITIONS

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

B. Regardless of the specular gloss name paint manufacturers give their products, provide specular gloss as measured on a 60° and 85° geometry Parallel?Beam Glossmeter per ASTM D523 and as defined by Master Painters Institute as follows:
   1. Gloss Level 1: Traditional matte finish; flat. Gloss at 60°: Maximum 5 units. Sheen at 85°: Maximum 10 units.
   2. Gloss Level 2: High side sheen flat; velvet-like finish. Gloss at 60°: Maximum 10 units. Sheen at 85°: 10 to 35 units.
   3. Gloss Level 3: Traditional eggshell-like finish. Gloss at 60°: 10 to 25 units. Sheen at 85°: 10 to 35 units.
   4. Gloss Level 4: Satin-like finish. Gloss at 60°: 20 to 35 units. Sheen at 85°: Minimum 35 units.
   5. Gloss Level 5: Traditional semi-gloss. Gloss at 60°: 35 to 70 units.
   6. Gloss Level 6: Traditional gloss. Gloss at 60°: 70 to 85 units.
   7. Gloss Level 7: High gloss. Gloss at 60°: More than 85 units.

1.04 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2016.

C. ASTM D4258 - Standard Practice for Surface Cleaning Concrete for Coating; 2005 (Reapproved 2017).

D. ASTM D4259 - Standard Practice for Preparation of Concrete by Abrasion Prior to Coating Application; 2018.

E. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2016.

F. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; Current Edition.

G. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

H. SSPC V1 (PM1) - Good Painting Practice: Painting Manual, Volume 1; 2016.

I. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

J. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. MPI product number (e.g. MPI #47).
   3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
   4. Manufacturer's installation instructions.
   5. If proposal of substitutions is allowed under submittal procedures, explanation of substitutions proposed.

C. Samples: Submit two paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.
   2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens definitely not required.

D. Manufacturer's Instructions: Indicate special surface preparation procedures.

E. Maintenance Data: Submit data including product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, and touch-up procedures.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Paint and Finish Materials: 1 gallon of each color and type; from the same product run, store where directed.
   3. Label each container with color in addition to the manufacturer's label.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years experience and approved by manufacturer.

1.07 MOCK-UP

A. See Section 01 40 00 - Quality Requirements, for general requirements for mock-up.

B. Locate where directed by Architect.

C. Mock-up may remain as part of the work.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.09 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply materials when relative humidity exceeds 85 percent; at temperatures less than 5 degrees F above the dew point; or to damp or wet surfaces.

D. Minimum Application Temperatures for Paints: 50 degrees F for interiors unless required otherwise by manufacturer's instructions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and finishes from the same manufacturer to the greatest extent possible.
   1. In the event that a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.
   2. Substitution of MPI-approved products by a different manufacturer is preferred over substitution of unapproved products by the same manufacturer.

B. Paints:
   1. Rodda Paint Co: www.roddapaint.com/#sle.
   2. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
   3. Miller Paint: www.millerpaint.com.

C. Primer Sealers: Same manufacturer as top coats.

D. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready mixed, unless intended to be a field-catalyzed paint.
   1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
   3. Supply each paint material in quantity required to complete entire project's work from a single production run.
   4. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content:
   1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
      a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
   2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

C. Flammability: Comply with applicable code for surface burning characteristics.

D. Colors: As indicated on 09 06 00 Schedule of Finishes.

2.03 PAINT SYSTEMS - INTERIOR

A. Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, concrete, plaster, and drywall.
   1. Two top coats and one coat primer.
   2. Top Coat(s): Interior Latex; MPI #52, MPI #53 (Concrete Only).
      a. Products:
         1) Rodda Master Painter Ultra Low VOC Flat, 513601. (MPI #53)
         2) Sherwin-Williams Harmony Interior Acrylic Latex, Flat. (MPI #53)
         3) Sherwin-Williams ProMar 200 HP Series, Eg-Shel. (MPI #52)
         4) Rodda Paint Lasyn, Eg-shell. (MPI #52).
         5) Substitutions: Section 01 60 00 - Product Requirements.
   3. Top Coat Sheen:
      a. Flat: MPI gloss level 1; use this sheen for ceilings and other overhead surfaces and Mechanical/Electrical Rooms.
      b. Velvet: MPI gloss level 2; use this sheen at Custodial Closets and Concrete.
      c. Eggshell: MPI gloss level 3; use this sheen at Classrooms, Offices, Corridor.
      d. Satin: MPI gloss level 4; use this sheen at Kitchen, Cafeteria, Restrooms.
   4. Primer: As recommended by top coat manufacturer for specific substrate.
      a. Gypsum, Drywall, and Plaster: PVA
      b. Concrete: One coat high quality, acrylic latex primer.

B. Medium Duty Door/Trim: For surfaces subject to frequent contact by occupants, including metals and wood:
   1. Medium duty applications include doors, door frames, railings, handrails, guardrails, and balustrades.
   2. Two top coats and one coat primer.
   3. Top Coat(s): Interior Light Industrial Coating, Water Based; MPI #153.
      a. Products:
         1) Rodda Multi Master DTM Acrylic Semi-Gloss Enamel, 548901. (MPI #153)
         2) Sherwin-Williams Pro Industrial Acrylic Coating, Semi-Gloss. (MPI #153)
         3) Substitutions: Section 01 60 00 - Product Requirements.
   4. Top Coat Sheen:
      a. Gloss: To match existing.
   5. Primer: As recommended by top coat manufacturer for specific substrate.
      a. Interior Ferrous Metals: Red Oxide, Alkyd.
      b. Interior Non-Ferrous Metals: Vinyl wash primer.

2.04 PRIMERS

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.

2.05 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

C. Test shop-applied primer for compatibility with subsequent cover materials.

D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
   1. Gypsum Wallboard: 12 percent.
   2. Plaster and Stucco: 12 percent.
   3. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
   4. Interior Wood: 15 percent, measured in accordance with ASTM D4442.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Concrete:
   1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
   2. Clean concrete according to ASTM D4258. Allow to dry.

F. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

G. Plaster: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.

H. Ferrous Metal:
   1. Solvent clean according to SSPC-SP 1.
   2. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.

I. Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.

J. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with clear sealer.

K. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

C. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

D. Sand wood and metal surfaces lightly between coats to achieve required finish.

E. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

F. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

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

3.05 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 09 96 00
HIGH-PERFORMANCE COATINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. High performance coatings.

B. Surface preparation.

1.02 RELATED REQUIREMENTS

A. Section 09 91 13 - Exterior Painting.

B. Section 09 91 23 - Interior Painting: Requirements for mechanical and electrical equipment surfaces.

1.03 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. ASTM D4258 - Standard Practice for Surface Cleaning Concrete for Coating; 2005 (Reapproved 2017).

C. ASTM D4259 - Standard Practice for Preparation of Concrete by Abrasion Prior to Coating Application; 2018.

D. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; Current Edition.

E. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

F. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. SCAQMD 1113 - Architectural Coatings; 1977 (Amended 2016).

H. SSPC V1 (PM1) - Good Painting Practice: Painting Manual, Volume 1; 2016.

I. SSPC-PA 1 - Shop, Field, and Maintenance Painting of Steel; 2016.

J. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

K. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

L. SSPC-SP 11 - Power Tool Cleaning to Bare Metal; 2012, with Editorial Revision (2013).

M. SSPC-SP 13 - Surface Preparation of Concrete; 1997 (Reaffirmed 2003).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide complete list of all products to be used, with the following information for each:

1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
2. MPI product number (e.g. MPI #47).
3. Cross-reference to specified coating system(s) product is to be used in; include description of each system.

C. Samples: Submit two samples 8 by 8 inch in size illustrating colors available for selection.

D. Manufacturer's Certificate: Certify that high-performance coatings comply with VOC limits specified.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

G. Maintenance Data: Include cleaning procedures and repair and patching techniques.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Coating Materials: 1 gallon of each type and color.
   3. Label each container with manufacturer's name, product number, color number, and room names and numbers where used.

1.05 QUALITY ASSURANCE

A. Maintain one copy of each referenced document that applies to application on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

C. Applicator Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.

1.06 MOCK-UP

A. See Section 01 40 00 - Quality Requirements, for general requirements for mock-up.

B. Locate where directed.

C. Mock-up may remain as part of the work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of coating, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Coating Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.08 FIELD CONDITIONS

A. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

B. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the coating product manufacturer.

C. Do not install materials when temperature is below 55 degrees F or above 90 degrees F.

D. Maintain this temperature range, 24 hours before, during, and 72 hours after installation of coating.

E. Restrict traffic from area where coating is being applied or is curing.

1.09 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide high performance coating products from the same manufacturer to the greatest extent possible.
   1. In the event that a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.
   2. Substitution of MPI-approved products by a different manufacturer is preferred over substitution of unapproved products by the same manufacturer.
   3. Substitution of a different high performance coating system using MPI-approved products by the same manufacturer will be considered.

B. High-Performance Coatings:

1. Tnemec Company, Inc: www.tnemec.com/#sle.
2. Sherwin-Williams Company.
3. Substitutions: Section 01 60 00 - Product Requirements.

2.02 HIGH-PERFORMANCE COATINGS

A. MPI Standards: Provide products that comply with MPI standards indicated and are listed in "MPI Approved Products List."

2.03 TOP COAT MATERIALS

A. Coatings - General: Provide complete multi-coat systems formulated and recommended by manufacturer for the applications indicated, in the thicknesses indicated; number of coats specified does not include primer or filler coat.
   1. Colors: As indicated.

B. Elastomeric Coating for Exterior Concrete and Stucco:
   1. Number of Coats: Two.
   2. Product Characteristics:
      a. Comply with the performance requirements specified above for moderate exposure.
   3. Top Coat(s): Exterior Pigmented Elastomeric, Water Based; MPI #113.
      a. Sheen: To match existing.
      b. Products:
         1) Sherwin-Williams; CONFLEX XL Smooth High Build Acrylic Coating, MPI #113: www.sherwin-williams.com.
         2) Substitutions: Section 01 60 00 - Product Requirements.
   4. Primer: As recommended by coating manufacturer for specific substrate.
      a. Stucco: One coat, high quality acrylic latex primer.
      b. Concrete: Appropriate pH factor for application per reference standards.

C. 2-Part Epoxy Coating for Exterior Ferrous Metals:
   1. Number of coats: Two.
   2. Product Characteristics:
      a. Comply with the performance requirements specified above for moderate exposure.
   3. Top Coat(s): High Performance Institutional, Two-Component, Water Based Epoxy Coating.
      a. Sheen: Gloss to match existing.
      b. Products:
         1) Tnemec Company, Inc: www.tnemec.com/#sle..
         2) Substitutions: Section 01 60 00 - Product Requirements.
   4. Primer: Oil base primer, As recommended by coating manufacturer for specific substrate.

2.04 ACCESSORY MATERIALS

A. Accessory Materials: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of coated surfaces.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Do not begin application of coatings until substrates have been properly prepared.

C. Verify that substrate surfaces are ready to receive work as instructed by the coating manufacturer. Obtain and follow manufacturer's instructions for examination and testing of substrates.

D. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

3.02 PREPARATION

A. Clean surfaces of loose foreign matter.

B. Remove substances that would bleed through finished coatings. If unremovable, seal surface with shellac.

C. Remove finish hardware, fixture covers, and accessories and store.

D. Existing Painted and Sealed Surfaces:
   1. Strip existing paint and coatings from surface.
   2. Clean with mixture of trisodium phosphate and water to remove surface grease and foreign matter.

E. Ferrous Metal:
   1. Solvent clean according to SSPC-SP 1.
   2. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning", and protect from corrosion until coated.

F. Protect adjacent surfaces and materials not receiving coating from spatter and overspray; mask if necessary to provide adequate protection. Repair damage.

3.03 PRIMING

A. Apply primer to all surfaces, unless specifically not required by coating manufacturer. Apply in accordance with coating manufacturer's instructions.

3.04 COATING APPLICATION

A. Apply coatings in accordance with manufacturer's written instructions, to thicknesses specified and recommendations in "MPI Architectural Painting and Specification Manual".

B. Apply in uniform thickness coats, without runs, drips, pinholes, brush marks, or variations in color, texture, or finish. Finish edges, crevices, corners, and other changes in dimension with full coating thickness.

3.05 CLEANING

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

B. Clean surfaces immediately of overspray, splatter, and excess material.

C. After coating has cured, clean and replace finish hardware, fixtures, and fittings previously removed.

3.06 PROTECTION

A. Protect finished work from damage.

END OF SECTION

SECTION 10 11 00
VISUAL DISPLAY UNITS

PART 1 GENERAL

1.01 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's data on tackboard, tackboard surface covering, trim, and accessories.

C. Samples: Submit two samples 12x12 inch in size illustrating materials and finish, color and texture of tackboard, tackboard surfacing, and trim.

PART 2 PRODUCTS

2.01 VISUAL DISPLAY UNITS

A. Tackboards: Fine-grained, homogeneous natural cork.
   1. Cork Thickness: To match existing inch.
   2. Length: As indicated on drawings.
   3. Frame: Extruded aluminum, with concealed fasteners. To match existing.
   4. Frame Profile: As indicated on drawings.

2.02 MATERIALS

2.03 ACCESSORIES

A. Mounting Brackets: Concealed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that internal wall blocking is ready to receive work and positioning dimensions are as indicated on shop drawings.

3.02 PREPARATION

A. Remove switchplates, wall plates, and surface-mounted fixtures where tackable wall paneling is applied. Reinstall items on completion of installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

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

B. Secure units level and plumb.

C. Butt Joints: Install with tight hairline joints.

D. Carefully cut holes in boards for thermostats and wall switches.

E. Install tackable wall panels in accordance with manufacturer's recommendations on specified substrates with concealed attachments.

3.04 CLEANING

A. Clean board surfaces in accordance with manufacturer's instructions.

END OF SECTION

SECTION 10 26 00
WALL AND DOOR PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Corner guards.

1.02 RELATED REQUIREMENTS

A. Section 09 21 16 - Gypsum Board Assemblies: Placement of supports in stud wall construction.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Indicate physical dimensions, features, wall mounting brackets with mounted measurements, anchorage details, and rough-in measurements.

C. Samples: Submit samples illustrating component design, configurations, joinery, color and finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Corner Guards:
   1. Inpro: www.inprocorp.com/#sle.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Metal Door, Frame, and Knob/Lever Protection:
   1. Inpro: www.inprocorp.com/#sle.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PRODUCT TYPES

A. Corner Guards - Surface Mounted:
   1. Material: Type 304 stainless steel, No. 4 finish, 16 gauge, .051 inch think.
   2. Width of Wings: 3 inches.
   3. Corner: Radiused.
   4. Height: 4 feet minimum, 6' minimum at kitchen and serivce/delivery areas.
   5. Fasteners: Mechanically fastened with counter-sunk screws.
   6. Color: As selected from manufacturer's standard colors.
   7. Attachment: Mechanically fastened, counter-sunk.
   8. Length: One piece.

2.03 FABRICATION

A. Fabricate components with tight joints, corners and seams.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings, concealed blocking, and anchors are correctly sized and located.

3.02 INSTALLATION

A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to supporting construction.

B. Position corner guard 4 inches above finished floor to 48 inches high.

END OF SECTION

SECTION 21 05 48
VIBRATION AND SEISMIC CONTROLS FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Seismic control requirements.

B. Seismic restraint systems

1.02 RELATED REQUIREMENTS

A. Section 01 45 33 - Code-Required Special Inspections and Procedures.

1.03 DEFINITIONS

A. Fire Suppression Component: Where referenced in this section in regards to seismic controls, applies to any portion of the fire suppression system subject to seismic evaluation in accordance with applicable codes, including distributed systems (e.g., piping).

B. Seismic Restraint: Structural members or assemblies of members or manufactured elements specifically designed and applied for transmitting seismic forces between components and the seismic force-resisting system of the structure.

1.04 REFERENCE STANDARDS

A. ASCE 19 - Structural Applications of Steel Cables for Buildings 2016.

B. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications Most Recent Edition Cited by Referring Code or Reference Standard.

C. FEMA 412 - Installing Seismic Restraints for Mechanical Equipment 2002.

D. FEMA 413 - Installing Seismic Restraints for Electrical Equipment 2004.

E. FEMA 414 - Installing Seismic Restraints for Duct and Pipe 2004.

F. FEMA E-74 - Reducing the Risks of Nonstructural Earthquake Damage 2012.

G. FM 1950 - Seismic Sway Braces for Automatic Sprinkler Systems 2010.

H. MFMA-4 - Metal Framing Standards Publication 2004.

I. NFPA 13 - Standard for the Installation of Sprinkler Systems Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems 2008.

K. UL 203A - Standard for Sway Brace Devices for Sprinkler System Piping Current Edition, Including All Revisions.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Design Documents: Prepare and submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, details, and calculations.

C. Shop Drawings - Seismic Controls:
   1. Include dimensioned plan views and sections indicating proposed fire suppression component locations and distributed system routing, with locations and details of gravity supports and seismic restraints and associated attachments.
   2. Identify anchor manufacturer, type, minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
   3. Indicate proposed arrangement of distributed system trapeze support groupings.
   4. Indicate proposed locations for distributed system flexible fittings and/or connections.
   5. Indicate locations of seismic separations where applicable.

D. Seismic Design Data:

1. Compile information on project-specific characteristics of actual installed fire suppression components necessary for determining seismic design forces required to design appropriate seismic controls.
2. Include structural calculations, stamped or sealed by seismic controls designer, demonstrating suitability of seismic controls for seismic design forces.

1.06 QUALITY ASSURANCE

A. Comply with the Oregon Structural Specialty Code.

B. Seismic Controls Designer Qualifications: Registered professional engineer licensed in the state of Oregon.
   1. Designer may be employed by the manufacturer of the seismic restraint products.

PART 2 PRODUCTS

2.01 SEISMIC CONTROL REQUIREMENTS

A. Design and provide fire suppression component restraints, supports, and attachments suitable for seismic loads determined in accordance with applicable codes, as well as gravity and operating loads and other structural design considerations of the installed location. Consider wind loads for outdoor fire suppression components.

B. Seismic Design Criteria: As indicated on drawings.

C. Component Importance Factor (Ip): Fire suppression components to be assigned a component importance factor (Ip) of 1.5 unless otherwise indicated.

D. Seismic Restraints:
   1. Provide seismic restraints for fire suppression components except where exempt according to applicable codes and specified seismic design criteria, as approved by authorities having jurisdiction.
   2. Seismic Restraint Exemptions, All Seismic Design Categories:
      a. Fire Suppression Piping Exemptions, All Seismic Design Categories:
         1) Lateral sway bracing for piping individually supported within 6 inches of the structure measured between the top of pipe and the point of attachment to the structure, where all conditions for exception specified in NFPA 13 are met.
         2) Lateral sway bracing for branch lines smaller than 2-1/2 inches in diameter, where branch line restraint is provided in accordance with NFPA 13.
   3. Comply with applicable general recommendations of the following, where not in conflict with applicable codes, seismic design criteria, or other specified requirements:
      a. ASHRAE (HVACA).
      b. FEMA 412.
      c. FEMA 413.
      d. FEMA 414.
      e. FEMA E-74.
      f. SMACNA (SRM).
   4. Seismic restraint capacities to be verified by a Nationally Recognized Testing Laboratory (NRTL) or certified by an independent third-party registered professional engineer acceptable to authorities having jurisdiction.
   5. Seismic Restraint Systems:
      a. Arrange restraint elements to avoid obstruction of sprinklers in accordance with NFPA 13.
      b. Except where otherwise restricted, use of either cable or rigid restraints is permitted.
      c. Use only one restraint system type for a given fire suppression component or distributed system (e.g., piping) run; mixing of cable and rigid restraints on a given component/run is not permitted.
      d. Size restraint elements, including anchorage, to resist seismic loads as necessary to restrain fire suppression component in all lateral directions; consider bracket geometry in anchor load calculations.

e. Use rod stiffener clips to attach bracing to hanger rods as required to prevent rod buckling from vertical (upward) compressive load introduced by cable or rigid restraints loaded in tension, in excess of downward tensile load due to supported fire suppression component weight.
f. Select hanger rods and associated anchorage as required to accommodate vertical (downward) tensile load introduced by rigid restraints loaded in compression, in addition to downward tensile load due to supported fire suppression component weight.
g. Clevis hangers may only be used for attachment of transverse restraints; do not use for attachment of longitudinal restraints.
h. Where seismic restraints are attached to clevis hangers, provide clevis bolt reinforcement accessory to prevent clevis hanger deformation.
i. Do not introduce lateral loads on open bar joist chords or the weak axis of beams, or loads in any direction at other than panel points unless approved by project Structural Engineer of Record.

E. Seismic Attachments:
1. Comply with support and attachment requirements of NFPA 13.
2. Attachments to be bolted, welded, or otherwise positively fastened without consideration of frictional resistance produced by the effects of gravity.
3. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) or qualified evaluation service acceptable to authorities having jurisdiction for compliance with applicable building code, and qualified for seismic applications; concrete anchors to be qualified for installation in both cracked and uncracked concrete.
4. Do not use power-actuated fasteners.
5. Do not use friction clips (devices that rely on mechanically applied friction to resist loads). Beam clamps may be used for supporting sustained loads where provided with restraining straps, but not for sway bracing attachments as prohibited by NFPA 13.
6. Comply with anchor minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.

F. Seismic Interactions:
1. Include provisions to prevent seismic impact between fire suppression components and other structural or nonstructural components.
2. Include provisions such that failure of a component, either essential or nonessential, does not cause the failure of an essential component.
3. Comply with minimum clearance requirements between other equipment, distribution systems, and associated supports and fire protection sprinkler system drops and sprigs.

G. Seismic Relative Displacement Provisions:
1. Use suitable fittings or flexible connections, in accordance with NFPA 13, to accommodate:
a. Relative displacements at connections between components, including distributed systems (e.g., piping); do not exceed load limits for equipment utility connections.
b. Relative displacements between component supports attached to dissimilar parts of structure that may move differently during an earthquake.
c. Design displacements at seismic separations.
d. Anticipated drifts between floors.
2. Provide clearance around fire suppression system piping extending through walls, floors, platforms, and foundations in accordance with NFPA 13.

2.02 SEISMIC RESTRAINT SYSTEMS

A. Manufacturers:
1. Seismic Restraint Systems:
a. AFCON, a brand of Anvil International.
b. Eaton Corporation.

c. Kinetics Noise Control, Inc.
d. Mason Industries.

2. Source Limitations: Furnish seismic restraint system components and accessories produced by a single manufacturer and obtained from a single supplier.

B. Description: System components and accessories specifically designed for field assembly and attachment of seismic restraints.

C. Where required by NFPA 13, provide products listed as complying with UL 203A or FM 1950.

D. Cable Restraints:
1. Comply with ASCE 19.
2. Cables: Pre-stretched, galvanized steel wire rope with certified break strength.
3. Cable Connections: Use only swaged end fittings. Cable clips and wedge type end fittings are not permitted in accordance with ASCE 19.
4. Use protective thimbles for cable loops where potential for cable damage exists.

E. Rigid Restraints: Use MFMA-4 steel channel (strut), steel angle, or steel pipe for structural element; suitable for both compressive and tensile design loads.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that mounting surfaces are ready to receive vibration isolation and/or seismic control components and associated attachments.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 CODE-REQUIRED SPECIAL INSPECTIONS

A. Arrange work to accommodate tests and/or inspections performed by Special Inspection Agency employed by Owner or Architect in accordance with Section 01 45 33 and statement of special inspections as required by applicable building code.

B. Frequency of Special Inspections: Where special inspections are designated as continuous or periodic, arrange work accordingly.
1. Continuous Special Inspections: Special Inspection Agency to be present in the area where the work is being performed and observe the work at all times the work is in progress.
2. Periodic Special Inspections: Special Inspection Agency to be present in the area where work is being performed and observe the work part-time or intermittently and at the completion of the work.

C. Seismic special inspections include, but are not limited to:
1. Verification of required clearances between other equipment, distribution systems, and associated supports and fire protection sprinkler system drops and sprigs for Seismic Design Categories C, D, E, and F; periodic inspection.

D. Prior to starting work, Contractor to submit written statement of responsibility to authorities having jurisdiction and to Owner acknowledging awareness of special requirements contained in the statement of special inspections.

E. Special Inspection Agency services do not relieve Contractor from performing inspections and testing specified elsewhere.

3.03 INSTALLATION

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

B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

C. Secure fasteners according to manufacturer's recommended torque settings.

D. Install flexible piping connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.

E. Seismic Controls:
   1. Use only specified components, anchorage, and hardware evaluated by seismic design. Comply with conditions of seismic certification where applicable.
   2. Where mounting hole diameter exceeds bolt diameter by more than 0.125 inch, use epoxy grout, elastomeric grommet, or welded washer to reduce clearance to 0.125 inch or less.
   3. Seismic Restraint Systems:
      a. Do not attach seismic restraints and gravity supports to dissimilar parts of structure that may move differently during an earthquake.
      b. Install restraints within permissible angles in accordance with seismic design.
      c. Install cable restraints straight between component/run and structural attachment; do not bend around other nonstructural components or structural elements.
      d. Install cable restraints for vibration-isolated components slightly slack to prevent short-circuiting of isolation.
      e. Install hanger rod stiffeners where indicated using only specified clamps; do not weld stiffeners to hanger rod.

END OF SECTION

SECTION 22 05 17
SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe sleeves.

1.02 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

1.03 REFERENCE STANDARDS

A. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type) 2016.

B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems 2013a (Reapproved 2017).

PART 2 PRODUCTS

2.01 PIPE SLEEVES

A. Vertical Piping:
   1. Sleeve Length: 1 inch above finished floor.
   2. Provide sealant for watertight joint.
   3. Drilled Penetrations: Provide 1-1/2 inch angle ring or square set in silicone adhesive around penetration.

B. Sheet Metal: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.

PART 3 EXECUTION

3.01 INSTALLATION

A. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

B. Install piping to conserve building space, to not interfere with use of space and other work.

C. Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

D. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
   1. Aboveground Piping:
      a. Pack solid using mineral fiber complying with ASTM C592.
      b. Fill space with an elastomer caulk to a depth of 0.50 inch where penetrations occur between conditioned and unconditioned spaces.
   2. All Rated Openings: Caulk tight with fire stopping material complying with ASTM E814 in accordance with Section 07 84 00 to prevent the spread of fire, smoke, and gases.
   3. Caulk exterior wall sleeves watertight with lead and oakum or mechanically expandable chloroprene inserts with mastic-sealed components.

E. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

END OF SECTION

SECTION 22 05 29
HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Support and attachment components for equipment, piping, and other plumbing work.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.

1.03 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2014.

D. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings 1999, with Editorial Revision (2018).

E. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel 2019.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2020.

G. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials 2016.

H. MFMA-4 - Metal Framing Standards Publication 2004.

I. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation 2018.

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

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
   2. Coordinate the work with other trades to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
   4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
   5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 30 00.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
   1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of plumbing work.

2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
4. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
5. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
    a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
    b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
    c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
    d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Metal Channel (Strut) Framing Systems:
1. Manufacturers:
    a. Cooper B-Line, a division of Eaton Corporation.
    b. Thomas & Betts Corporation.
    c. Unistrut, a brand of Atkore International Inc.
    d. Source Limitations: Furnish channels (struts) and associated fittings, accessories, and hardware produced by a single manufacturer.
2. Provide factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
3. Comply with MFMA-4.
4. Channel Material:
    a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
5. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch.
6. Minimum Channel Dimensions: 1-5/8 inch width by 13/16 inch height.

C. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
1. Minimum Size, Unless Otherwise Indicated or Required:
    a. Equipment Supports: 1/2 inch diameter.
    b. Piping up to 1 inch (27 mm) nominal: 1/4 inch diameter.
    c. Piping larger than 1 inch (27 mm) nominal: 3/8 inch diameter.
    d. Trapeze Support for Multiple Pipes: 3/8 inch diameter.

D. Thermal Insulated Pipe Supports:
1. General Construction and Requirements:
    a. Insulated pipe supports to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.
    b. Surface Burning Characteristics: Flame spread index/smoke developed index of 5/30, maximum, when tested in accordance with ASTM E84 or UL 723.
    c. Pipe supports to be provided for nominally sized, 1/2 inch to 30 inch iron pipes.
    d. Insulation inserts to consist of rigid phenolic foam insulation surrounded by a 360 degree, PVC jacketing.
2. PVC Jacket:
    a. Pipe insulation protection shields to be provided with a ball bearing hinge and locking seam.
    b. Moisture Vapor Transmission: 0.0071 perm inch, when tested in accordance with ASTM E96/E96M.
    c. Thickness: 60 mil.
3. Pipe insulation protection shields to be provided at the hanger points and guide locations on pipes requiring insulation as indicated on drawings.

E. Pipe Supports:
   1. Liquid Temperatures Up To 122 degrees F:
      a. Overhead Support: MSS SP-58 Types 1, 3 through 12.
      b. Support From Below: MSS SP-58 Types 35 through 38.
   2. Operating Temperatures from 122 to 446 degrees F:
      a. Overhead Support: MSS SP-58 Type 1 or 3 through 12, with appropriate saddle of MSS SP-58 Type 40 for insulated pipe.

F. Offset Pipe Clamps: Double-leg design two-piece pipe clamp.

G. Strut Clamps: Two-piece pipe clamp.

H. Insulation Clamps: Two bolt-type clamps designed for installation under insulation.

I. Pipe Hangers: For a given pipe run, use hangers of the same type and material.
   1. Material: Malleable iron, ASTM A47/A47M; or carbon steel, ASTM A36/A36M.
   2. Provide coated or plated hangers to isolate steel hangers from dissimilar metal tube or pipe.

J. Dielectric Barriers: Provide between metallic supports and metallic piping and associated items of dissimilar type; acceptable dielectric barriers include rubber or plastic sheets or coatings attached securely to pipe or item.

K. Pipe Shields for Insulated Piping:
   1. General Construction and Requirements:
      a. Surface Burning Characteristics: Comply with ASTM E84 or UL 723.
      b. Shields Material: UV-resistant polypropylene with glass fill.
      c. Maximum Insulated Pipe Outer Diameter: 12-5/8 inch.
      d. Minimum Service Temperature: Minus 40 degrees F.
      e. Maximum Service Temperature: 178 degrees F.
      f. Pipe shields to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.

L. Anchors and Fasteners:
   1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
   2. Hollow Stud Walls: Use toggle bolts.
   3. Wood: Use wood screws.
   4. Plastic and lead anchors are not permitted.
   5. Hammer-driven anchors and fasteners are not permitted.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

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

B. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.

C. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

D. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

E. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

F. Provide thermal insulated pipe supports complete with hangers and accessories. Install thermal insulated pipe supports during the installation of the piping system.

G. Equipment Support and Attachment:
   1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
   2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
   3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.

H. Secure fasteners according to manufacturer's recommended torque settings.

I. Remove temporary supports.

END OF SECTION

SECTION 22 05 48
VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Seismic control requirements.

B. Seismic restraint systems.

1.02 RELATED REQUIREMENTS

A. Section 01 45 33 - Code-Required Special Inspections and Procedures.

B. Section 03 30 00 - Cast-in-Place Concrete.

1.03 DEFINITIONS

A. Plumbing Component: Where referenced in this section in regards to seismic controls, applies to any portion of the plumbing system subject to seismic evaluation in accordance with applicable codes, including distributed systems (e.g., piping).

B. Seismic Restraint: Structural members or assemblies of members or manufactured elements specifically designed and applied for transmitting seismic forces between components and the seismic force-resisting system of the structure.

1.04 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures Most Recent Edition Cited by Referring Code or Reference Standard.

B. ASCE 19 - Structural Applications of Steel Cables for Buildings 2016.

C. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications Most Recent Edition Cited by Referring Code or Reference Standard.

D. FEMA 412 - Installing Seismic Restraints for Mechanical Equipment 2002.

E. FEMA 413 - Installing Seismic Restraints for Electrical Equipment 2004.

F. FEMA 414 - Installing Seismic Restraints for Duct and Pipe 2004.

G. FEMA E-74 - Reducing the Risks of Nonstructural Earthquake Damage 2012.

H. MFMA-4 - Metal Framing Standards Publication 2004.

I. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems 2008.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate selection and arrangement of vibration isolation and/or seismic control components with the actual equipment to be installed.
   2. Coordinate the work with other trades to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
   4. Seismic Controls:
      a. Coordinate the arrangement of seismic restraints with piping, conduit, equipment, and other potential conflicts installed under other sections or by others.
      b. Coordinate the work with other trades to accommodate relative positioning of essential and nonessential components in consideration of seismic interaction.
   5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 30 00.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Design Documents: Prepare and submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, details, and calculations.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets for products, including materials, fabrication details, dimensions, and finishes.
   1. Seismic Controls: Include seismic load capacities.

D. Shop Drawings - Vibration Isolation Systems:
   1. Include dimensioned plan views and sections indicating proposed arrangement of vibration isolators; indicate equipment weights and static deflections.

E. Shop Drawings - Seismic Controls:
   1. Include dimensioned plan views and sections indicating proposed plumbing component locations and distributed system routing, with locations and details of gravity supports and seismic restraints and associated attachments.
   2. Identify anchor manufacturer, type, minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
   3. Indicate proposed arrangement of distributed system trapeze support groupings.
   4. Indicate proposed locations for distributed system flexible fittings and/or connections.
   5. Indicate locations of seismic separations where applicable.

F. Seismic Design Data:
   1. Compile information on project-specific characteristics of actual installed plumbing components necessary for determining seismic design forces required to design appropriate seismic controls, including but not limited to the following.
      a. Component operating weight and center of gravity.
      b. Component elevation in the building in relation to the roof elevation (z/h).
      c. Component importance factor (Ip).
      d. For distributed systems, component materials and connection methods.
      e. Component amplification factor (ap) and component response modification factor (Rp), determined in accordance with ASCE 7 tables.
      f. Applicability of overstrength factor (for certain anchorage in concrete and masonry).
   2. Include structural calculations, stamped or sealed by seismic controls designer, demonstrating suitability of seismic controls for seismic design forces.

G. Evaluation Reports: For products specified as requiring evaluation and recognition by a qualified evaluation service, provide current evaluation reports.

1.07 QUALITY ASSURANCE

A. Comply with the Oregon Structural Specialty Code.

B. Seismic Controls Designer Qualifications: Registered professional engineer licensed in the State in which the Project is located and with minimum five years experience designing seismic restraints for nonstructural components.

C. Seismic Controls Designer Qualifications: Registered professional engineer licensed in the state of Oregon.
   1. Designer may be employed by the manufacturer of the seismic restraint products.

PART 2 PRODUCTS

2.01 SEISMIC CONTROL REQUIREMENTS

A. Design and provide plumbing component restraints, supports, and attachments suitable for seismic loads determined in accordance with applicable codes, as well as gravity and operating loads and other structural design considerations of the installed location. Consider wind loads for outdoor plumbing components.

B. Seismic Design Criteria: As indicated on drawings.

C. Component Importance Factor (Ip): Plumbing components essential to life safety to be assigned a component importance factor (Ip) of 1.5 as indicated or as required. This includes but is not limited to:
   1. Plumbing components required to function for life safety purposes after an earthquake.
   2. Plumbing components that support or otherwise contain hazardous substances.

D. Seismic Restraints:
   1. Provide seismic restraints for plumbing components except where exempt according to applicable codes and specified seismic design criteria, as approved by authorities having jurisdiction.
   2. Seismic Restraint Exemptions:
      a. Exemptions for Seismic Design Category C:
         1) Plumbing components where either of the following apply:
            (a) The component importance factor (Ip) is 1.0 and the component is positively attached to the structure.
            (b) The component weighs 20 pounds or less or, in the case of a distributed system, 5 pounds per foot or less.
         2) Plumbing piping with component importance factor (Ip) of 1.5 and nominal pipe size of 2 inch or less, where flexible connections, expansion loops, or other assemblies are provided between piping and associated components, and where piping is positively attached to the structure; exemption does not apply to piping constructed of low-deformability materials (e.g., cast iron, glass, nonductile plastics).
      b. Exemptions for Seismic Design Category D, E, and F:
         1) Discrete plumbing components that are positively attached to the structure where either of the following apply:
            (a) The component weighs 400 pounds or less, has a center of mass located 4 feet or less above the adjacent floor level, flexible connections are provided between the component and associated ductwork, piping, and conduit, and the component importance factor (Ip) is 1.0.
            (b) The component weighs 20 pounds or less or, in the case of a distributed system, 5 pounds per foot or less.
         2) Plumbing piping with component importance factor (Ip) of 1.0 and nominal pipe size of 3 inch or less, or with component importance factor (Ip) of 1.5 and nominal pipe size of 1 inch or less, where flexible connections, expansion loops, or other assemblies are provided between piping and associated components, and where piping is positively attached to the structure; exemption does not apply to piping constructed of low-deformability materials (e.g., cast iron, glass, nonductile plastics).
      c. Plumbing Piping Exemptions, All Seismic Design Categories:
         1) Plumbing piping where flexible connections, expansion loops, or other assemblies are provided between piping and associated components, where piping is positively attached to the structure, and where one of the following apply:
            (a) Trapeze supported piping weighing less than 10 pounds per foot, where all pipes supported meet size requirements for exemption as single pipes described under specific seismic design category exemptions above.
            (b) Trapeze supported piping with trapeze assemblies using 3/8 inch diameter rod hangers not exceeding 12 inches in length from support point connection to the supporting structure, where all pipes supported have a component importance factor (Ip) of 1.0 and meet size requirements for exemption as single pipes described under specific seismic design category exemptions above, and where the total weight supported by any single trapeze is 100 pounds or less.

(c) Trapeze supported piping with trapeze assemblies using 1/2 inch diameter rod hangers not exceeding 12 inches in length from support point connection to the supporting structure, where all pipes supported have a component importance factor (Ip) of 1.0 and meet size requirements for exemption as single pipes described under specific seismic design category exemptions above, and where the total weight supported by any single trapeze is 200 pounds or less.

(d) Trapeze supported piping with trapeze assemblies using 1/2 inch diameter rod hangers not exceeding 24 inches in length from support point connection to the supporting structure, where all pipes supported have a component importance factor (Ip) of 1.0 and meet size requirements for exemption as single pipes described under specific seismic design category exemptions above, and where the total weight supported by any single trapeze is 100 pounds or less.

(e) Hanger supported piping with individual rod hangers 3/8 inch or 1/2 inch in diameter not exceeding 12 inches in length from support point connection to the supporting structure, where pipe has a component importance factor (Ip) of 1.0 and meets size requirements for exemption as single pipes described under specific seismic design category exemptions above, and where the total weight supported by any single rod is 50 pounds or less.

3. Comply with applicable general recommendations of the following, where not in conflict with applicable codes, seismic design criteria, or other specified requirements:
   a. ASHRAE (HVACA).
   b. FEMA 412.
   c. FEMA 413.
   d. FEMA 414.
   e. FEMA E-74.
   f. SMACNA (SRM).
4. Seismic restraint capacities to be verified by a Nationally Recognized Testing Laboratory (NRTL) or certified by an independent third-party registered professional engineer acceptable to authorities having jurisdiction.
5. Seismic Restraint Systems:
   a. Except where otherwise restricted, use of either cable or rigid restraints is permitted.
   b. Use only cable restraints to restrain vibration-isolated plumbing components, including distributed systems.
   c. Use only one restraint system type for a given plumbing component or distributed system (e.g., piping) run; mixing of cable and rigid restraints on a given component/run is not permitted.
   d. Size restraint elements, including anchorage, to resist seismic loads as necessary to restrain plumbing component in all lateral directions; consider bracket geometry in anchor load calculations.
   e. Use rod stiffener clips to attach bracing to hanger rods as required to prevent rod buckling from vertical (upward) compressive load introduced by cable or rigid restraints loaded in tension, in excess of downward tensile load due to supported plumbing component weight.
   f. Select hanger rods and associated anchorage as required to accommodate vertical (downward) tensile load introduced by rigid restraints loaded in compression, in addition to downward tensile load due to supported plumbing component weight.
   g. Clevis hangers may only be used for attachment of transverse restraints; do not use for attachment of longitudinal restraints.
   h. Where seismic restraints are attached to clevis hangers, provide clevis bolt reinforcement accessory to prevent clevis hanger deformation.
   i. Do not introduce lateral loads on open bar joist chords or the weak axis of beams, or loads in any direction at other than panel points unless approved by project Structural Engineer of Record.

E. Seismic Attachments:
   1. Attachments to be bolted, welded, or otherwise positively fastened without consideration of frictional resistance produced by the effects of gravity.
   2. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) or qualified evaluation service acceptable to authorities having jurisdiction for compliance with applicable building code, and qualified for seismic applications; concrete anchors to be qualified for installation in both cracked and uncracked concrete.
   3. Do not use power-actuated fasteners.
   4. Do not use friction clips (devices that rely on mechanically applied friction to resist loads). Beam clamps may be used for supporting sustained loads where provided with restraining straps.
   5. Comply with anchor minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
   6. Concrete Housekeeping Pads:
      a. Increase size of pad as required to comply with anchor requirements.
      b. Provide pad reinforcement and doweling to ensure integrity of pad and connection and to provide adequate load path from pad to supporting structure.

F. Seismic Interactions:
   1. Include provisions to prevent seismic impact between plumbing components and other structural or nonstructural components.
   2. Include provisions such that failure of a component, either essential or nonessential, does not cause the failure of an essential component.
   3. Comply with minimum clearance requirements between plumbing equipment, distribution systems, and associated supports and fire protection sprinkler system drops and sprigs.

G. Seismic Relative Displacement Provisions:
   1. Use suitable fittings or flexible connections to accommodate:
      a. Relative displacements at connections between components, including distributed systems (e.g., piping); do not exceed load limits for equipment utility connections.
      b. Relative displacements between component supports attached to dissimilar parts of structure that may move differently during an earthquake.
      c. Design displacements at seismic separations.
      d. Anticipated drifts between floors.

2.02 SEISMIC RESTRAINT SYSTEMS

A. Manufacturers:
   1. Seismic Restraint Systems:
      a. AFCON, a brand of Anvil International.
      b. Eaton Corporation.
      c. Kinetics Noise Control, Inc.
      d. Mason Industries.
   2. Source Limitations: Furnish seismic restraint system components and accessories produced by a single manufacturer and obtained from a single supplier.

B. Description: System components and accessories specifically designed for field assembly and attachment of seismic restraints.

C. Cable Restraints:
   1. Comply with ASCE 19.
   2. Cables: Pre-stretched, galvanized steel wire rope with certified break strength.
   3. Cable Connections: Use only swaged end fittings. Cable clips and wedge type end fittings are not permitted in accordance with ASCE 19.
   4. Use protective thimbles for cable loops where potential for cable damage exists.

D. Rigid Restraints: Use MFMA-4 steel channel (strut), steel angle, or steel pipe for structural element; suitable for both compressive and tensile design loads.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that mounting surfaces are ready to receive vibration isolation and/or seismic control components and associated attachments.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 CODE-REQUIRED SPECIAL INSPECTIONS

A. Arrange work to accommodate tests and/or inspections performed by Special Inspection Agency employed by Owner or Architect in accordance with Section 01 45 33 and statement of special inspections as required by applicable building code.

B. Frequency of Special Inspections: Where special inspections are designated as continuous or periodic, arrange work accordingly.
   1. Continuous Special Inspections: Special Inspection Agency to be present in the area where the work is being performed and observe the work at all times the work is in progress.
   2. Periodic Special Inspections: Special Inspection Agency to be present in the area where work is being performed and observe the work part-time or intermittently and at the completion of the work.

C. Seismic special inspections include, but are not limited to:
   1. Installation and anchorage of piping systems designed to carry hazardous materials and their associated mechanical units for Seismic Design Categories C, D, E, and F; periodic inspection.
   2. Installation and anchorage of vibration isolation systems for Seismic Design Categories C, D, E, and F where the approved Contract Documents require a nominal clearance of 1/4 inch or less between equipment support frame and seismic restraint; periodic inspection.
   3. Verification of required clearances between plumbing equipment, distribution systems, and associated supports and fire protection sprinkler system drops and sprigs for Seismic Design Categories C, D, E, and F; periodic inspection.

D. Prior to starting work, Contractor to submit written statement of responsibility to authorities having jurisdiction and to Owner acknowledging awareness of special requirements contained in the statement of special inspections.

E. Special Inspection Agency services do not relieve Contractor from performing inspections and testing specified elsewhere.

3.03 INSTALLATION

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

B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

C. Secure fasteners according to manufacturer's recommended torque settings.

D. Install flexible piping connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.

E. Seismic Controls:
   1. Provide specified snubbing element air gap; remove any factory-installed spacers, debris, or other obstructions.
   2. Use only specified components, anchorage, and hardware evaluated by seismic design. Comply with conditions of seismic certification where applicable.
   3. Where mounting hole diameter exceeds bolt diameter by more than 0.125 inch, use epoxy grout, elastomeric grommet, or welded washer to reduce clearance to 0.125 inch or less.
   4. Concrete Housekeeping Pads:
      a. Size in accordance with seismic design to meet anchor requirements.

b. Install pad reinforcement and doweling in accordance with seismic design to ensure integrity of pad and associated connection to slab.

5. Seismic Restraint Systems:
   a. Do not attach seismic restraints and gravity supports to dissimilar parts of structure that may move differently during an earthquake.
   b. Install restraints within permissible angles in accordance with seismic design.
   c. Install cable restraints straight between component/run and structural attachment; do not bend around other nonstructural components or structural elements.
   d. Install cable restraints for vibration-isolated components slightly slack to prevent short-circuiting of isolation.
   e. Install hanger rod stiffeners where indicated using only specified clamps; do not weld stiffeners to hanger rod.

END OF SECTION

SECTION 22 07 19
PLUMBING PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping insulation.

1.02 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

1.03 REFERENCE STANDARDS

A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus 2019.

B. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement 2007 (Reapproved 2013).

C. ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement 2007 (Reapproved 2013).

D. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation 2019.

E. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel 2008 (Reapproved 2018).

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2020.

G. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials 2016.

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

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER

A. Manufacturers:
   1. CertainTeed Corporation.
   2. Johns Manville Corporation.
   3. Knauf Insulation.
   4. Owens Corning Corporation.

B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
   1. K Value: ASTM C177, 0.24 at 75 degrees F.
   2. Maximum Service Temperature: 850 degrees F.
   3. Maximum Moisture Absorption: 0.2 percent by volume.

C. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.

D. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

E. Vapor Barrier Lap Adhesive: Compatible with insulation.

F. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.

G. Insulating Cement: ASTM C449.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Exposed Piping: Locate insulation and cover seams in least visible locations.

C. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.

D. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

E. Glass fiber insulated pipes conveying fluids above ambient temperature:
   1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
   2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

F. Inserts and Shields:
   1. Application: Piping 1-1/2 inches diameter or larger.
   2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
   3. Insert Location: Between support shield and piping and under the finish jacket.
   4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
   5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

G. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 07 84 00.

H. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with ABS jacket and fitting covers.

I. Buried Piping: Provide factory fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with one mil thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with a polyester film.

3.03 REFER TO DRAWINGS FOR DUCT INSULATION SCHEDULE

3.04 SCHEDULES: REFER TO DRAWINGS FOR PIPING INSULATION SCHEDULE

END OF SECTION

SECTION 22 10 05
PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe, pipe fittings, specialties, and connections for piping systems.
   1. Sanitary sewer.
   2. Domestic water.
   3. Storm water.
   4. Flanges, unions, and couplings.
   5. Pipe hangers and supports.
   6. Ball valves.

1.02 REFERENCE STANDARDS

A. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300 2016.

B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings 2018.

C. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings 2018.

D. ASME B31.1 - Power Piping 2020.

E. ASME B31.9 - Building Services Piping 2017.

F. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless 2020.

G. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings 2020.

H. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service 2019.

I. ASTM B32 - Standard Specification for Solder Metal 2008 (Reapproved 2014).

J. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes 2020.

K. ASTM B88 - Standard Specification for Seamless Copper Water Tube 2020.

L. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric) 2020.

M. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube 2016.

N. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings 2016.

O. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings 2020a.

P. ASTM F876 - Standard Specification for Crosslinked Polyethylene (PEX) Tubing 2020.

Q. ASTM F1960 - Standard Specification for Cold Expansion Fittings with PEX Reinforcing Rings for Use with Cross-linked Polyethylene (PEX) and Polyethylene of Raised Temperature (PE-RT) Tubing 2019a.

R. AWWA C651 - Disinfecting Water Mains 2014.

S. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications 2017 (Revised 2018).

T. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications 2012 (Revised 2018).

U. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation 2018.

V. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends 2010.

W. NSF 61 - Drinking Water System Components - Health Effects 2020.

X. NSF 372 - Drinking Water System Components - Lead Content 2016.

Y. PPI TR-4 - PPI Listing of Hydrostatic Design Basis (HDB), Hydrostatic Design Stress (HDS), Strength Design Basis (SDB), Pressure Design Basis (PDB), and Minimum Required Strength (MRS) Ratings For Thermoplastic Piping Materials or Pipe 2017.

1.03 QUALITY ASSURANCE

A. Perform work in accordance with Oregon Plumbing Specialty Code.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

C. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Cast Iron Pipe: ASTM A74 extra heavy weight.
   1. Fittings: Cast iron.
   2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets or lead and oakum.

2.03 SANITARY SEWER PIPING, ABOVE GRADE

A. Cast Iron Pipe: CISPI 301, hubless, service weight.
   1. Fittings: Cast iron.
   2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

2.04 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Copper Pipe: ASTM B42, hard drawn.
   1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.
   2. Joints: ASTM B32, alloy Sn95 solder.

B. Cross-Linked Polyethylene (PEX) Pipe: ASTM F876 or ASTM F877.
   1. Manufacturers:
      a. Uponor, Inc.
   2. PPI TR-4 Pressure Design Basis:
      a. 160 psig at maximum 73 degrees F.
      b. 100 psig at maximum 180 degrees F.
      c. 80 psig at maximum 200 degrees F.
   3. Fittings: Brass and engineered polymer (EP) ASTM F1960.

2.05 DOMESTIC WATER PIPING, ABOVE GRADE

A. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), Drawn (H).
   1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
   2. Joints: ASTM B32, alloy Sn95 solder.
   3. Mechanical Press Sealed Fittings: Double-pressed type, NSF 61 and NSF 372 approved or certified, utilizing EPDM, nontoxic, synthetic rubber sealing elements.

2.06 STORM WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Cast Iron Pipe: ASTM A74 extra heavy weight.
   1. Fittings: Cast iron.

2. Joint Seals: ASTM C564 neoprene gaskets, or lead and oakum.

2.07 STORM WATER PIPING, ABOVE GRADE

A. Cast Iron Pipe: CISPI 301, hubless, service weight.
   1. Fittings: Cast iron.
   2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.

2.08 NATURAL GAS PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
   1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.
   2. Joints: Threaded or welded to ASME B31.1.

2.09 FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 3 Inches and Under:
   1. Copper Tube and Pipe: Class 150 bronze unions with soldered joints.

B. No-Hub Couplings:
   1. Gasket Material: Neoprene complying with ASTM C564.
   2. Band Material: Stainless steel.
   3. Eyelet Material: Stainless steel.

C. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.10 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.
   1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
   2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
   3. Trapeze Hangers: Welded steel channel frames attached to structure.
   4. Vertical Pipe Support: Steel riser clamp.

B. Plumbing Piping - Drain, Waste, and Vent:
   1. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
   2. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
   3. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
   4. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.

C. Plumbing Piping - Water:
   1. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
   2. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.

2.11 BALL VALVES

A. Construction, 4 Inches and Smaller: MSS SP-110, Class 150, 400 psi CWP, bronze body, 304 stainless steel ball, full port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, solder or threaded ends with union.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

D. Install piping to maintain headroom, conserve space, and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

G. Prepare exposed, unfinished pipe, fittings, supports, and accessories for finish painting.

H. Install water piping to ASME B31.9.

I. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.

J. Sleeve pipes passing through partitions, walls, and floors.

K. Pipe Hangers and Supports:
   1. Install in accordance with MSS SP-58.
   2. Support horizontal piping as indicated.
   3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
   4. Place hangers within 12 inches of each horizontal elbow.
   5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
   6. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
   7. Provide copper plated hangers and supports for copper piping.
   8. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
   9. Support cast iron drainage piping at every joint.

L. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

3.03 TOLERANCES

A. Drainage Piping: Establish invert elevations within 1/2 inch vertically of location indicated and slope to drain at minimum of 1/4 inch per foot slope.

B. Water Piping: Slope at minimum of 1/32 inch per foot and arrange to drain at low points.

3.04 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Prior to starting work, verify system is complete, flushed, and clean.

B. Ensure acidity (pH) of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).

C. Inject disinfectant, free chlorine in liquid, powder, tablet, or gas form throughout system to obtain 50 to 80 mg/L residual.

D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.

E. Maintain disinfectant in system for 24 hours.

F. If final disinfectant residual tests less than 25 mg/L, repeat treatment.

G. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.

H. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.05 SCHEDULES

A. Pipe Hanger Spacing:
   1. Metal Piping:
      a. Pipe Size: 1/2 inches to 1-1/4 inches:
         1) Maximum Hanger Spacing: 6.5 ft.
         2) Hanger Rod Diameter: 3/8 inches.
      b. Pipe Size: 1-1/2 inches to 2 inches:
         1) Maximum Hanger Spacing: 10 ft.
         2) Hanger Rod Diameter: 3/8 inch.
      c. Pipe Size: 2-1/2 inches to 3 inches:
         1) Maximum Hanger Spacing: 10 ft.
         2) Hanger Rod Diameter: 1/2 inch.
      d. Pipe Size: 4 inches to 6 inches:
         1) Maximum Hanger Spacing: 10 ft.
         2) Hanger Rod Diameter: 5/8 inch.

END OF SECTION

SECTION 22 10 06
PLUMBING PIPING SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hydrants.

1.02 REFERENCE STANDARDS

A. ASSE 1019 - Performance Requirements for Wall Hydrant with Backflow Protection and Freeze Resistance 2011 (Reaffirmed 2016).

B. NSF 61 - Drinking Water System Components - Health Effects 2020.

C. NSF 372 - Drinking Water System Components - Lead Content 2016.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

2.02 HYDRANTS

A. Manufacturers:
   1. Arrowhead Brass & Plumbing, LLC.
   2. Jay R. Smith Manufacturing Company.
   3. Murdock Manufacturing, Inc.
   4. Zurn Industries, LLC.

B. Wall Hydrants:
   1. ASSE 1019; freeze resistant, self-draining type with chrome plated wall plate hose thread spout, lockshield and removable key, and integral vacuum breaker.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

END OF SECTION

SECTION 22 40 00
PLUMBING FIXTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sinks.

1.02 REFERENCE STANDARDS

A. ASME A112.19.3 - Stainless Steel Plumbing Fixtures 2017.

B. NSF 61 - Drinking Water System Components - Health Effects 2020.

C. NSF 372 - Drinking Water System Components - Lead Content 2016.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

C. Maintenance Data: Include fixture trim exploded view and replacement parts lists.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Accept fixtures on site in factory packaging. Inspect for damage.

B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 REGULATORY REQUIREMENTS

A. Comply with applicable codes for installation of plumbing systems.

2.03 SINKS

A. Sink Manufacturers:
   1. Elkay (DRKR2517).

B. Single Compartment Bowl: 25 by 17 by 7-5/8 inchoutside dimensions, 18-gauge Type 304 stainless steel, self rimming and undercoated, with left side ledge drilled for faucet trim and right side ledge drilled for bubbler trim.
   1. Drain: 3-1/2 inch grid strainer and tailpiece.
   2. Supply Faucet:
      a. Supply Faucet Manufacturer: Chicago Faucet [1100-CP] or [1100-GN2AE3VPAXKCP] or [50-CP]
      b. 8 inch fixed centers, 5-1/4 inch rigid gooseneck spout, vandal proof aerator, vandal proof 2 inch handles, ceramic quarter turn operating cartridges, ADA compliant.
   3. Bubbler
      a. Bubbler Manufacturer: Chicago Faucet 748-665ABCP
      b. Deck-mounted bubbler, single hole, vandal-proof metering push handle, metering cartridge, valve with inline filter screen, 1/2 inch supply inlet, metal mouth guard, chrome plated finish.
   4. Thermostatic Mixing Valve: Thermostatic mixing valve, ASSE 1070 listed, with combination stop, strainer, and check valves, and flexible stainless steel connectors.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install components level and plumb.

END OF SECTION

SECTION 23 05 17
SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe sleeves.

1.02 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

1.03 REFERENCE STANDARDS

A. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type) 2016.

B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems 2013a (Reapproved 2017).

PART 2 PRODUCTS

2.01 PIPE SLEEVES

A. Sheet Metal: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.

B. Clearances:
   1. Provide allowance for insulated piping.
   2. Wall, Floor, Floor, Partitions: 1 inch greater than external; pipe diameter.
   3. All Rated Openings: Caulked tight with fire stopping material in compliance with ASTM E814 in accordance with Section 07 84 00 to prevent the spread of fire, smoke, and gases.

PART 3 EXECUTION

3.01 INSTALLATION

A. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

B. Install piping to conserve building space, to not interfere with use of space and other work.

C. Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

D. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
   1. Aboveground Piping:
      a. Pack solid using mineral fiber in compliance with ASTM C592.
      b. Fill space with an elastomer caulk to a depth of 0.50 inch where penetrations occur between conditioned and unconditioned spaces.
   2. All Rated Openings: Caulk tight with fire stopping material in compliance with ASTM E814 in accordance with Section 07 84 00 to prevent the spread of fire, smoke, and gases.
   3. Caulk exterior wall sleeves watertight with lead and oakum or mechanically expandable chloroprene inserts with mastic-sealed components.

E. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

END OF SECTION

SECTION 23 05 29
HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Support and attachment components for equipment, piping, and other HVAC/hydronic work.

1.02 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2014.

D. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings 1999, with Editorial Revision (2018).

E. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel 2019.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2020.

G. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials 2016.

H. MFMA-4 - Metal Framing Standards Publication 2004.

I. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation 2018.

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

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
   2. Coordinate the work with other trades to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
   4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
   5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
   1. Comply with MSS SP-58.
   2. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of plumbing work.
   3. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
   4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.

5. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
6. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
    a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
    b. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
    c. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
1. Manufacturers:
    a. Cooper B-Line, a division of Eaton Corporation.
    b. Ferguson Enterprises Inc.
    c. Thomas & Betts Corporation.
    d. Source Limitations: Furnish channels (struts) and associated fittings, accessories, and hardware produced by a single manufacturer.
2. Provide factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
3. Comply with MFMA-4.
4. Channel Material:
    a. Indoor Dry Locations: Use painted steel or zinc-plated steel.
5. Minimum Channel Thickness: Steel sheet, 12 gage, 0.1046 inch.
6. Minimum Channel Dimensions: 1-5/8 inch width by 13/16 inch height.

C. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
1. Minimum Size, Unless Otherwise Indicated or Required:
    a. Equipment Supports: 1/2 inch diameter.
    b. Piping up to 1 inch (27 mm) nominal: 1/4 inch diameter.
    c. Piping larger than 1 inch (27 mm) nominal: 3/8 inch diameter.
    d. Trapeze Support for Multiple Pipes: 3/8 inch diameter.

D. Steel Cable:
1. Manufacturers:
    a. Ductmate Industries, Inc, a DMI Company.
    b. Source Limitations: Furnish associated fittings, accessories, and hardware produced by a single manufacturer.

E. Thermal Insulated Pipe Supports:
1. General Construction and Requirements:
    a. Insulated pipe supports to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.
    b. Surface Burning Characteristics: Flame spread index/smoke developed index of 5/30, maximum, when tested in accordance with ASTM E84 or UL 723.
    c. Pipe supports to be provided for nominally sized, 1/2 inch to 30 inch iron pipes.
    d. Insulation inserts to consist of rigid polyisocyanurate (urethane) insulation surrounded by a 360 degree, PVC jacketing.
2. PVC Jacket:
    a. Pipe insulation protection shields to be provided.
    b. Minimum Service Temperature: Minus 40 degrees F.
    c. Maximum Service Temperature: 180 degrees F.
    d. Moisture Vapor Transmission: 0.0071 perm inch, when tested in accordance with ASTM E96/E96M.
    e. Thickness: 60 mil.

3. Pipe insulation protection shields to be provided at the hanger points and guide locations on pipes requiring insulation as indicated on drawings.

F. Pipe Supports:
   1. Liquid Temperatures Up To 122 degrees F:
      a. Overhead Support: MSS SP-58 Types 1, 3 through 12.
      b. Support From Below: MSS SP-58 Types 35 through 38.
   2. Operating Temperatures from 122 to 446 degrees F:
      a. Overhead Support: MSS SP-58 Type 1 or 3 through 12, with appropriate saddle of MSS SP-58 Type 40 for insulated pipe.

G. Offset Pipe Clamps: Double-leg design two-piece pipe clamp.

H. Strut Clamps: Two-piece pipe clamp.

I. Insulation Clamps: Two bolt-type clamps designed for installation under insulation.

J. Pipe Hangers: For a given pipe run, use hangers of the same type and material.
   1. Material: Malleable iron, ASTM A47/A47M; or carbon steel, ASTM A36/A36M.
   2. Provide coated or plated hangers to isolate steel hangers from dissimilar metal tube or pipe.

K. Dielectric Barriers: Provide between metallic supports and metallic piping and associated items of dissimilar type; acceptable dielectric barriers include rubber or plastic sheets or coatings attached securely to pipe or item.

L. Pipe Shields for Insulated Piping:
   1. General Construction and Requirements:
      a. Surface Burning Characteristics: Comply with ASTM E84 or UL 723.
      b. Shields Material: UV-resistant polypropylene with glass fill.
      c. Maximum Insulated Pipe Outer Diameter: 12-5/8 inch.
      d. Minimum Service Temperature: Minus 40 degrees F.
      e. Maximum Service Temperature: 178 degrees F.
      f. Pipe shields to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.

M. Anchors and Fasteners:
   1. Manufacturers - Mechanical Anchors:
      a. Hilti, Inc.
      b. Powers Fasteners, Inc.
      c. Simpson Strong-Tie Company Inc.
   2. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
   3. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
   4. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
   5. Hollow Masonry: Use toggle bolts.
   6. Hollow Stud Walls: Use toggle bolts.
   7. Steel: Use beam clamps, machine bolts, or welded threaded studs.
   8. Sheet Metal: Use sheet metal screws.
   9. Wood: Use wood screws.
   10. Plastic and lead anchors are not permitted.
   11. Powder-actuated fasteners are not permitted.
   12. Hammer-driven anchors and fasteners are not permitted.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

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

B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

C. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.

D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

G. Provide thermal insulated pipe supports complete with hangers and accessories. Install thermal insulated pipe supports during the installation of the piping system.

H. Equipment Support and Attachment:
   1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
   2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
   3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
   4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

I. Secure fasteners according to manufacturer's recommended torque settings.

J. Remove temporary supports.

END OF SECTION

SECTION 23 05 48
VIBRATION AND SEISMIC CONTROLS FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Seismic control requirements.

B. Seismic restraint systems.

1.02 RELATED REQUIREMENTS

A. Section 01 45 33 - Code-Required Special Inspections and Procedures.

1.03 DEFINITIONS

A. HVAC Component: Where referenced in this section in regards to seismic controls, applies to any portion of the HVAC system subject to seismic evaluation in accordance with applicable codes, including distributed systems (e.g., ductwork, piping).

B. Seismic Restraint: Structural members or assemblies of members or manufactured elements specifically designed and applied for transmitting seismic forces between components and the seismic force-resisting system of the structure.

1.04 REFERENCE STANDARDS

A. ASCE 19 - Structural Applications of Steel Cables for Buildings 2016.

B. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications Most Recent Edition Cited by Referring Code or Reference Standard.

C. FEMA 412 - Installing Seismic Restraints for Mechanical Equipment 2002.

D. FEMA 413 - Installing Seismic Restraints for Electrical Equipment 2004.

E. FEMA 414 - Installing Seismic Restraints for Duct and Pipe 2004.

F. FEMA E-74 - Reducing the Risks of Nonstructural Earthquake Damage 2012.

G. MFMA-4 - Metal Framing Standards Publication 2004.

H. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems 2008.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate selection and arrangement of vibration isolation and/or seismic control components with the actual equipment to be installed.
   2. Coordinate the work with other trades to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
   4. Seismic Controls:
      a. Coordinate the arrangement of seismic restraints with piping, conduit, equipment, and other potential conflicts installed under other sections or by others.
      b. Coordinate the work with other trades to accommodate relative positioning of essential and nonessential components in consideration of seismic interaction.
   5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Design Documents: Prepare and submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, details, and calculations.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets for products, including materials, fabrication details, dimensions, and finishes.
   1. Seismic Controls: Include seismic load capacities.

D. Shop Drawings - Vibration Isolation Systems:
   1. Include dimensioned plan views and sections indicating proposed arrangement of vibration isolators; indicate equipment weights and static deflections.

E. Shop Drawings - Seismic Controls:
   1. Include dimensioned plan views and sections indicating proposed HVAC component locations and distributed system routing, with locations and details of gravity supports and seismic restraints and associated attachments.
   2. Identify anchor manufacturer, type, minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
   3. Indicate proposed arrangement of distributed system trapeze support groupings.
   4. Indicate proposed locations for distributed system flexible fittings and/or connections.
   5. Indicate locations of seismic separations where applicable.

F. Seismic Design Data:
   1. Compile information on project-specific characteristics of actual installed HVAC components necessary for determining seismic design forces required to design appropriate seismic controls.
   2. Include structural calculations, stamped or sealed by seismic controls designer, demonstrating suitability of seismic controls for seismic design forces.

G. Evaluation Reports: For products specified as requiring evaluation and recognition by a qualified evaluation service, provide current evaluation reports.

1.07 QUALITY ASSURANCE

A. Comply with Oregon Structural Specialty Code.

B. Seismic Controls Designer Qualifications: Registered professional engineer licensed in the State of Oregon.
   1. Designer may be employed by the manufacturer of the seismic restraint products.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 SEISMIC CONTROL REQUIREMENTS

A. Design and provide HVAC component restraints, supports, and attachments suitable for seismic loads determined in accordance with applicable codes, as well as gravity and operating loads and other structural design considerations of the installed location. Consider wind loads for outdoor HVAC components.

B. Seismic Design Criteria: As indicated on drawings.

C. Component Importance Factor (Ip): HVAC components essential to life safety to be assigned a component importance factor (Ip) of 1.5 as indicated or as required. This includes but is not limited to:
   1. HVAC components required to function for life safety purposes after an earthquake.
   2. HVAC components that support or otherwise contain hazardous substances.

D. Seismic Restraints:
   1. Provide seismic restraints for HVAC components except where exempt according to applicable codes and specified seismic design criteria, as approved by authorities having jurisdiction.
   2. Seismic Restraint Exemptions:
      a. Exemptions for Seismic Design Category C:
         1) HVAC components where either of the following apply:

(a) The component importance factor (Ip) is 1.0 and the component is positively attached to the structure.
(b) The component weighs 20 pounds or less or, in the case of a distributed system, 5 pounds per foot or less.

2) HVAC piping with component importance factor (Ip) of 1.5 and nominal pipe size of 2 inch or less, where flexible connections, expansion loops, or other assemblies are provided between piping and associated components, and where piping is positively attached to the structure; exemption does not apply to piping constructed of low-deformability materials (e.g., cast iron, glass, nonductile plastics).

b. Exemptions for Seismic Design Category D, E, and F:

1) Discrete HVAC components that are positively attached to the structure where either of the following apply:
(a) The component weighs 400 pounds or less, has a center of mass located 4 feet or less above the adjacent floor level, flexible connections are provided between the component and associated ductwork, piping, and conduit, and the component importance factor (Ip) is 1.0.
(b) The component weighs 20 pounds or less or, in the case of a distributed system, 5 pounds per foot or less.

2) HVAC piping with component importance factor (Ip) of 1.0 and nominal pipe size of 3 inch or less, or with component importance factor (Ip) of 1.5 and nominal pipe size of 1 inch or less, where flexible connections, expansion loops, or other assemblies are provided between piping and associated components, and where piping is positively attached to the structure; exemption does not apply to piping constructed of low-deformability materials (e.g., cast iron, glass, nonductile plastics).

c. Duct System Exemptions, All Seismic Design Categories:

1) Duct systems not designed to carry toxic, highly toxic, or flammable gases and not used for smoke control with component importance factor (Ip) of 1.0, where flexible connections or other assemblies are provided between duct system and associated components, where duct system is positively attached to the structure, and where one of the following apply:
(a) Trapeze supported duct with trapeze assemblies using 3/8 inch diameter rod hangers not exceeding 12 inches in length from support point connection to the supporting structure, and the total weight supported by any single trapeze is 100 pounds or less.
(b) Trapeze supported duct with trapeze assemblies using 1/2 inch diameter rod hangers not exceeding 12 inches in length from support point connection to the supporting structure, and the total weight supported by any single trapeze is 200 pounds or less.
(c) Trapeze supported duct with trapeze assemblies using 1/2 inch diameter rod hangers not exceeding 24 inches in length from support point connection to the supporting structure, and the total weight supported by any single trapeze is 100 pounds or less.
(d) Hanger supported duct with individual rod hangers 3/8 inch or 1/2 inch in diameter not exceeding 12 inches in length from support point connection to the supporting structure, and the total weight supported by any single rod is 50 pounds or less.

2) Duct systems not designed to carry toxic, highly toxic, or flammable gases and not used for smoke control, where there are provisions to avoid impact with other ducts or mechanical components or to protect ducts in the event of such impact, and where duct system is positively attached to the structure and has a cross sectional area of less than 6 square feet and weighs 20 pounds per foot or less.

d. HVAC Piping Exemptions, All Seismic Design Categories:

1) HVAC piping where flexible connections, expansion loops, or other assemblies are provided between piping and associated components, where piping is positively attached to the structure, and where one of the following apply:
   (a) Trapeze supported piping weighing less than 10 pounds per foot, where all pipes supported meet size requirements for exemption as single pipes described under specific seismic design category exemptions above.
   (b) Trapeze supported piping with trapeze assemblies using 3/8 inch diameter rod hangers not exceeding 12 inches in length from support point connection to the supporting structure, where all pipes supported have a component importance factor (Ip) of 1.0 and meet size requirements for exemption as single pipes described under specific seismic design category exemptions above, and where the total weight supported by any single trapeze is 100 pounds or less.
   (c) Trapeze supported piping with trapeze assemblies using 1/2 inch diameter rod hangers not exceeding 12 inches in length from support point connection to the supporting structure, where all pipes supported have a component importance factor (Ip) of 1.0 and meet size requirements for exemption as single pipes described under specific seismic design category exemptions above, and where the total weight supported by any single trapeze is 200 pounds or less.
   (d) Trapeze supported piping with trapeze assemblies using 1/2 inch diameter rod hangers not exceeding 24 inches in length from support point connection to the supporting structure, where all pipes supported have a component importance factor (Ip) of 1.0 and meet size requirements for exemption as single pipes described under specific seismic design category exemptions above, and where the total weight supported by any single trapeze is 100 pounds or less.
   (e) Hanger supported piping with individual rod hangers 3/8 inch or 1/2 inch in diameter not exceeding 12 inches in length from support point connection to the supporting structure, where pipe has a component importance factor (Ip) of 1.0 and meets size requirements for exemption as single pipes described under specific seismic design category exemptions above, and where the total weight supported by any single rod is 50 pounds or less.

3. Comply with applicable general recommendations of the following, where not in conflict with applicable codes, seismic design criteria, or other specified requirements:
   a. ASHRAE (HVACA).
   b. FEMA 412.
   c. FEMA 413.
   d. FEMA 414.
   e. FEMA E-74.
   f. SMACNA (SRM).
4. Seismic restraint capacities to be verified by a Nationally Recognized Testing Laboratory (NRTL) or certified by an independent third-party registered professional engineer acceptable to authorities having jurisdiction.
5. Seismic Restraint Systems:
   a. Except where otherwise restricted, use of either cable or rigid restraints is permitted.
   b. Use only cable restraints to restrain vibration-isolated HVAC components, including distributed systems.
   c. Use only one restraint system type for a given HVAC component or distributed system (e.g., ductwork, piping) run; mixing of cable and rigid restraints on a given component/run is not permitted.
   d. Size restraint elements, including anchorage, to resist seismic loads as necessary to restrain HVAC component in all lateral directions; consider bracket geometry in anchor load calculations.

e. Use rod stiffener clips to attach bracing to hanger rods as required to prevent rod buckling from vertical (upward) compressive load introduced by cable or rigid restraints loaded in tension, in excess of downward tensile load due to supported HVAC component weight.
f. Select hanger rods and associated anchorage as required to accommodate vertical (downward) tensile load introduced by rigid restraints loaded in compression, in addition to downward tensile load due to supported HVAC component weight.
g. Clevis hangers may only be used for attachment of transverse restraints; do not use for attachment of longitudinal restraints.
h. Where seismic restraints are attached to clevis hangers, provide clevis bolt reinforcement accessory to prevent clevis hanger deformation.
i. Do not introduce lateral loads on open bar joist chords or the weak axis of beams, or loads in any direction at other than panel points unless approved by project Structural Engineer of Record.

6. Ductwork Applications:
   a. Provide independent support and seismic restraint for in-line components (e.g., fans, heat exchangers, humidifiers) having an operating weight greater than 75 pounds.
   b. Positively attach appurtenances (e.g., dampers, louvers, diffusers) with mechanical fasteners.

E. Seismic Attachments:
1. Attachments to be bolted, welded, or otherwise positively fastened without consideration of frictional resistance produced by the effects of gravity.
2. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) or qualified evaluation service acceptable to authorities having jurisdiction for compliance with applicable building code, and qualified for seismic applications; concrete anchors to be qualified for installation in both cracked and uncracked concrete.
3. Do not use power-actuated fasteners.
4. Do not use friction clips (devices that rely on mechanically applied friction to resist loads). Beam clamps may be used for supporting sustained loads where provided with restraining straps.
5. Comply with anchor minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
6. Concrete Housekeeping Pads:
   a. Increase size of pad as required to comply with anchor requirements.
   b. Provide pad reinforcement and doweling to ensure integrity of pad and connection and to provide adequate load path from pad to supporting structure.

F. Seismic Interactions:
1. Include provisions to prevent seismic impact between HVAC components and other structural or nonstructural components.
2. Include provisions such that failure of a component, either essential or nonessential, does not cause the failure of an essential component.
3. Comply with minimum clearance requirements between HVAC equipment, distribution systems, and associated supports and fire protection sprinkler system drops and sprigs.

G. Seismic Relative Displacement Provisions:
1. Use suitable fittings or flexible connections to accommodate:
   a. Relative displacements at connections between components, including distributed systems (e.g., ductwork, piping); do not exceed load limits for equipment utility connections.
   b. Relative displacements between component supports attached to dissimilar parts of structure that may move differently during an earthquake.
   c. Design displacements at seismic separations.
   d. Anticipated drifts between floors.

2.02 SEISMIC RESTRAINT SYSTEMS

A. Manufacturers:
   1. Seismic Restraint Systems:
      a. AFCON, a brand of Anvil International.
      b. Eaton Corporation.
      c. Kinetics Noise Control, Inc.
      d. Mason Industries.
   2. Source Limitations: Furnish seismic restraint system components and accessories produced by a single manufacturer and obtained from a single supplier.

B. Description: System components and accessories specifically designed for field assembly and attachment of seismic restraints.

C. Cable Restraints:
   1. Comply with ASCE 19.
   2. Cables: Pre-stretched, galvanized steel wire rope with certified break strength.
   3. Cable Connections: Use only swaged end fittings. Cable clips and wedge type end fittings are not permitted in accordance with ASCE 19.
   4. Use protective thimbles for cable loops where potential for cable damage exists.

D. Rigid Restraints: Use MFMA-4 steel channel (strut), steel angle, or steel pipe for structural element; suitable for both compressive and tensile design loads.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that mounting surfaces are ready to receive vibration isolation and/or seismic control components and associated attachments.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 CODE-REQUIRED SPECIAL INSPECTIONS

A. Arrange work to accommodate tests and/or inspections performed by Special Inspection Agency employed by Owner or Architect in accordance with Section 01 45 33 and statement of special inspections as required by applicable building code.

B. Frequency of Special Inspections: Where special inspections are designated as continuous or periodic, arrange work accordingly.
   1. Continuous Special Inspections: Special Inspection Agency to be present in the area where the work is being performed and observe the work at all times the work is in progress.
   2. Periodic Special Inspections: Special Inspection Agency to be present in the area where work is being performed and observe the work part-time or intermittently and at the completion of the work.

C. Seismic special inspections include, but are not limited to:
   1. Verification of required clearances between HVAC equipment, distribution systems, and associated supports and fire protection sprinkler system drops and sprigs for Seismic Design Categories C, D, E, and F; periodic inspection.

D. Prior to starting work, Contractor to submit written statement of responsibility to authorities having jurisdiction and to Owner acknowledging awareness of special requirements contained in the statement of special inspections.

E. Special Inspection Agency services do not relieve Contractor from performing inspections and testing specified elsewhere.

3.03 INSTALLATION

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

B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

C. Secure fasteners according to manufacturer's recommended torque settings.

D. Install flexible piping connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.

E. Seismic Controls:
   1. Provide specified snubbing element air gap; remove any factory-installed spacers, debris, or other obstructions.
   2. Use only specified components, anchorage, and hardware evaluated by seismic design. Comply with conditions of seismic certification where applicable.
   3. Where mounting hole diameter exceeds bolt diameter by more than 0.125 inch, use epoxy grout, elastomeric grommet, or welded washer to reduce clearance to 0.125 inch or less.
   4. Equipment with Sheet Metal Housings:
      a. Use Belleville washers to distribute stress over a larger surface area of the sheet metal connection interface as approved by manufacturer.
      b. Attach additional steel as approved by manufacturer where required to transfer loads to structure.
      c. Where mounting surface is irregular, do not shim housing; reinforce housing with additional steel as approved by manufacturer.
   5. Concrete Housekeeping Pads:
      a. Size in accordance with seismic design to meet anchor requirements.
      b. Install pad reinforcement and doweling in accordance with seismic design to ensure integrity of pad and associated connection to slab.
   6. Seismic Restraint Systems:
      a. Do not attach seismic restraints and gravity supports to dissimilar parts of structure that may move differently during an earthquake.
      b. Install restraints within permissible angles in accordance with seismic design.
      c. Install cable restraints straight between component/run and structural attachment; do not bend around other nonstructural components or structural elements.
      d. Install cable restraints for vibration-isolated components slightly slack to prevent short-circuiting of isolation.
      e. Install hanger rod stiffeners where indicated using only specified clamps; do not weld stiffeners to hanger rod.

END OF SECTION

SECTION 23 07 13
DUCT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Duct insulation.

1.02 REFERENCE STANDARDS

A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus 2017.

B. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation 2014 (Reapproved 2019).

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2020.

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

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.04 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing the type of work specified in this section.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER, RIGID

A. Manufacturer:
   1. CertainTeed Corporation.
   2. Johns Manville, 800 Series Spin-Glas.
   3. Knauf Insulation.
   4. Owens Corning Corporation.

B. Insulation: ASTM C612; rigid, noncombustible blanket.
   1. K Value: 0.23 at 75 degrees F, when tested in accordance with ASTM C518.
   2. Maximum Service Temperature: 450 degrees F.
   3. Maximum Water Vapor Absorption: 5.0 percent.
   4. Maximum Density: 6.0 lb/cu ft.

C. Vapor Barrier Jacket:
   1. White, Polypropylene-top ASJ.
   2. Secure with mechanical fasteners or adhesives in accordance with manufacturer instructions.

PART 3 EXECUTION

3.01 EXAMINATION

A. Test ductwork for design pressure prior to applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Insulated Ducts Conveying Air Below Ambient Temperature:
   1. Provide insulation with vapor barrier jackets.
   2. Finish with tape and vapor barrier jacket.
   3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
   4. Insulate entire system, including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

3.03 REFER TO DRAWINGS FOR DUCT INSULATION SCHEDULE.

END OF SECTION

SECTION 23 07 19
HVAC PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping insulation.

1.02 REFERENCE STANDARDS

A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus 2019.

B. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement 2007 (Reapproved 2013).

C. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form 2020.

D. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation 2019.

E. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel 2008 (Reapproved 2018).

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2020.

G. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials 2016.

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

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER, RIGID

A. Manufacturers:
   1. CertainTeed Corporation.
   2. Johns Manville Corporation.
   3. Knauf Insulation.
   4. Owens Corning Corporation.

B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
   1. K Value: ASTM C177, 0.24 at 75 degrees F.
   2. Maximum Service Temperature: 850 degrees F.
   3. Maximum Moisture Absorption: 0.2 percent by volume.

C. Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.

D. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

E. Vapor Barrier Lap Adhesive: Compatible with insulation.

F. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.

2.03 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturers:
   1. Aeroflex USA, Inc.
   2. Armacell LLC.
   3. K-Flex USA LLC.

B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
   1. Minimum Service Temperature: Minus 40 degrees F.
   2. Maximum Service Temperature: 180 degrees F.
   3. Connection: Waterproof vapor barrier adhesive.

C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

PART 3 EXECUTION

3.01 EXAMINATION

A. Test piping for design pressure, liquid tightness, and continuity prior to applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Exposed Piping: Locate insulation and cover seams in least visible locations.

D. Insulated Pipes Conveying Fluids Below Ambient Temperature:
   1. Insulate entire system, including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

E. Glass Fiber Insulated Pipes Conveying Fluids Below Ambient Temperature:
   1. Provide vapor barrier jackets, factory-applied or field-applied; secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
   2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

F. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

G. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.

H. Glass Fiber Insulated Pipes Conveying Fluids Above Ambient Temperature:
   1. Provide standard jackets, with or without vapor barrier, factory-applied, or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples.
   2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

I. Inserts and Shields:
   1. Application: Piping 1-1/2 inches diameter or larger.
   2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
   3. Insert location: Between support shield and piping and under the finish jacket.
   4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
   5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

J. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 07 84 00.

K. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with canvas jacket sized for finish painting.

L. Buried Piping: Provide factory-fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with one mil thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with

polyester film.

3.03 REFER TO DRAWINGS FOR PIPE INSULATION SCHEDULE

END OF SECTION

SECTION 23 11 23
FACILITY NATURAL-GAS PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe, pipe fittings, valves, and connections for natural gas piping systems.

1.02 REFERENCE STANDARDS

A. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300 2016.

B. ASME B31.1 - Power Piping 2020.

C. ASME B31.9 - Building Services Piping 2017.

D. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless 2020.

E. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service 2019.

F. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements 2015.

G. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements 2015.

H. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements 2015.

I. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements 2016.

J. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends 2010.

1.03 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

PART 2 PRODUCTS

2.01 NATURAL GAS PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M, Schedule 40 black.
   1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.
   2. Joints: Threaded to ASME B31.1.

2.02 FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 3 Inches and Under:
   1. Ferrous Pipe: Class 150 malleable iron threaded unions.

B. Flanges for Pipe Size Over 1 Inch:
   1. Ferrous Pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.

C. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.03 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.
   1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
   2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
   3. Trapeze Hangers: Welded steel channel frames attached to structure.
   4. Vertical Pipe Support: Steel riser clamp.

B. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:

1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
5. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308.
6. Other Types: As required.

2.04 BALL VALVES

A. Construction, 4 Inches and Smaller: MSS SP-110, Class 150, 400 psi CWP, bronze body, 304 stainless steel ball, regular port, Teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, threaded ends with union.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

D. Install piping to maintain headroom, conserve space, and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section 22 05 16.

G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

H. Provide access where valves and fittings are not exposed.

I. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting.

J. Sleeve pipes passing through partitions, walls and floors.

K. Pipe Hangers and Supports:
   1. Install in accordance with ASME B31.9.
   2. Support horizontal piping as indicated.
   3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
   4. Place hangers within 12 inches of each horizontal elbow.
   5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
   6. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

3.02 SCHEDULES

A. Pipe Hanger Spacing:
   1. Metal Piping:
      a. Pipe Size: 1/2 inches to 1-1/4 inches:
         1) Maximum Hanger Spacing: 6.5 ft.
         2) Hanger Rod Diameter: 3/8 inches.
      b. Pipe Size: 1-1/2 inches to 2 inches:
         1) Maximum Hanger Spacing: 10 ft.
         2) Hanger Rod Diameter: 3/8 inch.

END OF SECTION

SECTION 23 31 00
HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal ductwork.

B. Nonmetal ductwork.

1.02 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2014.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2020.

D. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems 2018.

E. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible 2005 (Revised 2009).

PART 2 PRODUCTS

2.01 DUCT ASSEMBLIES

A. Regulatory Requirements: Construct ductwork to comply with NFPA 90A standards.

B. Ducts: Galvanized steel, unless otherwise indicated.

C. Low Pressure Supply (System with Cooling Coils): 1 inch wg pressure class, galvanized steel.

D. Return and Relief: 1 inch wg pressure class, galvanized steel.

E. General Exhaust: 1 inch wg pressure class, galvanized steel.

2.02 MATERIALS

A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.

B. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
   1. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
   2. VOC Content: Not more than 250 g/L, excluding water.
   3. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.
   4. For Use with Flexible Ducts: UL labeled.

C. Gasket Tape: Provide butyl rubber gasket tape for a flexible seal between transfer duct connector (TDC), transverse duct flange (TDF), applied flange connections, and angle rings connections.

D. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

2.03 DUCTWORK FABRICATION

A. Fabricate and support in accordance with SMACNA (DCS) and as indicated.

B. Provide duct material, gauges, reinforcing, and sealing for operating pressures indicated.

C. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide air foil turning vanes of perforated metal with glass fiber insulation.

D. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence

downstream.

E. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA (DCS).

2.04 MANUFACTURED DUCTWORK AND FITTINGS

A. Spiral Ducts: Round spiral lockseam duct with galvanized steel outer wall.
   1. Manufacture in accordance with SMACNA (DCS).

B. Round Ducts: Round lockseam duct with galvanized steel outer wall.
   1. Manufacture in accordance with SMACNA (DCS).

C. Flexible Ducts: Two ply vinyl film supported by helically wound spring steel wire.
   1. Insulation: Fiberglass insulation with polyethylene vapor barrier film.
   2. Pressure Rating: 10 inches wg positive and 1.0 inches wg negative.
   3. Maximum Velocity: 4000 fpm.
   4. Temperature Range: Minus 10 degrees F to 160 degrees F.

D. Transverse Duct Connection System: SMACNA "E" rated rigidly class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips in accordance with SMACNA (DCS).

E. Round Duct Connection System: Interlocking duct connection system in accordance with SMACNA (DCS).

PART 3 EXECUTION

3.01 INSTALLATION

A. Install, support, and seal ducts in accordance with SMACNA (DCS).

B. Install in accordance with manufacturer's instructions.

C. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

D. Flexible Ducts: Connect to metal ducts with liquid adhesive plus draw bands.

E. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.

F. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

G. Connect diffusers or light troffer boots to low pressure ducts directly or with 5 feet maximum length of flexible duct held in place with strap or clamp.

END OF SECTION

SECTION 23 33 00
AIR DUCT ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Air turning devices/extractors.

B. Volume control dampers.

C. Miscellaneous products:
   1. Damper operators.
   2. Duct opening closure film.

1.02 REFERENCE STANDARDS

A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems 2018.

B. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible 2005 (Revised 2009).

PART 2 PRODUCTS

2.01 AIR TURNING DEVICES/EXTRACTORS

A. Multi-blade device with radius blades attached to pivoting frame and bracket, steel construction, with push-pull operator strap.

2.02 VOLUME CONTROL DAMPERS

A. Fabricate in accordance with SMACNA (DCS) and as indicated.

B. Single Blade Dampers:
   1. Fabricate for duct sizes up to 6 by 30 inch.

C. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 by 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.

D. End Bearings: Except in round ducts 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon, thermoplastic elastomer, or sintered bronze bearings.

E. Quadrants:
   1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
   2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.
   3. Where rod lengths exceed 30 inches provide regulator at both ends.

2.03 MISCELLANEOUS PRODUCTS

A. Duct Opening Closure Film: Mold-resistant, self-adhesive film to keep debris out of ducts during construction.
   1. Thickness: 2 mils.
   2. High tack water based adhesive.
   3. UV stable light blue color.
   4. Elongation Before Break: 325 percent, minimum.

PART 3 EXECUTION

3.01 PREPARATION

A. Verify that electric power is available and of the correct characteristics.

3.02 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). Refer to Section 23 31 00 for duct construction and pressure class.

B. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

END OF SECTION

SECTION 23 37 00
AIR OUTLETS AND INLETS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Rectangular ceiling diffusers.

B. Registers/grilles:
   1. Wall-mounted, supply register/grilles.
   2. Wall-mounted, exhaust and return register/grilles.

1.02 REFERENCE STANDARDS

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Krueger-HVAC.

B. Price Industries.

C. Titus, a brand of Air Distribution Technologies.

2.02 RECTANGULAR CEILING DIFFUSERS

A. Type: Provide square, panel-faced diffuser to discharge air in four way pattern.

B. Connections: Round.

C. Frame: Provide inverted T-bar type.

D. Fabrication: Steel with baked enamel finish.

E. Color: As indicated.

2.03 WALL SUPPLY REGISTERS/GRILLES

A. Type: Streamlined and individually adjustable blades, 3/4 inch minimum depth, 3/4 inch maximum spacing with spring or other device to set blades, vertical face, double deflection.

B. Frame: 1-1/4 inch margin with concealed mounting and gasket.

C. Fabrication: Steel with 20 gauge, 0.0359 inch minimum frames and 22 gauge, 0.0299 inch minimum blades, steel and aluminum with 20 gauge, 0.0359 inch minimum frame, or aluminum extrusions, with factory baked enamel finish.

D. Color: To be selected by Architect from manufacturer's standard range.

E. Damper: Integral, gang-operated opposed blade type with removable key operator, operable from face.

2.04 WALL EXHAUST AND RETURN REGISTERS/GRILLES

A. Type: Streamlined blades, 3/4 inch minimum depth, 3/4 inch maximum spacing, with spring or other device to set blades, horizontal face.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Check location of outlets and inlets and make necessary adjustments in position to comply with architectural features, symmetry, and lighting arrangement.

C. Install diffusers to ductwork with air tight connection.

D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.

END OF SECTION

SECTION 26 05 05
SELECTIVE DEMOLITION FOR ELECTRICAL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical demolition.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work: As specified in individual sections.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that abandoned wiring and equipment serve only abandoned facilities.

B. Demolition drawings are based on casual field observation and existing record documents.

C. Report discrepancies to Architect before disturbing existing installation.

D. Beginning of demolition means installer accepts existing conditions.

3.02 PREPARATION

A. Disconnect electrical systems in walls, floors, and ceilings to be removed.

B. Coordinate utility service outages with utility company.
   1. Plan the installation of work so that interruptions of services to the building are kept to a minimum, and such interruptions shall occur at owner's conveniance.
   2. Interruptions shall be for as short of duration as possible.
   3. Service shutdown shall not commence without owner approval. Contractor shall obtain permission from the owner to shut off services to any location by notification in writing a minimum of two weeks prior to shutdown. Notification shall include the reason for and duration of the service shutdown.

C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

D. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.

E. Existing Fire Alarm System: Maintain existing system in service until new system is accepted. Disable system only to make switchovers and connections. Minimize outage duration.
   1. Notify local fire service.

F. Existing Communications Systems: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.

3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Refer to electrical abbreviations on drawings for demolition tag descriptions: "E","R","RR", etc

B. Remove, relocate, and extend existing installations to accommodate new construction.

C. Remove abandoned wiring to source of supply.

D. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.

E. Remove abandoned surface mounted raceway. Where existing surface mounted raceway is installed and devices are shown to be removed, coordinate device removal with existing devices to remain. If removal of a device will effect the installation of remaining devices, notify

the engineer prior to demolition.

F. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank stainless steel cover for abandoned junction boxes.

G. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.

H. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.

I. Repair adjacent construction and finishes damaged during demolition and extension work.

J. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.

END OF SECTION

SECTION 26 05 19
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Single conductor building wire.

B. Metal-clad cable.

C. Wiring connectors.

1.02 RELATED REQUIREMENTS

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

B. Section 07 84 00 - Firestopping.

C. Section 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS: Additional requirements for grounding conductors and grounding connectors.

D. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire 2013 (Reapproved 2018).

B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft 2011 (Reapproved 2017).

C. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation 2004 (Reapproved 2020).

D. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape 2017.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

F. NECA 120 - Standard for Installing Armored Cable (AC) and Metal-Clad Cable (MC) 2012.

G. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy 2009.

H. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. UL 44 - Thermoset-Insulated Wires and Cables Current Edition, Including All Revisions.

J. UL 83 - Thermoplastic-Insulated Wires and Cables Current Edition, Including All Revisions.

K. UL 486A-486B - Wire Connectors Current Edition, Including All Revisions.

L. UL 486C - Splicing Wire Connectors Current Edition, Including All Revisions.

M. UL 486D - Sealed Wire Connector Systems Current Edition, Including All Revisions.

N. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape Current Edition, Including All Revisions.

O. UL 1569 - Metal-Clad Cables Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS

A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.

B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

C. Metal-clad cable is permitted only as follows:
   1. Where not otherwise restricted, may be used:
      a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.
      b. Where concealed in hollow stud walls, above accessible ceilings, and under raised floors for branch circuits up to 20 A.
   2. In addition to other applicable restrictions, may not be used:
      a. Where exposed to view.
      b. Where exposed to damage.
      c. For damp, wet, or corrosive locations.
      d. For homeruns to electrical panels.

2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

A. Provide products that comply with requirements of NFPA 70.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

D. Comply with NEMA WC 70/ICEA S-95-658.

E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

G. Conductors for Grounding and Bonding: Also comply with Section 26 05 26.

H. Conductor Material:
   1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
   2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.

I. Minimum Conductor Size:
   1. Branch Circuits: 12 AWG.
      a. Exceptions:
         1) 20A, 120 V circuit longer than 100 ft: 10 AWG. for voltage drop.

J. Conductor Color Coding:
   1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
   2. Color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."
   3. Color Code:
      a. 208Y/120 V, 3 Phase, 4 Wire System:
         1) Phase A: Black.
         2) Phase B: Red.

3) Phase C: Blue.
4) Neutral/Grounded: White.

b. Equipment Ground, All Systems: Green.

2.03 SINGLE CONDUCTOR BUILDING WIRE

A. Manufacturers:
1. Copper Building Wire:
a. Cerro Wire LLC: www.cerrowire.com/#sle.
b. Encore Wire Corporation: www.encorewire.com/#sle.
c. General Cable Technologies Corporation: www.generalcable.com/#sle.
d. Southwire Company: www.southwire.com/#sle.

B. Description: Single conductor insulated wire.

C. Conductor Stranding:
1. Feeders and Branch Circuits:
a. Size 10 AWG and Smaller: Solid.
b. Size 8 AWG and Larger: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Insulation:
1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2.

2.04 METAL-CLAD CABLE

A. Manufacturers:
1. AFC Cable Systems Inc: www.afcweb.com/#sle.
2. Encore Wire Corporation: www.encorewire.com/#sle.
3. Southwire Company: www.southwire.com/#sle.

B. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.

C. Conductor Stranding:
1. Size 10 AWG and Smaller: Solid.
2. Size 8 AWG and Larger: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.

F. Grounding: Full-size integral equipment grounding conductor.

G. Armor: Steel, interlocked tape.

2.05 WIRING CONNECTORS

A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

B. Connectors for Grounding and Bonding: Comply with Section 26 05 26.

C. Wiring Connectors for Splices and Taps:
1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.

D. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.
1. Manufacturers:
a. 3M: www.3m.com/#sle.
b. Ideal Industries, Inc: www.idealindustries.com/#sle.
c. NSI Industries LLC: www.nsiindustries.com/#sle.

E. Mechanical Connectors: Provide bolted type or set-screw type.
   1. Manufacturers:
      a. Burndy LLC: www.burndy.com/#sle.
      b. Ilsco: www.ilsco.com/#sle.
      c. Thomas & Betts Corporation: www.tnb.com/#sle.

F. Compression Connectors: Provide circumferential type or hex type crimp configuration.
   1. Manufacturers:
      a. Burndy LLC: www.burndy.com/#sle.
      b. Ilsco: www.ilsco.com/#sle.
      c. Thomas & Betts Corporation: www.tnb.com/#sle.

2.06 ACCESSORIES

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Electrical Tape:
   1. Manufacturers:
      a. 3M: www.3m.com/#sle.
      b. Plymouth Rubber Europa: www.plymouthrubber.com/#sle.
   2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.

C. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.

D. Cable Ties: Material and tensile strength rating suitable for application.

PART 3 EXECUTION

3.01 INSTALLATION

A. Circuiting Requirements:
   1. Unless dimensioned, circuit routing indicated is diagrammatic.
   2. When circuit destination is indicated without specific routing, determine exact routing required.
   3. Arrange circuiting to minimize splices.
   4. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
   5. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.

B. Install products in accordance with manufacturer's instructions.

C. Perform work in accordance with NECA 1 (general workmanship).

D. Install metal-clad cable (Type MC) in accordance with NECA 120.

E. Installation in Raceway:
   1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
   2. Pull all conductors and cables together into raceway at same time.
   3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
   4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.

F. Exposed Cable Installation (only where specifically permitted):
   1. Route cables parallel or perpendicular to building structural members and surfaces.

2. Protect cables from physical damage.

G. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

H. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

I. Terminate cables using suitable fittings.
   1. Metal-Clad Cable (Type MC):
      a. Use listed fittings.
      b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.

J. Install conductors with a minimum of 6-inches of slack at each outlet.

K. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

L. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

M. Make wiring connections using specified wiring connectors.
   1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
   2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
   3. Do not remove conductor strands to facilitate insertion into connector.
   4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
   5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

N. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.

O. Insulate ends of spare conductors using vinyl insulating electrical tape.

P. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

Q. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

END OF SECTION

SECTION 26 05 26
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Grounding and bonding requirements.

B. Conductors for grounding and bonding.

C. Connectors for grounding and bonding.

1.02 RELATED REQUIREMENTS

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

B. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding.

C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

B. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. UL 467 - Grounding and Bonding Equipment Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS

A. Existing Work: Where existing grounding and bonding system components are indicated to be reused, they may be reused only where they are free from corrosion, integrity and continuity are verified, and where acceptable to the authority having jurisdiction.

B. Do not use products for applications other than as permitted by NFPA 70 and product listing.

C. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

D. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

E. Bonding and Equipment Grounding:
   1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
   2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.

3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.

2.02 GROUNDING AND BONDING COMPONENTS

A. General Requirements:
   1. Provide products listed, classified, and labeled as suitable for the purpose intended.
   2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 05 26:
   1. Use insulated copper conductors unless otherwise indicated.
      a. Exceptions:
         1) Use bare copper conductors where installed underground in direct contact with earth.
         2) Use bare copper conductors where directly encased in concrete (not in raceway).
      b. Where bare copper conductors are used for grounding systems, they shall comply with the following:
         1) Solid Conductors: ASTM B 3.
         2) Stranded Conductors: ASTM B 8.
         3) Tinend Conductors: ASTM B 33.
         4) Bonding Cable: 28 KCMIL, 14 strands of No. 17 AWG conductors, 1/4 inch in diameter.
         5) Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
         6) Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
         7) Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

C. Connectors for Grounding and Bonding:
   1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
   2. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.

PART 3 EXECUTION

3.01 INSTALLATION

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

B. Perform work in accordance with NECA 1 (general workmanship).

C. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
   1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
   2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
   3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

E. Make grounding and bonding connections using specified connectors.

1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
3. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
    a. Applications:
        1) Pipe and equipment grounding conductor terminations.

F. Identify grounding and bonding system components in accordance with Section 26 05 53.

3.02 EQUIPMENT GROUNDING:

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

3.03 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Tests and Inspection: After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
    1. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions

END OF SECTION

SECTION 26 05 29
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.02 RELATED REQUIREMENTS

A. Section 26 05 33.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.

B. Section 26 05 33.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.

C. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.

D. Section 26 51 00 - Interior Lighting: Additional support and attachment requirements for interior luminaires.

1.03 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.

C. MFMA-4 - Metal Framing Standards Publication 2004.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

E. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems, non-penetrating rooftop supports, and post-installed concrete and masonry anchors.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
   1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
   2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
   3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
   4. Do not use products for applications other than as permitted by NFPA 70 and product listing.
   5. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
      a. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.

C. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.

D. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
   1. Comply with MFMA-4.
   2. Channel Material:
      a. galvanized steel.
   3. Minimum Channel Dimensions: 1-5/8 inch width by 13/16 inch height.

E. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.

F. Anchors and Fasteners:
   1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
   2. Hollow Stud Walls: Use toggle bolts.
   3. Steel: Use beam clamps complying with MSS SP-96.
   4. Sheet Metal: Use sheet metal screws.
   5. Wood: Use Fasten with lag screws or through bolts.

PART 3 EXECUTION

3.01 INSTALLATION

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

B. Perform work in accordance with NECA 1 (general workmanship).

C. Do not provide support from piping, ductwork, or other systems.

D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

G. Equipment Support and Attachment:
   1. Strength and support assemblies: where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
   2. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMTs, IMCs, and RMCs as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
   3. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
   4. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
   5. Use slotted-channel racks attached to substrate to support equipment surface-mounted on hollow stud wallsand nonstructual building surfaces.
   6. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
   7. Unless otherwise indicated, mount floor-mounted equipment on properly sized 3 inch high concrete pad constructed in accordance with Section 03 30 00 and as specified in this section.
   8. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
   9. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

10. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

H. Secure fasteners according to manufacturer's recommended torque settings.

I. Remove temporary supports.

END OF SECTION

SECTION 26 05 33.13
CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Galvanized steel rigid metal conduit (RMC).
B. Flexible metal conduit (FMC).
C. Liquidtight flexible metal conduit (LFMC).
D. Electrical metallic tubing (EMT).
E. Surface Mounted Raceways
F. Conduit fittings.
G. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete encasement of conduits.
B. Section 07 84 00 - Firestopping.
C. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables.
D. Section 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS.
   1. Includes additional requirements for fittings for grounding and bonding.
E. Section 26 05 29 - Hangers and Supports for Electrical Systems.
F. Section 26 05 33.16 - Boxes for Electrical Systems.
G. Section 26 05 33.23 - Surface Raceways for Electrical Systems.
H. Section 26 05 39 - Underfloor Raceways for Electrical Systems.
I. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
J. Section 26 21 00 - Low-Voltage Electrical Service Entrance: Additional requirements for electrical service conduits.

1.03 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC) 2015.
B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S) 2015.
C. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
D. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT) 2013.
E. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable 2014.
F. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
G. UL 1 - Flexible Metal Conduit Current Edition, Including All Revisions.
H. UL 6 - Electrical Rigid Metal Conduit-Steel Current Edition, Including All Revisions.
I. UL 360 - Liquid-Tight Flexible Steel Conduit Current Edition, Including All Revisions.
J. UL 514B - Conduit, Tubing, and Cable Fittings Current Edition, Including All Revisions.
K. UL 797 - Electrical Metallic Tubing-Steel Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate minimum sizes of conduits with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
2. Coordinate the arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
3. Verify exact conduit termination locations required for boxes, enclosures, and equipment installed under other sections or by others.
4. Coordinate the work with other trades to provide roof penetrations that preserve the integrity of the roofing system and do not void the roof warranty.
5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
1. Do not begin installation of conductors and cables until installation of conduit is complete between outlet, junction and splicing points.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.

B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.

C. Concealed Within Masonry Walls: Use electrical metallic tubing (EMT).

D. Concealed Within Hollow Stud Walls: Use electrical metallic tubing (EMT).

E. Concealed Above Accessible Ceilings: Use electrical metallic tubing (EMT).

F. Interior, Damp or Wet Locations: Use electrical metallic tubing (EMT).

G. Exposed, Interior, Not Subject to Physical Damage, Located within unfinished spaces(mechanical rooms/storage rooms): Use electrical metallic tubing (EMT).

H. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit.

I. Exposed, Exterior: Use galvanized steel rigid metal conduit.

J. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit.

K. Connections to Vibrating Equipment, 3" and larger trade size at equipment:
1. Dry Locations: Use flexible metal conduit.
2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.
3. Maximum Length: 6 feet unless otherwise indicated.
4. Vibrating equipment includes, but is not limited to:
   a. Transformers.
   b. Motors.
   c. Pneumatic Equipment
   d. Electric Solenoids.
   e. Hydraulic equipment.
5. Equipment connections includes,
   a. Switchboards
   b. Panels
   c. Transformers

L. Fished in Existing Walls, Where Necessary: Use flexible metal conduit.

2.02 CONDUIT REQUIREMENTS

A. Existing Work: Where existing conduits are indicated to be reused, they may be reused only where they comply with specified requirements, are free from corrosion, and integrity is verified by pulling a mandrel through them.

B. Fittings for Grounding and Bonding: Also comply with Section 26 05 26.

C. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.

D. Provide products listed, classified, and labeled as suitable for the purpose intended.

E. Minimum Conduit Size, Unless Otherwise Indicated:
   1. Branch Circuits: 1/2 inch (16 mm) trade size.

F. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Manufacturers:
   1. Allied Tube & Conduit: www.alliedeg.com/#sle.
   2. Republic Conduit: www.republic-conduit.com/#sle.
   3. Wheatland Tube, a Division of Zekelman Industries: www.wheatland.com/#sle.

B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

C. Fittings:
   1. Manufacturers:
      a. Bridgeport Fittings Inc: www.bptfittings.com/#sle.
      b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.
      c. Thomas & Betts Corporation: www.tnb.com/#sle.
   2. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   3. Material: Use steel.
   4. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.04 FLEXIBLE METAL CONDUIT (FMC)

A. Manufacturers:
   1. AFC Cable Systems, Inc: www.afcweb.com/#sle.
   2. Electri-Flex Company: www.electriflex.com/#sle.
   3. International Metal Hose: www.metalhose.com/#sle.

B. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.

C. Fittings:
   1. Manufacturers:
      a. Bridgeport Fittings Inc: www.bptfittings.com/#sle.
      b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.
      c. Thomas & Betts Corporation: www.tnb.com/#sle.
   2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   3. Material: Use steel.

2.05 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Manufacturers:
   1. AFC Cable Systems, Inc: www.afcweb.com/#sle.
   2. Electri-Flex Company: www.electriflex.com/#sle.

3. International Metal Hose: www.metalhose.com/#sle.

B. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.

C. Fittings:
   1. Manufacturers:
      a. Bridgeport Fittings Inc: www.bptfittings.com/#sle.
      b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.
      c. Thomas & Betts Corporation: www.tnb.com/#sle.
   2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   3. Material: Use steel.

2.06 ELECTRICAL METALLIC TUBING (EMT)

A. Manufacturers:
   1. Allied Tube & Conduit: www.alliedeg.com/#sle.
   2. Republic Conduit: www.republic-conduit.com/#sle.
   3. Wheatland Tube, a Division of Zekelman Industries: www.wheatland.com/#sle.

B. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

C. Fittings:
   1. Manufacturers:
      a. Bridgeport Fittings Inc: www.bptfittings.com/#sle.
      b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.
      c. Thomas & Betts Corporation: www.tnb.com/#sle.
   2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   3. Material: Use steel.
   4. Connectors and Couplings: Use compression (gland) or set-screw type.
      a. Do not use indenter type connectors and couplings.
   5. Damp or Wet Locations (where permitted): Use fittings listed for use in wet locations.

2.07 SURFACE MOUNTED RACEWAYS

A. Provide all components, fittings, supports, and accessories required for a complete raceway system.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Do not use raceways for applications other than as permitted by NFPA 70 and product listing.

D. Surface Metal Raceways: Listed and labeled as complying with UL 5.

E. Surface Nonmetallic Raceways: Listed and labeled as complying with UL 5A.

F. Multioutlet Assemblies: Listed and labeled as complying with UL 111.
   1. Color: To be selected by architect prior to product order.
   2. Accessory Device Boxes: Suitable for the devices to be installed; color to match raceway.

PART 3 EXECUTION

3.01 INSTALLATION

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

B. Perform work in accordance with NECA 1 (general workmanship).

C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.

D. Conduit Routing:
   1. Unless dimensioned, conduit routing indicated is diagrammatic.
   2. When conduit destination is indicated without specific routing, determine exact routing required.

3. Conceal all conduits unless specifically indicated to be exposed.
4. Install raceways square to enclosures and terminate with locknuts.
5. Conduits in the following areas may be exposed, unless otherwise indicated:
    a. Electrical rooms.
    b. Mechanical equipment rooms.
    c. Within joists in areas with no ceiling.
6. Unless otherwise approved, do not route conduits exposed:
    a. Across floors.
    b. Across roofs.
    c. Across top of parapet walls.
    d. Across building exterior surfaces.
7. Arrange conduit to maintain adequate headroom, clearances, and access.
8. Arrange conduit to provide no more than the equivalent of three 90 degree bends between pull points.
9. Maintain minimum clearance of 6 inches between conduits and piping for other systems.
10. Maintain minimum clearance of 12 inches between conduits and hot surfaces. This includes, but is not limited to:
    a. Heaters.
    b. Hot water piping.
    c. Flues.
11. Arrange stub-ups so curved portions of bends are not visible above finished slab.

E. Conduit Support:
1. Secure and support conduits in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.
2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
4. Use conduit strap to support single surface-mounted conduit.
    a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
5. Use metal channel (strut) with accessory conduit clamps to support multiple parallel surface-mounted conduits.
6. Use conduit clamp to support single conduit from beam clamp or threaded rod.
7. Use trapeze hangers assembled from threaded rods and metal channel (strut) with accessory conduit clamps to support multiple parallel suspended conduits.
8. Use non-penetrating rooftop supports to support conduits routed across rooftops (only where approved). Coordinate required roofing material modifications with roofing installer for conduit support locations prior to installation.
9. Support conduits within 12 inches of connected enclosure.

F. Connections and Terminations:
1. Use approved conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
3. Use suitable adapters where required to transition from one type of conduit to another.
4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
5. Terminate threaded conduits in boxes and enclosures using threaded hubs for dry locations and raintight hubs for wet locations.
6. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
7. Secure joints and connections to provide maximum mechanical strength and electrical continuity.

8. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

G. Penetrations:
   1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
   2. Make penetrations perpendicular to surfaces unless otherwise indicated.
   3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
   4. Conceal bends for conduit risers emerging above ground.
   5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
   6. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
   7. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty.
   8. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

H. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
   1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
   2. Where conduits are subject to earth movement by settlement or frost.

I. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
   1. Where conduits pass from outdoors into conditioned interior spaces.
   2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
   3. Where conduits penetrate coolers or freezers.

J. Provide pull string in all empty conduits and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches at each end.

K. Provide grounding and bonding in accordance with Section 26 05 26.

L. Surface Raceway Installation:
   1. Install surface raceway with a minimum 2-inch radius control at bend points.
   2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight raceway section.
   3. Support raceway according to manufacturers written instructions. Tape and glue are not acceptable support methods.

END OF SECTION

SECTION 26 05 33.16
BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.

B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.

1.02 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 08 31 00 - Access Doors and Panels: Panels for maintaining access to concealed boxes.

C. Section 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS.

D. Section 26 05 29 - Hangers and Supports for Electrical Systems.

E. Section 26 05 33.13 - Conduit for Electrical Systems:
   1. Conduit bodies and other fittings.

F. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

G. Section 26 27 26 - Wiring Devices:
   1. Wall plates.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices 2010.

C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable 2014.

D. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports 2013.

E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2018.

F. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations Current Edition, Including All Revisions.

H. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations Current Edition, Including All Revisions.

I. UL 508A - UL Standard for Safety Industrial Control Panels 2018.

J. UL 514A - Metallic Outlet Boxes Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
   2. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
   3. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
   4. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.

5. Coordinate the work with other trades to preserve insulation integrity.
6. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
7. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for outlet and device boxes, junction and pull boxes, and cabinets and enclosures.

PART 2 PRODUCTS

2.01 BOXES

A. General Requirements:
1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
3. Provide products listed, classified, and labeled as suitable for the purpose intended.
4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:
1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
2. Use cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
3. Use raised covers suitable for the type of wall construction and device configuration where required.
4. Use shallow boxes where required by the type of wall construction.
5. Do not use "through-wall" boxes designed for access from both sides of wall.
6. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
7. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
8. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
9. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
10. Minimum Box Size, Unless Otherwise Indicated:
    a. 4 inch square by 1-1/2 inch deep (100 by 38 mm) trade size
11. Wall Plates: Comply with Section 26 27 26.

C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:
1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
2. NEMA 250 Environment Type, Unless Otherwise Indicated:
    a. Indoor Clean, Dry Locations: Type 1, painted steel.
    b. Outdoor Locations: Type 3R, painted steel.
3. Junction and Pull Boxes Larger Than 100 cubic inches:
    a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
4. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:
    a. Provide lockable hinged covers unless otherwise indicated.

b. Back Panels: Painted steel, removable.

5. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.
6. Manufacturers:
   a. Cooper B-Line, a division of Eaton Corporation: www.cooperindustries.com/#sle.
   b. Hoffman, a brand of Pentair Technical Products: www.hoffmanonline.com/#sle.
   c. Hubbell Incorporated; Wiegmann Products: www.hubbell-wiegmann.com/#sle.

PART 3 EXECUTION

3.01 INSTALLATION

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

B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide separate boxes for emergency power and normal power systems.

E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.

F. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.

G. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.

H. Box Locations:
   1. Mount at heights indicated on drawings. If mounting heights are not individually indicated, Locate boxes to be accessible. Provide access panels in accordance with Section 08 31 00 as requiredwhere approved by the Architect.
   2. Unless dimensioned, box locations indicated are approximate.
   3. Locate boxes so that wall plates do not span different building finishes.
   4. Locate boxes so that wall plates do not cross masonry joints.
   5. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
   6. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches horizontal separation unless otherwise indicated.
   7. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.

I. Box Supports:
   1. Secure and support boxes in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.
   2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
   3. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.
   4. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
   5. Do not support boses by conduit alone.

J. Install boxes plumb and level.

K. Flush-Mounted Boxes:
   1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch or does not project beyond finished surface.
   2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.

3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the edge of the box.

L. Install boxes as required to preserve insulation integrity.

M. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

N. Close unused box openings.

O. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

P. Provide grounding and bonding in accordance with Section 26 05 26.

Q. Identify boxes in accordance with Section 26 05 53.

END OF SECTION

SECTION 26 05 48
VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Seismic control requirements.
   1. Includes requirements for seismic qualification of equipment not specified in this section.

B. Seismic restraint systems.

1.02 RELATED REQUIREMENTS

A. Section 26 05 29 - Hangers and Supports for Electrical Systems.

1.03 DEFINITIONS

A. Seismic Restraint: Structural members or assemblies of members or manufactured elements specifically designed and applied for transmitting seismic forces between components and the seismic force-resisting system of the structure.

1.04 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures Most Recent Edition Cited by Referring Code or Reference Standard.

B. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications Most Recent Edition Cited by Referring Code or Reference Standard.

C. FEMA 413 - Installing Seismic Restraints for Electrical Equipment 2004.

D. FEMA E-74 - Reducing the Risks of Nonstructural Earthquake Damage 2012.

E. ICC (IBC) - International Building Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

G. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems 2008.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for products, including materials, fabrication details, dimensions, and finishes.
   1. Seismic Controls: Include seismic load capacities.

C. Seismic Design Data:
   1. Compile information on project-specific characteristics of actual installed electrical components necessary for determining seismic design forces required to design appropriate seismic controls, including but not limited to the following.
      a. Component operating weight and center of gravity.
      b. Component importance factor (Ip).
   2. Include structural calculations, stamped or sealed by seismic controls designer, demonstrating suitability of seismic controls for seismic design forces.

PART 2 PRODUCTS

2.01 SEISMIC CONTROL REQUIREMENTS

A. Design and provide electrical component restraints, supports, and attachments suitable for seismic loads determined in accordance with applicable codes, as well as gravity and operating loads and other structural design considerations of the installed location. Consider wind loads for outdoor electrical components.

B. Seismic Design Criteria: ICC (IBC).

C. Component Importance Factor (Ip): Electrical components to be assigned a component importance factor (Ip) of 1.5 unless otherwise indicated.

D. Component Importance Factor (Ip): Electrical components essential to life safety to be assigned a component importance factor (Ip) of 1.5 as indicated or as required. This includes but is not limited to:
   1. Electrical components required to function for life safety purposes after an earthquake.
   2. Electrical components that support or otherwise contain hazardous substances.

E. Seismic Restraints:
   1. Provide seismic restraints for electrical components except where exempt according to applicable codes and specified seismic design criteria, as approved by authorities having jurisdiction.
   2. Comply with applicable general recommendations of the following, where not in conflict with applicable codes, seismic design criteria, or other specified requirements:
      a. ASHRAE (HVACA).
      b. FEMA 413.
      c. FEMA E-74.
      d. SMACNA (SRM).
   3. Seismic Restraint Systems:
      a. Except where otherwise restricted, use of either cable or rigid restraints is permitted.
      b. Use only cable restraints to restrain vibration-isolated electrical components, including distributed systems.
      c. Size restraint elements, including anchorage, to resist seismic loads as necessary to restrain electrical component in all lateral directions; consider bracket geometry in anchor load calculations.
      d. Use rod stiffener clips to attach bracing to hanger rods as required to prevent rod buckling from vertical (upward) compressive load introduced by cable or rigid restraints loaded in tension, in excess of downward tensile load due to supported electrical component weight.
      e. Select hanger rods and associated anchorage as required to accommodate vertical (downward) tensile load introduced by rigid restraints loaded in compression, in addition to downward tensile load due to supported electrical component weight.
      f. Clevis hangers may only be used for attachment of transverse restraints; do not use for attachment of longitudinal restraints.
      g. Where seismic restraints are attached to clevis hangers, provide clevis bolt reinforcement accessory to prevent clevis hanger deformation.
      h. Do not introduce lateral loads on open bar joist chords or the weak axis of beams, or loads in any direction at other than panel points unless approved by project Structural Engineer of Record.

F. Seismic Attachments:
   1. Attachments to be bolted, welded, or otherwise positively fastened without consideration of frictional resistance produced by the effects of gravity.
   2. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) or qualified evaluation service acceptable to authorities having jurisdiction for compliance with applicable building code, and qualified for seismic applications; concrete anchors to be qualified for installation in both cracked and uncracked concrete.
   3. Do not use power-actuated fasteners.
   4. Do not use friction clips (devices that rely on mechanically applied friction to resist loads). Beam clamps may be used for supporting sustained loads where provided with restraining straps.
   5. Comply with anchor minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.

G. Seismic Interactions:
   1. Include provisions to prevent seismic impact between electrical components and other structural or nonstructural components.
   2. Include provisions such that failure of a component, either essential or nonessential, does not cause the failure of an essential component.

H. Seismic Relative Displacement Provisions:
   1. Use suitable fittings or flexible connections to accommodate:
      a. Relative displacements between component supports attached to dissimilar parts of structure that may move differently during an earthquake.
      b. Design displacements at seismic separations.
      c. Anticipated drifts between floors.

PART 3 EXECUTION

3.01 INSTALLATION

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

B. Install products in accordance with applicable requirements of NECA 1 (general workmanship).

C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

D. Secure fasteners according to manufacturer's recommended torque settings.

E. Install flexible conduit and cable connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.

F. Seismic Controls:
   1. Provide specified snubbing element air gap; remove any factory-installed spacers, debris or other obstructions.
   2. Use only specified components, anchorage, and hardware evaluated by seismic design. Comply with conditions of seismic certification where applicable.
   3. Where mounting hole diameter exceeds bolt diameter by more than 0.125 inch, use epoxy grout, elastomeric grommet, or welded washer to reduce clearance to 0.125 inch or less.
   4. Equipment with Sheet Metal Housings:
      a. Use Belleville washers to distribute stress over a larger surface area of the sheet metal connection interface as approved by manufacturer.
      b. Attach additional steel as approved by manufacturer where required to transfer loads to structure.
      c. Where mounting surface is irregular, do not shim housing; reinforce housing with additional steel as approved by manufacturer.

END OF SECTION

SECTION 26 05 53
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical identification requirements.

B. Identification nameplates and labels.

C. Wire and cable markers.

D. Voltage markers.

1.02 RELATED REQUIREMENTS

A. Section 26 27 26 - Wiring Devices - Lutron: Device and wallplate finishes; factory pre-marked wallplates.

B. Section 27 10 00 - Structured Cabling: Identification for communications cabling and devices.

1.03 REFERENCE STANDARDS

A. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs 2011.

B. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels 2011.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.

PART 2 PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS

A. Existing Work: Unless specifically excluded, identify existing elements to remain that are not already identified in accordance with specified requirements.

B. Identification for Equipment:
   1. Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".

C. Identification for Conductors and Cables:
   1. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
      a. Color-Coding for Phase- and Voltage-Level Identification, 600 V or Less: Use colors listed below for ungrounded feeder and branch-circuit conductors.
         1) Color shall be factory applied or field applied for sizes larger than No. 8 AWG if authorities having jurisdiction permit.
         2) Colors for 208/120-V Circuits:
            (a) Phase A: Black.
            (b) Phase B: Red.
            (c) Phase C: Blue.
         3) Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
   2. Identification for Communications Conductors and Cables: Comply with Section 27 10 00.
   3. Use identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.

4. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:
    a. Within boxes when more than one circuit is present.

D. Identification for Boxes:
1. Use identification labels or handwritten text using indelible marker to identify circuits enclosed.
    a. For exposed boxes in public areas, use only identification labels.

E. Identification for Devices:
1. Identification for Communications Devices: Comply with Section 27 10 00.
2. Wiring Device and Wallplate Finishes: Comply with Section 26 27 26.
3. Use identification label to identify serving branch circuit for all receptacles.
    a. For receptacles in areas as directed by Architect, provide identification on inside surface of wallplate. Verify with Architect prior to label application.
4. Use identification label to identify receptacles protected by upstream GFI protection, where permitted.

2.02 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Labels:
1. Manufacturers:
    a. Brady Corporation: www.bradyid.com/#sle.
    b. Brother International Corporation: www.brother-usa.com/#sle.
    c. Panduit Corp: www.panduit.com/#sle.
2. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
    a. Use only for indoor locations.
3. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

B. Format for Receptacle Identification:
1. Minimum Size: 3/8 inch by 1.5 inches.
2. Legend: Power source and circuit number or other designation indicated.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 3/16 inch.
5. Color: Black text on clear background.

C. Format for Control Device Identification:
1. Minimum Size: 3/8 inch by 1.5 inches.
2. Legend: Load controlled or other designation indicated.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 3/16 inch.
5. Color: Black text on clear background.

2.03 WIRE AND CABLE MARKERS

A. Manufacturers:
1. Brady Corporation: www.bradyid.com/#sle.
2. HellermannTyton: www.hellermanntyton.com/#sle.
3. Panduit Corp: www.panduit.com/#sle.

B. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl self-laminating type markers suitable for the conductor or cable to be identified.

C. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.

D. Legend: Power source and circuit number or other designation indicated.

E. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.

F. Minimum Text Height: 1/8 inch.

G. Color: Black text on white background unless otherwise indicated.

PART 3 EXECUTION

3.01 PREPARATION

A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.02 INSTALLATION

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

B. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, drawings, shop drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout project.

C. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
   1. Boxes: Outside face of cover.
   2. Conductors and Cables: Legible from the point of access.
   3. Devices: Outside face of cover.

D. Install identification products centered, level, and parallel with lines of item being identified.

E. Apply identification devices to surfaces that require finish after completing finish work.

F. Unless labels and nameplates are provided with self-adhesive means of attachment, fasten them with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

G. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.

H. Mark all handwritten text, where permitted, to be neat and legible.

I. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

J. Equipment To Be Labeled:
   1. Enclosures and electrical cabinets.
   2. Access doors and panels for concealed electrical items.
   3. Emergency system boxes and enclosures.

END OF SECTION

SECTION 26 09 23
LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Occupancy sensors.

B. Lighting contactors.

1.02 RELATED REQUIREMENTS

A. Section 26 05 29 - Hangers and Supports for Electrical Systems

B. Section 26 05 33.16 - Boxes for Electrical Systems.

C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

D. Section 26 27 26 - Wiring Devices: Devices for manual control of lighting, including wall switches.
   1. Includes finish requirements for wall controls specified in this section.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices 2010.

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2018.

D. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts 2000, with Errata (2008).

E. NEMA ICS 6 - Industrial Control and Systems: Enclosures 1993 (Reaffirmed 2016).

F. UL 60947-1 - Low-Voltage Switchgear and Controlgear - Part 1: General Rules Current Edition, Including All Revisions.

G. UL 60947-4-1 - Low-Voltage Switchgear and Controlgear - Part 4-1: Contactors and Motor-starters - Electromechanical Contactors and Motor-starters Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the placement of lighting control devices with millwork, furniture, equipment, etc. installed under other sections or by others.
   2. Coordinate the placement of wall switch occupancy sensors with actual installed door swings.
   3. Coordinate the placement of occupancy sensors with millwork, furniture, equipment or other potential obstructions to motion detection coverage installed under other sections or by others.
   4. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.
   1. Occupancy Sensors: Include detailed motion detection coverage range diagrams.

C. Shop Drawings:
   1. Occupancy Sensors: Provide lighting plan indicating location, model number, and orientation of each occupancy sensor and associated system component.

D. Field Quality Control Reports.

E. Operation and Maintenance Data: Include detailed information on device programming and setup.

F. Project Record Documents: Record actual installed locations and settings for lighting control devices.

1.06 DELIVERY, STORAGE, AND PROTECTION

A. Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for all occupancy sensors.

C. Provide five year manufacturer warranty for all daylighting controls.

PART 2 PRODUCTS

2.01 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless specifically indicated to be excluded, provide all required conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.

2.02 OCCUPANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Refer to drawings and controls schedules for listed manufacturers.

B. All Occupancy Sensors:
   1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.
   2. Sensor Technology:
      a. Passive Infrared (PIR) Occupancy Sensors: Designed to detect occupancy by sensing movement of thermal energy between zones.
      b. Ultrasonic Occupancy Sensors: Designed to detect occupancy by sensing frequency shifts in emitted and reflected inaudible sound waves.
      c. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and ultrasonic technologies.
      d. Passive Infrared/Acoustic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and audible sound sensing technologies.
   3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.
   4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during an adjustable turn-off delay time interval.
   5. Dual Technology Occupancy Sensors: Field configurable turn-on and hold-on activation with settings for activation by either or both sensing technologies.
   6. Passive Infrared Lens Field of View: Field customizable by addition of factory masking material, adjustment of integral blinders, or similar means to block motion detection in selected areas.
   7. Turn-Off Delay: Field adjustable, with time delay settings up to 30 minutes.
   8. Sensitivity: Field adjustable.

9. Adaptive Technology: Field selectable; capable of self-adjusting sensitivity and time delay according to conditions.
10. Compatibility (Non-Dimming Sensors): Suitable for controlling incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, and fractional motor loads, with no minimum load requirements.
11. Load Rating for Line Voltage Occupancy Sensors: As required to control the load indicated on drawings.
12. Where wired sensors are indicated, wireless sensors are not acceptable without prior approval of Architect and Engineer.

C. Ceiling Mounted Occupancy Sensors:
1. All Ceiling Mounted Occupancy Sensors:
a. Description: Low profile occupancy sensors designed for ceiling installation.
b. Occupancy sensor to be field selectable as either manual-on/automatic-off or automatic on/off.
c. Finish: White unless otherwise indicated.

D. Directional Occupancy Sensors:
1. All Directional Occupancy Sensors: Designed for wall or ceiling mounting, with integral swivel for field adjustment of motion detection coverage.
a. Provide field selectable setting for disabling LED motion detector visual indicator.
b. Finish: White unless otherwise indicated.

E. Power Packs for Low Voltage Occupancy Sensors:
1. Description: Plenum rated, self-contained low voltage class 2 transformer and relay compatible with specified low voltage occupancy sensors for switching of line voltage loads.
2. Provide quantity and configuration of power and slave packs with all associated wiring and accessories as required to control the load indicated on drawings.
3. Input Supply Voltage: Dual rated for 120/277 V ac.
4. Load Rating: As required to control the load indicated on drawings.

F. Accessories:
1. Provide heavy duty coated steel wire protective guards compatible with specified occupancy sensors where indicated.

2.03 LIGHTING CONTACTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Refer to drawings and controls schedules for listed manufacturers.

B. Description: Magnetic lighting contactors complying with NEMA ICS 2, and listed and labeled as complying with UL 60947-1 and UL 60947-4-1; noncombination type unless otherwise indicated; ratings, configurations and features as indicated on the drawings.

C. Combination Contactors: NEMA ICS 2, Class A combination controllers with magnetic contactor(s) and externally operable disconnect.
1. Disconnects: Circuit breaker or disconnect switch type as indicated.
a. Disconnect Switches: Fusible or nonfusible type as indicated.
b. Provide externally operable handle with means for locking in the OFF position. Provide safety interlock to prevent opening the cover with the disconnect in the ON position with capability of overriding interlock for testing purposes.
c. Provide auxiliary interlock for disconnection of external control power sources where applicable.

D. Short Circuit Current Rating:
1. Provide contactors with listed short circuit current rating as indicated on the drawings.

E. Enclosures:

1. Comply with NEMA ICS 6.
2. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
   a. Indoor Clean, Dry Locations: Type 1 or Type 12.
   b. Outdoor Locations: Type 3R or Type 4.
3. Finish: Manufacturer's standard unless otherwise indicated.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install lighting control devices in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130.

B. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of lighting control devices provided under this section.
   1. Orient outlet boxes for vertical installation of lighting control devices unless otherwise indicated.

C. Install lighting control devices in accordance with manufacturer's instructions.

D. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

E. Install lighting control devices plumb and level, and held securely in place.

F. Where required and not furnished with lighting control device, provide wall plate in accordance with Section 26 27 26.

G. Provide required supports in accordance with Section 26 05 29.

H. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

I. Identify lighting control devices in accordance with Section 26 05 53.
   1. Identify controlled circuits in lighting contactors.
   2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.

J. Occupancy Sensor Locations:
   1. Location Adjustments: Locations indicated are diagrammatic and only intended to indicate which rooms or areas require devices. Provide quantity and locations as required for complete coverage of respective room or area based on manufacturer's recommendations for installed devices.
   2. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

K. Combination Enclosed Lighting Contactors:
   1. Except where indicated to be mounted adjacent to the equipment they supply, mount lighting contactors such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.
   2. Mount electrically held lighting contactors with elastomeric isolator pads to eliminate structure-borne vibration, unless contactors are installed in an enclosure with factory-installed vibration isolators.

L. Unless otherwise indicated, install power packs for lighting control devices above accessible ceiling or above access panel in inaccessible ceiling near the sensor location.

M. Where indicated, install separate compatible wall switches for manual control interface with lighting control devices or associated power packs.

N. Where indicated or required, provide cabinet or enclosure in accordance with Section 26 05 33.16 for mounting of lighting control device system components.

3.02 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Inspect each lighting control device for damage and defects.

D. Test occupancy sensors to verify proper operation, including time delays and ambient light thresholds where applicable. Verify optimal coverage for entire room or area. Record test results in written report to be included with submittals.

E. Correct wiring deficiencies and replace damaged or defective lighting control devices.

3.03 ADJUSTING

A. Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

B. Adjust devices and wall plates to be flush and level.

C. Adjust position of directional occupancy sensors to achieve optimal coverage as required.

D. Where indicated or as directed by Architect, install factory masking material or adjust integral blinders on passive infrared (PIR) and dual technology occupancy sensor lenses to block undesired motion detection.

3.04 CLOSEOUT ACTIVITIES

A. Training: Train Owner's personnel on operation, adjustment, programming, and maintenance of lighting control devices.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
   2. Instructor: Manufacturer's authorized service representative.
   3. Location: At project site.

END OF SECTION

SECTION 26 27 26
WIRING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Receptacles.

B. Wall plates.

1.02 RELATED REQUIREMENTS

A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Manufactured wiring systems for use with access floor boxes with compatible pre-wired connectors.

B. Section 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS.

C. Section 26 05 33.16 - Boxes for Electrical Systems.

D. Section 26 05 33.23 - Surface Raceways for Electrical Systems: Surface raceway systems, including multioutlet assemblies.

E. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

A. FS W-C-596 - Connector, Electrical, Power, General Specification for 2017h.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

C. NECA 130 - Standard for Installing and Maintaining Wiring Devices 2010.

D. NEMA WD 1 - General Color Requirements for Wiring Devices 1999 (Reaffirmed 2015).

E. NEMA WD 6 - Wiring Devices - Dimensional Specifications 2016.

F. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL 498 - Attachment Plugs and Receptacles Current Edition, Including All Revisions.

H. UL 514D - Cover Plates for Flush-Mounted Wiring Devices Current Edition, Including All Revisions.

I. UL 943 - Ground-Fault Circuit-Interrupters Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
   2. Coordinate the placement of outlet boxes for wall switches with actual installed door swings.
   3. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
   4. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Products: Listed, classified, and labeled as suitable for the purpose intended.

PART 2 PRODUCTS

2.01 WIRING DEVICE APPLICATIONS

A. Provide wiring devices suitable for intended use and with ratings adequate for load served.

B. Provide weather resistant GFCI receptacles with specified weatherproof in use covers for receptacles installed outdoors or in damp or wet locations.

C. Provide tamper resistant receptacles.

D. Provide GFCI protection for receptacles installed within 6 feet of sinks.

E. Provide GFCI protection for receptacles installed in commercial kitchens.

F. Provide GFCI protection for receptacles serving electric drinking fountains.

G. Unless noted otherwise, do not use combination switch/receptacle devices.

2.02 WIRING DEVICE FINISHES

A. Provide wiring device finishes as described below unless otherwise indicated.

B. Wiring Devices, Unless Otherwise Indicated: Gray with stainless steel wall plate, Verification during submittal process.

C. Wiring Devices Installed in Unfinished Spaces: Gray with galvanized steel wall plate.

D. Wiring Devices Installed in Wet or Damp Locations: Gray with specified weatherproof cover.

2.03 MANUFACTURERS:

A. Hubbell Incorporated: www.hubbell.com/#sle.

B. Leviton Manufacturing Company, Inc: www.leviton.com/#sle.

C. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/#sle.

D. Eaton(Arrow Hart).

E. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 SOURCE LIMITATIONS

A. Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.05 PRODUCT GRADE:

A. Receptacles: Unless indicated otherwise, Industrial specification grade.

B. Switches: Unless indicated otherwise, Industrial specification grade.

2.06 RECEPTACLES

A. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
   1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
   2. NEMA configurations specified are according to NEMA WD 6.

B. Convenience Receptacles:
   1. Weather Resistant Convenience Receptacles: Industrial specification grade, {CH#109268}{CH#109269}, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations; single or duplex as indicated{CH#109270}.
   2. Tamper Resistant Convenience Receptacles: Industrial Specification Grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; single or duplex as indicated on the drawings.

C. GFCI Receptacles:

1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
    a. Provide test and reset buttons of same color as device.
2. Standard GFCI Receptacles: Industrial Specification Grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
3. Weather Resistant GFCI Receptacles: Industrial Specification Grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.
4. Tamper Resistant GFCI Receptacles: Industrial Specification Grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type.

2.07 WALL PLATES

A. Wall Plates: Comply with UL 514D.
    1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
    2. Size: Standard.
    3. Screws: Metal with slotted heads finished to match wall plate finish.

B. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel unless indicated otherwise by architect during submittal process.

C. Galvanized Steel Wall Plates: Rounded corners and edges, with corrosion resistant screws.

D. Weatherproof Covers for Wet Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

PART 3 EXECUTION

3.01 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130.

B. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of wiring devices provided under this section.
    1. Mounting Heights: Unless otherwise indicated, as follows:
        a. Wall Switches: 48 inches above finished floor.
        b. Receptacles: 18 inches above finished floor or 6 inches above counter where indicated.
    2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
    3. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.
    4. Locate wall switches on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.
    5. Locate receptacles for electric drinking fountains concealed behind drinking fountain according to manufacturer's instructions.

C. Install wiring devices in accordance with manufacturer's instructions.

D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

E. Conductors:
    1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
    2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.

3. Where required, connect wiring devices using pigtails not less than 6 inches long. Do not connect more than one conductor to wiring device terminals.
4. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
5. Existing Conductors:
    a. Cut back and pigtail, or replace all damaged conductors.
    b. Straighten conductors that remain and remove corrosion and foreign matter.
    c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.
    d. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.

F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.

G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

H. Unless otherwise indicated, GFCI receptacles may be connected to provide feed-through protection to downstream devices. Label such devices to indicate they are protected by upstream GFCI protection.

I. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

J. Install wiring devices plumb and level with mounting yoke held rigidly in place.

K. Install wall switches with OFF position down.

L. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.

M. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

N. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

O. Identify wiring devices in accordance with Section 26 05 53.
1. Unless instructed differently by Architect, Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.02 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect each wiring device for damage and defects.

C. Test each receptacle to verify operation and proper polarity.
1. Line voltage: Acceptable range is 105 to 132 V.
2. Ground Impedance: Values of up to 2 ohms are acceptable.
3. Voltage Drop: Under 15A load, a value of 6 percent or higher is unnacceptable.

D. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.
1. Test for tripping values specified in UL 1436 and UL 943

E. Correct wiring deficiencies and replace damaged or defective wiring devices.

F. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete

3.03 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

3.04 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION

SECTION 26 51 00
INTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior luminaires.

B. Emergency lighting units.

C. Exit signs.

D. Ballasts and drivers.

E. Lamps.

F. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 26 05 29 - Hangers and Supports for Electrical Systems.

B. Section 26 05 33.16 - Boxes for Electrical Systems.

C. Section 26 27 26 - Wiring Devices: Manual wall switches and wall dimmers.

1.03 REFERENCE STANDARDS

A. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products 2008.

B. IES LM-80 - Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules 2015, with Errata (2017).

C. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems 2006.

D. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems 2006.

E. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts 2016.

F. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility 2012.

G. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. NFPA 101 - Life Safety Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. UL 924 - Emergency Lighting and Power Equipment Current Edition, Including All Revisions.

J. UL 1598 - Luminaires Current Edition, Including All Revisions.

K. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.
2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.
4. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
   1. LED Luminaires:
      a. Include estimated useful life, calculated based on IES LM-80 test data.
   2. LED Retrofit Luminaire Conversion Kits: Include list of compatible luminaires and/or criteria for compatibility.

C. Project Record Documents: Record actual connections and locations of luminaires and any associated remote components.

1.06 DELIVERY, STORAGE, AND PROTECTION

A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.07 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for LED luminaires, including drivers.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

2.02 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.

D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.

F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

G. Recessed Luminaires:
   1. Ceiling Compatibility: Comply with NEMA LE 4.
   2. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.
   3. Luminaires Recessed in Sloped Ceilings: Provide suitable sloped ceiling adapters.

H. LED Luminaires:
   1. Components: UL 8750 recognized or listed as applicable.

2. Tested in accordance with IES LM-79 and IES LM-80.
3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

2.03 EMERGENCY LIGHTING UNITS

A. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.

B. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to emergency power supply for minimum of 90 minutes of rated emergency illumination.Batteries, where used, automatically recharge upon restoration of normal power source.

C. Battery:
1. Size battery to supply all connected lamps, including emergency remote heads where indicated.

D. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.

E. Provide low-voltage disconnect to prevent battery damage from deep discharge.

F. Accessories:
1. Provide compatible accessory mounting brackets where indicated or required to complete installation.
2. Provide compatible accessory wire guards where indicated.
3. Where indicated, provide emergency remote heads that are compatible with the emergency lighting unit they are connected to and suitable for the installed location.

2.04 EXIT SIGNS

A. Description: Internally illuminated exit signs with LEDs unless otherwise indicated; complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
1. Number of Faces: Single or double as indicated or as required for the installed location.
2. Directional Arrows: As indicated or as required for the installed location.

B. Accessories:
1. Provide compatible accessory wire guards where indicated.

2.05 BALLASTS AND DRIVERS

A. Ballasts/Drivers - General Requirements:
1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.
3. Electronic Ballasts/Drivers: Inrush currents not exceeding peak currents specified in NEMA 410.

2.06 LAMPS

A. Lamps - General Requirements:
1. Unless explicitly excluded, provide new, compatible, operable lamps in each luminaire.
2. Verify compatibility of specified lamps with luminaires to be installed. Where lamps are not specified, provide lamps per luminaire manufacturer's recommendations.
3. Minimum Efficiency: Provide lamps complying with all current applicable federal and state lamp efficiency standards.
4. Color Temperature Consistency: Unless otherwise indicated, for each type of lamp furnish products which are consistent in perceived color temperature. Replace lamps that are determined by the Architect to be inconsistent in perceived color temperature.

PART 3 EXECUTION

3.01 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of luminaires provided under this section.

B. Install products in accordance with manufacturer's instructions.

C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).

D. Provide required support and attachment in accordance with Section 26 05 29.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Recessed Luminaires:
   1. Install trims tight to mounting surface with no visible light leakage.
   2. Secure luminaire to structural elements above suspended ceilings.

G. Install accessories furnished with each luminaire.

H. Bond products and metal accessories to branch circuit equipment grounding conductor.

I. Emergency Lighting Units:
   1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.

J. Exit Signs:
   1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.

K. Install lamps in each luminaire.

3.02 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect each product for damage and defects.

C. Operate each luminaire after installation and connection to verify proper operation.

D. Test self-powered exit signs and emergency lighting units to verify proper operation upon loss of normal power supply.

E. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.03 CLEANING

A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.04 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

B. Demonstration: Demonstrate proper operation of luminaires to Architect, and correct deficiencies or make adjustments as directed.

3.05 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

END OF SECTION

SECTION 27 00 00
GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Division 27 Specifications are provided to define the standards and criteria to be used to bid, plan, furnish, install, test, and document communication systems for 20083 - BSD Cooper Mountain Elementary Seismic. These specifications shall form the basis for implementation of the procurement, installation, inspection, and close-out process.

B. Communications systems, devices, cabling disconnection and removal, and reinstallation in conjunction with wall and ceiling modifications associated with structural improvements occurring as described on the plans. Testing of reconnected cabling and devices upon reinstallation.

C. Division 27 has been designed and developed based on NFPA 70 (NEC), National Electrical Safety Code (NESC), Institute of Electronic and Electrical Engineers (IEEE), and a combination of ANSI/TIA Telecommunication Standards, and BICSI methodologies. The requirements within those documents are not superseded herein unless specifically stated. NEC and NESC code requirements are unable to be superseded by this document at any time. ANSI/TIA standards and BICSI methodologies are guidelines and recommendations for best practices and may be superseded, as specified, or may be made more stringent by this document.

D. Any use of the word “shall” marks a mandatory requirement. Use of the word “may” or “should” suggests optional elements. All conflicts within this document shall be resolved by the General Contractor in consultation with the Design Team. The standards of XYZ Corporation shall take precedence in the resolution of any dispute.

E. Unauthorized changes and/or deviations from these specifications, regardless of scale, may result in re-design, reconstruction, or re-installation of communications elements at the contractor’s expense. Contractors shall obtain formal written approval prior to bidding and prior to installation in order to deviate from these specifications or from ANSI/TIA standards and BICSI methodologies. Contractors shall not deviate from NEC and NESC requirements.

F. Division 27 Specifications address information transport pathways, multiple different types of communication systems, spaces, media, grounding, identification, testing, and documentation requirements in support of multiple information transport infrastructures.

G. Specific responsibilities of Division 27 include, but are not limited to:
   1. The procurement and installation of each communications system and the associated components and cabling to create a fully functional system.
   2. Thorough testing shall be conducted of each individual communications system to illustrate compliance with specific performance requirements.
   3. Definition and establishment of administration and labeling schemes, conforming to Owner’s requirements.
   4. Securing all necessary permits and licenses, payment of all fees, and provision of all construction work notifications.
   5. Compliance with all applicable laws, ordinances, rules, and regulations.
   6. Mandatory project manager attendance at a weekly project status meeting with the General Contractor.
   7. It is the intent of the project drawings and specifications to provide complete and fully functional Division 27 communication systems, ready for use. Any item, not specifically shown in the project drawings or called for in the project specifications but normally required for a complete system, is to be considered a part of this contract.

H. System Continuity:
   1. Reconnect all existing items that remain in use. Provide all materials and labor required to retain continuity of existing circuits or systems that are disrupted by these alterations even though not indicated on the drawings.

1.02 RELATED REQUIREMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 & 01 Specification Sections, apply to this Section.

1.03 ABBREVIATIONS AND ACRONYMS

A. The following definitions are applicable to the work as indicated and as shown herein:
   1. ADA: Americans with Disabilities Act
   2. AFF: Above Finished Floor
   3. ANSI: American National Standards Institute
   4. ASTM: American Society for Testing & Materials (ASTM International)
   5. AWG: American Wire Gauge
   6. BET: Building Entrance Terminal
   7. BTU: British Thermal Unit
   8. dB: Decibel
   9. dBmV: Decibel Millivolt
   10. EMT: Electrical Metallic Tubing
   11. FCC: Federal Communications Commission
   12. Freq: Frequency
   13. HH: Hand Hole
   14. HVAC: Heating, Ventilation, and Air Conditioning
   15. Hz: Hertz
   16. IMC: Intermediate Metal Conduit
   17. IEEE: Institute of Electrical and Electronics Engineers
   18. ISO: International Organization for Standardization
   19. LAN: Local Area Network
   20. LCD: Liquid Crystal Display
   21. Mbps: Megabits per second
   22. MHz: Megahertz
   23. NEC: National Electrical Code, NFPA 70
   24. NESC: National Electric Safety Code
   25. NFPA: National Fire Protection Association
   26. NRTL: Nationally Recognized Testing Laboratory
   27. OSHA: Occupational Safety and Health Administration
   28. OSP: Outside cable Plant
   29. PR: Pair
   30. RFI: Radio Frequency Interference
   31. RH: Relative Humidity
   32. SE: Service Entrance
   33. SFP: Small Form-Factor Pluggable Transceiver
   34. TV: Television
   35. UL: Underwriters Laboratory
   36. UPS: Uninterruptible Power Supply
   37. WAP: Wireless Access Point

1.04 DEFINITIONS

A. The following definitions are applicable to the work as indicated and as shown herein:
   1. Attenuation: The decrease in power of a signal, light beam, or light wave, either absolutely or as a fraction of a reference value. Attenuation is the opposite of gain and is measured in decibels (dB).
   2. Backbone System: The cabling and connecting hardware that provides interconnection between Telecommunications Rooms, Equipment Room, and Entrance Facilities.
   3. BET: Building Entrance Terminal - Cable termination equipment used to terminate outside plant (OSP) cables at or near the point of building entry.

4. Conduit Chase Pipe: Short section of bushed EMT conduit with sufficient size and capacity to support horizontal cabling bundles from ceiling space, through ceiling tile, onto the ladder tray system connecting wall to rack or cabinet.
5. Design Team: A group of individuals comprised of Architect(s) and Engineer(s) involved in assembling the contract documents known as the drawings and specifications.
6. EF: Entrance facility - A location within a building for both public and private network service cables. A facility that provides all necessary mechanical and electrical services for the entry of telecommunications cables into a building and that complies with all relevant regulations. Also referred to as SE: Service Entrance.
7. J-Hook: A supporting device for horizontal cables that is shaped like a “J”. It is attached to some building structures. Horizontal cables are laid in the opening formed by the “J” to provide support for cables.
8. Minor Pathway Support Hardware: Anchors, support brackets, clamps, clips, cable ties, D-rings, rack screws, velcro straps and etc. used to dress and secure cabling, conduits and surface raceways.
9. Screen: A metallic layer, either a foil or braid, placed around a pair or group of conductors.
10. Shield: A metallic layer, either a foil or braid, placed around a group of conductors.
11. Splice: A joining of conductors meant to be permanent. A device that joins conducting or transmitting media. Also referred to as straight splice.
12. Trafficways: Locations where vehicular or pedestrian traffic is a normal course of events.

1.05 CODE REFERENCES AND STANDARDS

A. All work shall be in compliance with the following codes and agencies. Nothing contained within these specifications shall be misconstrued to permit work not in conformance with the most stringent of applicable codes and standards. It is assumed that bidders have access to, and specific knowledge of, the listed reference materials in order to ensure conformity with them.
   1. National Electrical Code (NEC)
   2. National Electrical Safety Code (NESC)
   3. National Fire Protection Association (NFPA)
   4. International Building Code (IBC)
   5. Iowa Administrative Code
   6. Federal, State, and Local Codes.
   7. National Electronic Manufacturer’s Association (NEMA)
   8. Institute of Electronic and Electrical Engineers (IEEE)
   9. American National Standards Institute/ Industries Association Telecommunication/ Electronic Industries Association (ANSI/TIA/EIA)
   10. Occupational Safety & Health Administration (OSHA)
   11. Federal Communications Commission (FCC)

B. All new materials, equipment, and installation practices shall meet the requirements of the following standards, unless specifically instructed otherwise by the Design Team.
   1. TIA-569-E - Telecommunications Pathways and Spaces (May 2019)
   2. NFPA 70 - National Electric Code (NEC)
   3. BICSI - Information Transport Systems Installation Manual 7th, or most recent, edition
   4. Federal, State, and local codes, rules, regulations, and ordinances.
      a. Perform all work in accordance with local jurisdiction requirements that is governing the work and as fully part of the specifications attached.

1.06 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the installation of the telephone and internet service provider pathway and entrance with the Electrical Contractor and the Owner's selected carrier.

B. Sequencing: Ensure that any wide area network, telephone service, and internet service connectivity cutover is achieved in a coordinated and orderly manner.

C. All Division 27 Contractor Project Managers shall schedule and conduct a coordination meeting with XYZ Corporation Information Technology Department to confirm and coordinate scope of

work requirements prior to commencement of work. Project meetings shall be scheduled through the General Contractor.

1.07 QUALITY ASSURANCE

A. Contracting firm shall constitute a company with a minimum of five (5) years successful installation experience with projects utilizing infrastructure and systems work similar to that required for this project.

B. Service Qualifications: Installing and servicing contractor shall have a permanent office within a 120-mile radius of the project site.

C. Cabling Contractor shall have at least one (1) Registered Communications Distribution Designer and installers with Installer-level BICSI Certifications on staff responsible for this project. Provide copies of these certificates in the submittal process.

D. Work crew, not involved in installing cable elements (e.g. laborers delivering/moving materials, installing grounding by an electrician, or workers installing pathway elements) do not require BICSI or manufacturer certification or registration.

E. Contractor shall provide a Manufacturer Certification for the system solution bid, issued directly in the bidder's company name, valid for the time frame in which the installation will be completed. Contractor shall be manufacturer certified in order to participate in the bid event.

F. The contractor shall be knowledgeable in local, state, regional, and national codes and regulations. All work shall comply with the latest revision of codes or regulations. When conflict exists between local or national codes or regulations, the most stringent codes or regulations shall apply.

G. Only installers trained and certified by the proposed manufacturer shall be allowed to install products. Installers must possess the highest level of certification available by the manufacturer for the specific solution being installed.

H. Only installers trained and certified by the proposed manufacturer shall be allowed to install firestop products.

I. Before bidding, the contractor shall study and compare all contract documents and promptly notify the Design Team of any discrepancies or deficiencies discovered by or made known to the contractor.

J. Discrepancies: Whenever a discrepancy or inconsistency exists between related information indicated on the contract drawings and/or specifications, this contractor shall obtain additional clarification and direction from the Design Team before proceeding. For bidding purposes, this contractor shall include the labor and materials necessary to comply with the solution that results in the greatest cost to the contract.
   1. If there is a conflict between applicable documents, then the more stringent requirement shall apply.
   2. The failure to question any controversial item will constitute acceptance by the bidder who shall execute it to the satisfaction of the owner after being awarded the contract.

K. Deficiencies: The contractor and associated subcontractors shall resolve all known deficiencies and omissions, including non-compliance with applicable codes, with the Design Team prior to ordering materials or proceeding with the work. Any work performed prior to receipt of instructions from the Design Team will be done so at the contractor's risk.
   1. If mention has been omitted pertaining to details, items or related accessories required for the completion of any system, it is understood such item and accessories are included in the contract. After the contract is awarded, claims based on insufficient data or incorrectly assumed conditions, or claims based on misunderstanding the nature of the work, will not be recognized.
   2. All devices, symbols and work illustrated shall be new work provided under this contract except work labeled existing to remain and equipment labeled to be furnished (or supplied) by others but installed by this contractor.

1.08 PROJECT CONDITIONS

A. Conditions and Measurements: Visit the jobsite to verify installation conditions and confirm measurements for all required systems and associated cabling connectivity.

1.09 WARRANTY

A. The Contractor shall submit, in the bid documents, any additional contractor-specific warranties or guarantees to be offered on the project.

B. The Contractor shall supply any and all necessary documentation needed to process and record the warranty(s) and to verify the installation solution.

C. All Other Communications Systems Warranty
   1. Unless listed elsewhere within these specifications, a warranty shall be provided for a minimum of one (1) year for all other communications systems listed. One year shall begin from the date of Substantial Completion. This warranty shall cover both product and service to address remedial maintenance and replacement parts as is appropriate to keep each system complete and fully functional.

PART 3 - EXECUTION

2.01 CLEANING

A. Division 27 Contractor shall thoroughly clean all assemblies within the telecommunications room's space before they are turned over to the XYZ Corporation IT Services for operation. Cleaning shall include, but not be limited to, all ladder tray, racks and wire managers (both inside and out), copper and optical fiber panels (both inside and out). Should any telecommunications room or closet be completed prior to the balance of the floor space construction that it serves, racks, cabinets, and wall frames shall be covered with plastic sheeting to repel dust and other contaminants to which they will be subjected.

B. At the end of each workday or shift, the Contractor shall be required to clean-up the work area and remove all construction debris such that the site is clean and usable without hazard to workers.

2.02 PROJECT CONDITIONS

A. The Owner shall not be responsible for delays in work because of shutdowns due to unsafe working practices by Contractors.

B. The active information transport system and cabling associated with specific work beyond the construction area shall not be disrupted at any time.

C. Contractor shall clean work areas each day and remove debris properly and legally from the project site. Materials and supplies stored for use in the project shall be neatly stacked outside the circulation areas. All exits and paths shall be cleaned so as to prevent dirt from being tracked into the site.

D. It shall be the responsibility of the Contractor to secure any parking permits prior to the first day of work on-site.

E. Work outside of normal operating hours and days shall be coordinated with XYZ Corporation.

2.03 SAFETY REQUIREMENTS

A. All contract work shall be performed in accordance with the policies, procedures, and standards established by the Owner.

B. In construction areas, all Contractor personnel shall wear personnel protection devices, as deemed appropriate by the General Contractor and as required by OSHA for the work location and work operation being performed. Devices shall include, but not be limited to hardhats, work boots, safety eye protection, reflective vests, etc.

C. All exposed holes, pits, pipes, etc., either inside or outside the project site, shall be barricaded or plated and adequately secured when Contractor personnel are not present. All ladders, hanging wires, pipes, and other items protruding at a pedestrian level travel way most be

removed or secured following the final shift of the day.

D. During breaks or when only a portion of work has been completed, tools shall not be left exposed where others may risk injury or attempt to use them. Windows and doors shall not be left unsecured or propped open during breaks. At the completion of the final shift each day, doors, windows, or other openings shall be adequately secured.

E. When driving on the Owner's property, Contractor personnel shall observe all traffic safety regulations and pay particular attention to pedestrians. All loose material and debris on vehicles shall be adequately secured and tied down.

END OF SECTION

SECTION 27 05 05
SELECTIVE DEMOLITION OF COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Demolition and removal of selected portions of building or structure.

B. Demolition, temporary removal, relocation, or reconfiguration of selected site elements and/or Information Technology (IT), Security or other Special Systems or infrastructure.

C. Salvage of existing items to be reused or recycled.

D. Contractor shall include in the Bid all labor, materials, tools, transportation, storage costs, equipment, insurance, temporary protection, permits, inspections, taxes and all necessary and related items required to provide complete demolition and cutover of existing telecommunication systems shown and described in the drawings and specifications herein.

E. The Contractor is responsible for providing and coordinating phased activities and construction methods that minimize disruption to operations and provide complete and operational systems. Equipment and devices shall not be removed or reconfigured until removal or reconfiguration has been coordinated with owner and approval is given in writing.

F. The Contractor shall coordinate interfaces to existing systems that are being demolished in order to minimize disruption to the existing systems operations. Any systems outages shall be approved in advance and scheduled with XYZ Corporation.

1.02 RELATED REQUIREMENTS

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

B. The following documents shall also be considered as a part of and shall relate directly to this section:
   1. Section 27 00 00 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS

1.03 ABBREVIATIONS AND ACRONYMS

A. Reference Section 27 00 00 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS

1.04 DEFINITIONS

A. Reference Section 27 00 00 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS

1.05 CODE REFERENCES AND STANDARDS

A. Comply with Section 27 00 00 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS

1.06 ADMINISTRATIVE REQUIREMENTS

A. Pre-Demolition Meeting
   1. Conduct a pre-demolition meeting at Project Site with XYZ Corporation and all affected stakeholders.
      a. Inspect and discuss condition of construction to be selectively demolished.
      b. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
      c. Review areas where existing construction is to remain and requires protection.
      d. Review procedures to be followed when critical systems are inadvertently interrupted. The Contractor shall be responsible for the coordination required with XYZ Corporation prior to device removal to ensure systems that must remain operational are not compromised during the demolition process.

1.07 QUALITY ASSURANCE

A. Comply with Section 27 00 00 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS

1.08 PROJECT CONDITIONS

A. The owner WILL NOT occupy portions of building during selective demolition.

B. Conduct selective demolition so Owner's operations will not be disrupted.

C. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

D. Field verify the existing conditions, device equipment locations to determine the extent of the demolition required. Notify the Design Team of discrepancies between existing conditions and Drawings before proceeding with selective demolition. Proceeding with demolition indicates and acceptance of existing conditions by the contractor.

E. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
   1. Hazardous materials will be removed by Owner before start of the Work.
   2. If suspected hazardous materials are encountered, do not disturb; immediately notify the Design Team. Hazardous materials will be removed by Owner under a separate contract.

F. Storage or sale of removed items or materials on-site is not permitted.

G. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 EXAMINATION

A. Demolition and construction methods shall conform to XYZ Corporation requirements and all applicable building codes.

B. Verify that utilities have been disconnected and capped per approved procedures before starting selective demolition operations.

C. Survey existing condition of all communications systems related conduits and cables from origin to destination and correlate with requirements indicated to determine extent of selective demolition required.

D. Label all conduits and cables with origin, destination and what system they serve.

E. Consult with the Owner to determine whether systems can be disabled or whether a new parallel system needs to be installed.

F. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to the Design Team.

3.02 PREPARATION

A. Comply with requirements for access and protection.

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

C. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.

D. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.

E. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.

F. Cover and protect furniture, furnishings, and equipment that have not been removed.

G. Comply with requirements for temporary enclosures, dust control, heating, and cooling.

3.03 SELECTIVE DEMOLITION

A. Demolish and remove existing construction only to the extent required by wall or ceiling modifications, new construction, and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
   1. Proceed with selective demolition systematically. Complete selective demolition operations above each floor or tier, before disturbing supporting members on the next lower level, if applicable. Remove all abandoned cable from origin to destination.
   2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
   3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
   4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and/or portable fire-suppression devices during flame-cutting operations.
   5. Maintain adequate ventilation when using cutting torches.
   6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
   7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
   8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
   9. Dispose of demolished items and materials promptly.

B. Removed and Salvaged Items:
   1. Clean salvaged items.
   2. Pack or crate items after cleaning. Identify contents of containers.
   3. Store items in a secure area until delivery to Owner.
   4. Transport items to Owner's designated storage area. Coordinate delivery of equipment with the Owner seven (7) days prior to delivery.
   5. Protect items from damage during transport and storage.

C. Removed and Reinstalled Items:
   1. Clean and repair items to functional condition adequate for intended reuse.
   2. Pack or crate items after cleaning and repairing. Identify contents of containers.
   3. Protect items from damage during transport and storage.
   4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
   5. Perform testing on reinstalled active systems and get sign-off by the Owner or Owner’s representative inspector that systems are re-connected and working properly.

D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Engineer, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.04 UTILITY SERVICES AND COMMUNICATION SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
   1. Comply with requirements for existing services/systems interruptions.
   2. For existing equipment with active components in them, provide dust protection and circulate cooling air with a portable air conditioning unit or other means to ensure equipment does not overheat.

B. Existing Services/Systems to Be Removed, or Relocated: Locate, identify, disconnect, and seal or cap off indicated utility services and communications systems serving areas to be selectively demolished.
   1. Owner will arrange to shut off indicated services/systems when requested by Contractor. Coordinate the disconnection of all electrical circuits with the Electrical Contractor prior to disconnection.
   2. Arrange to shut off indicated utilities with utility companies.
   3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.

3.05 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
   1. Do not allow demolished materials to accumulate onsite.
   2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
   3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.06 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

B. The contractor shall be required, on a daily basis, to dispose of any demolished material not required to be returned to the Owner. All materials shall be transported off of the Owner’s property at the expense of the Contractor.

C. Reference Section 27 00 00 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS.

END OF SECTION

SECTION 28 46 00
FIRE DETECTION AND ALARM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire alarm system design and installation, including all components, wiring, and conduit.

B. Circuits from protected premises to supervising station, including conduit.

C. Replacement and removal of existing fire alarm system components, wiring, and conduit indicated.

1.02 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping: Materials and methods for work to be performed by this installer.

1.03 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines current edition.

B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.

C. IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits 2002 (Corrigendum 2012).

D. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. NFPA 72 - National Fire Alarm and Signaling Code Most Recent Edition Cited by Referring Code or Reference Standard.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Proposal Documents: Submit the following with cost/time proposal:
   1. NFPA 72 "Record of Completion", filled out to the extent known at the time.
   2. Manufacturer's detailed data sheet for each control unit, initiating device, and notification appliance.
   3. Certification by Contractor that the system design will comply with Contract Documents.
   4. Proposed maintenance contract.

C. Drawings must be prepared using AutoCAD Release 2010.
   1. Owner will provide floor plan drawings for Contractor's use; verify all dimensions on Owner-provided drawings.

D. Evidence of designer qualifications.

E. Design Documents: Submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, riser diagrams, and description of operation:
   1. Copy (if any) of list of data required by authority having jurisdiction.
   2. NFPA 72 "Record of Completion", filled out to the extent known at the time.
   3. Clear and concise description of operation, with input/output matrix similar to that shown in NFPA 72 Appendix A-7-5-2.2(9), and complete listing of software required.
   4. System zone boundaries and interfaces to fire safety systems.
   5. Location of all components, circuits, and raceways; mark components with identifiers used in control unit programming.
   6. Circuit layouts; number, size, and type of raceways and conductors; conduit fill calculations; spare capacity calculations; notification appliance circuit voltage drop calculations.
   7. List of all devices on each signaling line circuit, with spare capacity indicated.

8. Manufacturer's detailed data sheet for each component, including wiring diagrams, installation instructions, and circuit length limitations.
9. Description of power supplies; if secondary power is by battery include calculations demonstrating adequate battery power.
10. Certification by either the manufacturer of the control unit or by the manufacturer of each other component that the components are compatible with the control unit.
11. Certification by the manufacturer of the control unit that the system design complies with Contract Documents.
12. Certification by Contractor that the system design complies with Contract Documents.
13. Do not show existing components to be removed.

F. Evidence of installer qualifications.

G. Inspection and Test Reports:
1. Submit inspection and test plan prior to closeout demonstration.
2. Submit documentation of satisfactory inspections and tests.
3. Submit NFPA 72 "Inspection and Test Form," filled out.

H. Operating and Maintenance Data: See Section 01 78 00 for additional requirements; revise and resubmit until acceptable; have one set available during closeout demonstration:
1. Complete set of specified design documents, as approved by authority having jurisdiction.
2. Additional printed set of project record documents and closeout documents, bound or filed in same manuals.
3. Contact information for firm that will be providing contract maintenance and trouble call-back service.
4. List of recommended spare parts, tools, and instruments for testing.
5. Replacement parts list with current prices, and source of supply.
6. Detailed troubleshooting guide and large scale input/output matrix.
7. Preventive maintenance, inspection, and testing schedule complying with NFPA 72; provide printed copy and computer format acceptable to Owner.
8. Detailed but easy to read explanation of procedures to be taken by non-technical administrative personnel in the event of system trouble, when routine testing is being conducted, for fire drills, and when entering into contracts for remodeling.

I. Project Record Documents: See Section 01 78 00 for additional requirements; have one set available during closeout demonstration:
1. Complete set of floor plans showing actual installed locations of components, conduit, and zones.
2. "As installed" wiring and schematic diagrams, with final terminal identifications.
3. "As programmed" operating sequences, including control events by device, updated input/output chart, and voice messages by event.

J. Closeout Documents:
1. Certification by manufacturer that the system has been installed in compliance with manufacturer's installation requirements, is complete, and is in satisfactory operating condition.
2. NFPA 72 "Record of Completion", filled out completely and signed by installer and authorized representative of authority having jurisdiction.

1.05 QUALITY ASSURANCE

A. Copies of Design Criteria Documents: Maintain at the project site for the duration of the project, bound together, an original copy of NFPA 72, the relevant portions of applicable codes, and instructions and guidelines of authorities having jurisdiction; deliver to Owner upon completion.

B. Designer Qualifications: NICET Level III or IV (3 or 4) certified fire alarm technician or registered fire protection engineer, employed by fire alarm control panel manufacturer, Contractor, or installer , with experience designing fire alarm systems in the jurisdictional area of the authorities having jurisdiction.

C. Installer Qualifications: Firm with minimum 3 years documented experience installing fire alarm systems of the specified type and providing contract maintenance service as a regular part of their business.
   1. Authorized representative of control unit manufacturer; submit manufacturer's certification that installer is authorized; include name and title of manufacturer's representative making certification.
   2. Installer Personnel: At least 2 years of experience installing fire alarm systems.
   3. Supervisor: NICET level III or IV (3 or 4) certified fire alarm technician; furnish name and address.

1.06 WARRANTY

A. Provide control panel manufacturer's warranty that system components other than wire and conduit are free from defects and will remain so for 1 year after date of Substantial Completion.

B. Provide installer's warranty that the installation is free from defects and will remain so for 1 year after date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Alarm Control Units and Accessories - Basis of Design: Simplex.

B. Initiating Devices and Notification Appliances:
   1. Simplex, a brand of Johnson Controls: www.simplex-fire.com/#sle.
   2. Same manufacturer as control units.
   3. Provide initiating devices and notification appliances made by the same manufacturer, where possible.

2.02 FIRE ALARM SYSTEM

A. Fire Alarm System: Provide modifications and extensions to the existing automatic fire detection and alarm system:
   1. Provide all components necessary, regardless of whether shown in Contract Documents or not.
   2. Protected Premises: Entire building shown on drawings.
   3. Comply with the following; where requirements conflict, order of precedence of requirements is as listed:
      a. ADA Standards.
      b. The requirements of the local authority having jurisdiction , which is City of Urbandale.
      c. Applicable local codes.
      d. Contract Documents (drawings and specifications).
      e. NFPA 72; where the word "should" is used consider that provision mandatory; where conflicts between requirements require deviation from NFPA 72, identify deviations clearly on design documents.
   4. Evacuation Alarm: Multiple smoke zones; allow for evacuation notification of any individual zone or combination of zones, in addition to general evacuation of entire premises.
   5. General Evacuation Zones: Each smoke zone is considered a general evacuation zone unless otherwise indicated, with alarm notification in all zones on the same floor, on the floor above, and the floor below.

B. Supervising Stations and Fire Department Connections:
   1. Public Fire Department Notification: By on-premises supervising station.
   2. On-Premises Supervising Station: Existing proprietary station operated by Owner, located at lobby entrance.
   3. Means of Transmission to On-Premises Supervising Station: Directly connected noncoded system.

C. Circuits:
   1. Initiating Device Circuits (IDC): Class B, Style A.
   2. Signaling Line Circuits (SLC) Within Single Building: Class B, Style 0.5.
   3. Notification Appliance Circuits (NAC): Class B, Style W.

D. Power Sources:
   1. Primary: Dedicated branch circuits of the facility power distribution system.
   2. Secondary: Storage batteries.
   3. Capacity: Sufficient to operate entire system for period specified by NFPA 72.
   4. Each Computer System: Provide uninterruptible power supply (UPS).

2.03 EXISTING COMPONENTS

A. On-Premises Supervising Station: Include as part of this work all modifications necessary to existing supervising station to accommodate new fire alarm work.

B. Clearly label components that are "Not In Service."

C. Remove unused existing components and materials from site and dispose of properly.

2.04 FIRE SAFETY SYSTEMS INTERFACES

A. Supervision: Provide supervisory signals in accordance with NFPA 72 for the following:
   1. Sprinkler water control valves.

B. Alarm: Provide alarm initiation in accordance with NFPA 72 for the following:
   1. Sprinkler water flow.
   2. Duct smoke detectors.

C. HVAC:
   1. Duct Smoke Detectors: Close dampers indicated; shut down air handlers indicated.

2.05 COMPONENTS

A. General:
   1. Provide flush mounted units where installed in finish areas; in unfinished areas, surface mounted unit are acceptable.
   2. Provide legible, permanent labels for each control device, using identification used in operation and maintenance data.

B. Fire Alarm Control Units: Analog, addressable type; listed, classified, and labeled as suitable for the purpose intended.

C. Master Control Unit: As specified for Basis of Design above, or equivalent.

D. Initiating Devices:
   1. Addressable Systems:
      a. Addressable Devices: Individually identifiable by addressable fire alarm control unit.
      b. Provide suitable addressable interface modules as indicated or as required for connection to conventional (non-addressable) devices and other components that provide a dry closure output.

E. Notification Appliances:
   1. Strobes: .

F. Circuit Conductors: Copper; provide 200 feet extra; color code and label.

G. Surge Protection: In accordance with IEEE C62.41.2 category B combination waveform and NFPA 70; except for optical fiber conductors.

H. Locks and Keys: Deliver keys to Owner.

I. Instruction Charts: Printed instruction chart for operators, showing steps to be taken when a signal is received (normal, alarm, supervisory, and trouble); easily readable from normal operator's station.
   1. Frame: Stainless steel or aluminum with polycarbonate or glass cover.
   2. Provide one for each control unit where operations are to be performed.

3. Obtain approval of Owner prior to mounting; mount in location acceptable to Owner.
4. Provide extra copy with operation and maintenance data submittal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with applicable codes, NFPA 72, NFPA 70, and Contract Documents.

B. Conceal all wiring, conduit, boxes, and supports where installed in finished areas.

C. Obtain Owner's approval of locations of devices, before installation.

D. Install instruction cards and labels.

3.02 INSPECTION AND TESTING FOR COMPLETION

A. Notify Owner 7 days prior to beginning completion inspections and tests.

B. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.

C. Provide the services of the installer's supervisor or person with equivalent qualifications to supervise inspection and testing, correction, and adjustments.

D. Prepare for testing by ensuring that all work is complete and correct; perform preliminary tests as required.

E. Provide all tools, software, and supplies required to accomplish inspection and testing.

F. Perform inspection and testing in accordance with NFPA 72 and requirements of local authorities; document each inspection and test.

G. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

3.03 CLOSEOUT

A. Closeout Demonstration: Demonstrate proper operation of all functions to Owner.
   1. Be prepared to conduct any of the required tests.
   2. Have at least one copy of operation and maintenance data, preliminary copy of project record drawings, input/output matrix, and operator instruction chart(s) available during demonstration.
   3. Have authorized technical representative of control unit manufacturer present during demonstration.
   4. Demonstration may be combined with inspection and testing required by authority having jurisdiction; notify authority having jurisdiction in time to schedule demonstration.
   5. Repeat demonstration until successful.

END OF SECTION

APPENDIX - A

ASBESTOS ABATEMENT CONTRACTOR BID DOCUMENT AND SPECIFICATIONS

Cooper Mountain Elementary School
Seismic Renovation Project

7670 SW 170th Avenue
Beaverton, OR 97007

Prepared for:

Beaverton School District

16550 SW Merlo Road
Beaverton, Oregon 97006

Submitted: November 19, 2020

Prepared By:

4105 SE International Way, Suite 505
Milwaukie, OR 97222
503.387.3251

TRC Project Number: **407537**

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BID FORM

1. Base Bid: Bid due date will be announced at the Job Walk

The undersigned, having examined the proposed contract documents titled: Asbestos Abatement Contractor Bid Document and Specifications for 7670 SW 170th Avenue in Beaverton, Oregon 97007 (Project Site), dated November 19, 2020, and having visited the site and examined the conditions affecting the work, hereby proposes and agrees to furnish all labor, materials, equipment, permits, insurance, appliances and regulatory fees to perform operations necessary to complete the work as required by said proposed contract documents, for that portion of the work identified in Scope of Work as "Base Bid" for the stipulated sum of:

_____**DOLLARS ($_____**)

To be completed in _____working days (8 hr. shifts).

Unit Abatement Costs: Removal as ACM and disposal as applicable by regulations:

Material	**Unit**	**Unit Cost**
Vinyl Floor Tile and Mastic	Square Foot	$/sq. ft.:
Thermal System Pipe Insulation (Elbows)	Each	$/ each:
Thermal System Pipe Insulation (Runs)	Linear Foot	$/ln. ft.:
Roofing Material	Square Foot	$/sq. ft.:
Fire Doors	Each	$/ Each
Mobilization Cost Associated with Follow-up Abatement Services	Mobilization	$/Mob

BIDDER

by_____

Address_____

_____

Contractor License_____

License Type_____

Type of business entity:

_____

Individual partners or individuals of the firm:

_____
_____
_____

President of Corporation_____
Secretary of Corporation_____
Corporation is organized under laws of the State of _____
Bid dated this _____day of _____, 2020.

END OF BID FORM

ASBESTOS CONTAINING MATERIALS ABATEMENT SUMMARY OF WORK

The Work includes the abatement of Asbestos Containing Materials (ACM) at 7670 SW 170th Avenue, Beaverton, Oregon in order to prepare the site for renovation. The scope of work includes abatement and proper disposal of the asbestos containing materials identified in this document.

Base Bid: The Asbestos Abatement Contractor shall furnish all labor, materials, services, insurance (specifically covering the handling, transportation of asbestos containing material (ACM) and equipment which is specified, shown, or reasonably implied for the following abatement work.

The removal and disposal as required by applicable regulations, of the following friable and non-friable asbestos containing materials identified in the Supplemental Asbestos and Lead Paint Survey report prepared by TRC and dated March 21, 2020. The asbestos-containing materials to be abated and their general location(s) are as follows:

Asbestos Containing Materials

Description	Material Location(s)	Friable / non-Friable	Approximate Quantity
12” x 12” Tan Floor Tile and Mastic	Various Locations (See Figure 1)	Non-Friable*	2,400 SF
Pipe Insulation and Elbows	Throughout (Based on demo needs)	Friable	40 Each
Built-up Roofing	North Roof on CMT2	Non-Friable	6,500 SF

*Floor Tile Mastic must be removed using bead blasting or grinding methods to leave a smooth concrete surface. Chemical removal is not allowed.

ASBESTOS

PART 1 GENERAL - ASBESTOS

1.01 SCOPE OF WORK

A. The asbestos abatement and disturbance work related to this Project will consist of the removal and disposal of asbestos containing materials (ACM) and presumed asbestos containing materials (PACM) within portions of Cooper Mountain Elementary School located at 7670 SW 170th Avenue in Beaverton, Oregon 97007 as part of a planned renovation project. This section is intended to provide instruction for requirements in connection with asbestos abatement or disturbance and is complementary to the other contract documents, which apply to this section by reference.

B. For Work described in this Section, the Abatement Contractor (Contractor) shall furnish all labor, materials, equipment, tools, and any other resources necessary to complete the work in accordance with regulatory requirements and project contract documents, using best available technology and industry standard methods and procedures. The work shall include but not be limited to the removal and proper disposal of ACM and/or presumed ACM (PACM) materials as described below:

Asbestos Containing Materials

Description	Material Location(s)	Friable / non- Friable	Approximate Quantity
12" x 12" Tan Floor Tile and Mastic	Various Locations (See Figure 1)	Non-Friable*	2,400 SF
Pipe Insulation and Elbows	Throughout (Based on demo needs)	Friable	40 Each
Built-up Roofing	North Roof on CMT2	Non-Friable	6,500 SF

*Floor Tile Mastic must be removed using bead blasting or grinding methods to leave a smooth concrete surface. Chemical removal is not allowed.

Please refer to Appendix A, Supplemental Asbestos Survey Report dated, September 21, 2020, for additional and more detailed information on the asbestos materials present at the Site.

Estimated quantities are provided as an approximate guide to the Contractor. The material quantities listed above are approximations and TRC is not responsible for the accuracy of the quantities and measurements provided. The Contractor shall field verify material quantities, locations, and make themselves cognizant of existing field conditions prior to submitting bids for the work of this specification. Submitting of bids for work described herein shall take into consideration and utilize the Contractor's field measurements of materials and observations of the conditions verified on site.

C. The Contractor shall be aware of all conditions of the Project and is responsible for verifying quantities and locations of all Work to be performed. Failure to do so shall not relieve the Contractor of its obligation to furnish all labor, equipment, and materials necessary to perform the Work.

D. All Work shall be performed in strict accordance with the Project Documents and all governing codes, rules, and regulations. Where conflicts occur between the Project Documents and applicable codes, rules, and regulations, the more stringent requirement shall apply.

E. Working hours shall be as required and approved by the Owner. ERM abatement activities including, but not limited to, work area preparation, gross removal activities, waste clean-up activities, waste removal, etc. may need to be performed during the specified time period by the Owner. The Contractor shall coordinate and schedule all Work with the facility and Owner's representative.

1.02 PERMITS AND COMPLIANCE

A. The Contractor shall assume full responsibility and liability for compliance with all applicable Federal, State, and local laws, rules, and regulations pertaining to Work practices, protection of Workers, authorized visitors to the site, persons, and property adjacent to the Work.

B. Perform asbestos related Work in accordance with Federal, State and Local Regulations (U.S. Environmental Protection Agency (EPA) 40 CFR 61, Occupational Health and Safety (OSHA) 29 CFR 1926 and Oregon Department of Environmental Quality (ODEQ)). Where more stringent requirements are specified, the Contractor shall adhere to the more stringent requirements.

1.03 SUBMITTALS

A. Pre-Work Submittals: Within 15 calendar days prior to the pre-construction conference, the Contractor shall submit copies of the documents listed below to Beaverton School District's Environmental Consultant for review and approval prior to the commencement of asbestos abatement activities:

1. Asbestos Removal Work Plan which includes the means, methods and protective measures which will be used to comply with all applicable Federal, State and Local rules and regulations. This plan shall be completed and signed by an EPA accredited Asbestos Project Designer.

2. Current worker and contractor/supervisor training records.

3. Insurance Certificates

   a. All Certificates of Insurance must name Beaverton School District as additional insured and will comply with entities noted in the contract as additional insured. These include the following:

      - Asbestos/Pollution Liability - $1,000,000;
      - Auto Liability - $1,000,000 per each vehicle on site;
      - Workman's Compensation and Employers Liability - $500,000 per accident;
      - Commercial General Liability - $1,000,000 per occurrence with $2,000,000 general aggregate per project
      - True Umbrella Policy - $5,000,000

   b. All insurance will be written through companies having an A.N. rating of at least A VII or with such other companies as may reasonably be approved by Owner. All such liability insurance maintained by the Contractor or any subcontractor will include the condition that it is primary and that any such insurance maintained by Owner or any other additional insured is excess and non-contributory.

B. On-Site Submittals: Refer to Part 3.01.C for all submittals, documentation, and postings required to be maintained on-site during abatement activities.

C. Project Close-out Submittals: Within 30 business days of the completion of the project, the Contractor shall submit digital and hard copies of the documents listed below. The documents shall be transmitted to the Environmental Consultant for review and approval prior to the Contractor's final payment.

1. Originals of all waste disposal manifests, seals, and disposal logs.

2. OSHA personal air monitoring results conducted during the Work.

3. Daily progress log describing in detail the areas of work and ACM/PACM affected by the day's work activities and regulated work area entry/exit logs

4. Project Notifications

5. Safety Meeting Logs

6. Insurance Certificates

7. Workers Certifications and Medical Monitoring

8. Contractors Licenses

1.04 PRE-CONSTRUCTION CONFERENCE

A. Prior to start of preparatory Work under this Contract, the Contractor shall attend a pre-construction conference attended by Owner, Architect and Environmental Consultant.

B. Agenda for this conference shall include but not necessarily be limited to:

1. Contractor's Asbestos Removal Work Plan

2. Environmental Consultant's duties and functions

3. Contractor's Work procedures including:

   a. Methods of job site preparation and removal methods

   b. Respiratory protection

   c. Disposal procedures

   d. Cleanup procedures

   e. Fire exits and emergency procedures

4. Contractor’s required pre-work and on-site submittals, documentation, and postings

5. Contractor's plan for twenty-four (24) hour project security both for prevention of theft and for barring entry of unauthorized personnel into work areas

6. Temporary utilities

7. Storage of removed asbestos containing materials

8. Waste disposal requirements and procedures, including waste manifest and container seals

C. In conjunction with the conference the Contractor shall accompany the Owner, Architect and Environmental Consultant on a pre-construction walk-through of the Project site.

1.05 APPLICABLE STANDARDS AND REGULATIONS

All asbestos related work must be performed in accordance with EPA and OSHA regulations (40 CFR 61, 29 CFR 1926) and Oregon Department of Environmental Quality. Where more stringent requirements are specified, the Contractor shall adhere to the more stringent requirements.

1.06 NOTICES

A. The Contractor shall provide notification of intent to commence asbestos abatement activities at least ten (10) working days prior to beginning abatement activities. Written notification shall be sent to the Oregon Department of Environmental Quality Department (DEQ).

B. The Contractor shall maintain copies of notices, and provide proof of delivery and receipt.

C. The Contractor shall be responsible for maintaining current project filings with regulatory agencies for the duration of the project.

1.07 ENVIRONMENTAL CONSULTANT

A. The Owner shall engage the services of an Environmental Consultant (the Consultant) who shall serve as the Owner's Representative in regard to the performance of the asbestos abatement Project and provide direction as required throughout the entire abatement Project period.

B. The Contractor is required to ensure cooperation of its personnel with the Consultant for the air sampling and Project monitoring functions described in this section. The Contractor shall comply with all direction given by the Consultant during the course of the Project.

C. The Consultant shall review and approve all Contractor submittals.

D. The Consultant shall staff the Project with a trained and certified person(s) to act on the Owner's behalf at the job site.

1. The consultant's representative shall be on-site at all times the Contractor is on-site. The Contractor shall not be permitted to conduct any Work unless the consultant's representative is on-site (except for inspection of barriers and negative air system during non-working days).

2. The consultant's representative shall have the authority to direct the actions of the Contractor verbally and in writing to ensure compliance with the Project documents and all regulations. The consultant's representative shall have the authority to Stop Work when gross Work practice deficiencies or unsafe practices are observed, or when ambient fiber concentrations outside the removal area exceed 0.01 f/cc or background level.

    a. Such Stop Work order(s) shall be effective immediately and remain in effect until corrective measures have been taken and the situation has been corrected.

    b. Standby time required to resolve the situation shall be at the Contractor's expense.

3. The consultant's representative shall provide the following services:

    a. Inspection of the Contractor's Work, practices, and procedures, including temporary protection requirements, for compliance with all regulations and Project specifications including provisions required by Variances, the Work Place Safety Plan and Asbestos Work Permit.

b. Provide abatement Project air sampling as required by applicable regulations and the Owner. Sampling will include background, work area preparation, asbestos handling, final cleaning and clearance air sampling.

c. Verify daily that all Workers used in the performance of the Project are certified by the appropriate regulatory agency.

d. Monitor the progress of the Contractor's Work, and report any deviations from the schedule to the Owner.

e. Monitor, verify, and document all waste load-out operations.

f. Verify that the Contractor is performing personal air monitoring daily, and that results are being returned and posted at the site as required.

g. The consultant's representative shall maintain a log on site that documents all project related and Consultant and Contractor actions, activities, and occurrences.

4. The following minimum inspections shall be conducted by the consultant's representative. Additional inspections shall be conducted as required by Project conditions. Progression from one phase of Work to the next by the Contractor is only permitted with the written approval of the consultant's representative.

a. Pre-Construction Inspection: The purpose of this inspection is to verify the existing conditions of the Work Areas and to document these conditions.

b. Pre-Commencement Inspection: The purpose of this inspection is to verify the integrity of each containment system prior to disturbance of any asbestos containing material. This inspection shall take place only after the Work Area is fully prepped for removal.

c. Work Inspections: The purpose of this inspection is to monitor the Work practices and procedures employed on the Project and to monitor the continued integrity of the containment system. Inspections within the removal areas shall be conducted by the consultant's representative during all preparation, removal, and cleaning activities at least twice every Work shift. Additional inspections shall be conducted as warranted.

d. Pre-Encapsulation Inspection: The purpose of this inspection is to ensure the complete removal of ACM and/or PACM, from all surfaces in the Work Area prior to encapsulation.

e. Visual Clearance Inspection: The purpose of this inspection is to verify that: all materials in the scope of work have been properly removed; no visible asbestos debris/residue remains; no pools of liquid or condensation remains; and all required cleanings are complete. This inspection shall be conducted before final air clearance testing.

f. Post-Clearance Inspection: The purpose of this inspection is to ensure the complete removal of ACM, including debris, from the Work Area after satisfactory final clearance sampling and removal of all isolation and critical barriers and equipment from the Work Area.

E. The Consultant shall provide abatement Project air sampling and analysis as required by applicable regulations. Sampling will include background, work area preparation, asbestos handling, and final cleaning and clearance air sampling.

1. Unless otherwise required by applicable regulations, the Consultant shall have samples analyzed by Phase Contrast Microscopy (PCM) for daily area and final clearance air monitoring during asbestos removal or disturbance work. Results shall be available at the Project site within 2 hours of completion of sampling. Should TEM analysis be requested/required, results will be provided within 24 hours of receipt of samples by the accredited laboratory.

2. Samples shall be collected as required by applicable regulations and these specifications.

3. If the air sampling during any phase of the abatement project reveals airborne fiber levels at or above .01 fibers/cc or the established background level, whichever is greater, outside the regulated Work Area, Work shall stop immediately and corrective measures required by applicable regulations shall be initiated. Notify all employers and occupants in adjacent areas. The Contractor shall bear the burden of any and all costs incurred by this delay.

4. At the completion of each abatement phase, the Consultant shall prepare an interim certificate of completion for project records.

1.08 PERSONAL AIR SAMPLING

A. The Contractor shall perform appropriate personal air monitoring in accordance with 29 CFR 1926.1101, every Work shift in each Work Area during which abatement activities occur in order to determine that appropriate respiratory protection is being worn and utilized.

B. The Contractor shall conduct air sampling that is representative of both the 8-hour time weighted average and 30-minute short-term exposures to indicate compliance with the permissible exposure and excursion limits.

C. The Contractor's laboratory analysis of air samples shall be conducted by laboratory accredited by the American Industrial Hygiene Association (AIHA) for PCM analysis.

E. Results of personnel air sample analyses shall be available within 5 business days of sample collection.

1.09 PROJECT SUPERVISOR

A. The Contractor shall designate a full-time Project Supervisor who shall meet the following qualifications:

1. The Project Supervisor shall hold an Asbestos Hazard Emergency Response Act (AHERA) certification as an Asbestos Contractor/Supervisor.

2. The Project Supervisor shall meet the requirements of a "Competent Person" as defined by OSHA 1926.1101 and shall have a minimum of one year experience as a supervisor.

3. The Project Supervisor must be able to speak, read, and write English fluently, as well as communicate in the primary language of the Workers and immediate community.

B. The Project Supervisor shall be responsible for the performance of the Work and shall represent the Contractor in all respects at the Project site. The Supervisor shall be the primary point of contact for the Asbestos Project Monitor.

1.10 RESPIRATORY PROTECTION

A. Select respirators from those approved by the National Institute for Occupational Safety and Health (NIOSH), Department of Health and Human Services.

B. High Efficiency Particulate Air (HEPA) respirator filters shall be approved by NIOSH and shall conform to the OSHA requirements in 29 CFR 1910.134 and 29 CFR 1926.1101.

C. A storage area for respirators shall be provided by the Contractor in the clean room side of the personnel decontamination enclosure where they will be kept in a clean environment.

D. The Contractor shall provide and make available a sufficient quantity of respirator filters so that filter changes can be made as necessary during the work day. Filters used with negative pressure air purifying respirators shall be changed regularly to comply with OSHA.

E. Any visitor, Worker, or supervisor found in the Work Area not wearing the required respiratory protection shall be removed from the Project site.

1.11 DELIVERY AND STORAGE

A. Store all materials at the job site in a suitable and designated area.

1. Store materials subject to deterioration or damage away from wet or damp surfaces and under cover.

2. Protect materials from unintended contamination and theft.

3. Storage areas shall be kept clean and organized.

B. Remove damaged or deteriorated materials from the job site. Materials contaminated with asbestos shall be disposed of as asbestos debris.

1.12 TEMPORARY UTILITIES

A. Shut down and lock out all electrical power to the asbestos Work Areas.

B. Provide temporary electric service with Ground Fault Circuit Interrupters (GFCI) for all electric requirements within the asbestos Work Area.

C. Provide temporary lighting with "weatherproof" fixtures for all Work Areas.

D. Utilize domestic water service, if available, from Owner's existing system. Provide hot water heaters with sufficient capacity to meet Project demands.

PART 2 PRODUCTS

2.01 MATERIALS

A. All materials shall be delivered to the job site in the original packages, containers, or bundles bearing the name of the manufacturer, the brand name and product technical description, with Safety Data Sheets (SDSs) as applicable.

B. No damaged or deteriorating materials shall be used. If material becomes contaminated the material shall be decontaminated or disposed of as asbestos-containing waste material. The cost to decontaminate and dispose of this material shall be at the expense of the Contractor.

C. Fire retardant polyethylene sheet shall be in roll size to minimize the frequency of joints, with factory label indicating no less than six (6) mil thickness.

D. Polyethylene disposable bags shall be no less than six (6) mils thick.

E. A commercial grade duct tape (or equivalent) capable of sealing joints in adjacent polyethylene sheets and for the attachment of polyethylene sheets to finished or unfinished surfaces must be capable of adhering under both dry and wet conditions.

F. Any planking, bracing, shoring, barricades and/or temporary sheet piling, necessary to appropriately perform work activities shall conform to all applicable federal, state and local regulations.

2.02 TOOLS AND EQUIPMENT

The Contractor shall provide tools and equipment that are suitable for asbestos related activities and in good working order.

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. The following submittals, documentation, and postings shall be maintained on-site by the Contractor during abatement activities:

1. Asbestos worker and contractor/supervisor certification cards for each person employed in the removal, handling, or disturbance of asbestos

2. Daily OSHA personal air monitoring results

3. Project documents (specifications and drawings)

4. Applicable regulations

5. Safety Data Sheets of supplies/chemicals used on the Project

6. Approved Abatement Work Plan

7. List of emergency telephone numbers

8. Daily Project Log

B. The following documentation shall be maintained on-site by TRC Environmental Corp. during abatement activities:

1. Air sample results

2. Project Monitor Daily Log

3. Asbestos Survey Report

4. A copy of ASTM Standard E1368 “Standard Practice for Visual Inspection of Asbestos Abatement Projects”

C. Install emergency exit signage and fire extinguishers throughout the Work Area in accordance with OSHA Construction Industry Standards.

D. Use the following engineering controls and work practices for all asbestos abatement operations, regardless of measured exposure levels:

1. Vacuum cleaners equipped with HEPA filters to collect all asbestos-containing dust and debris

2. Wet methods to control exposures during asbestos removal and clean-up, except where proven to be infeasible

3. Prompt clean-up and disposal of asbestos-contaminated wastes and debris in leak-proof containers

F. Do not use any of the following equipment or work practices during asbestos abatement operations, regardless of measured exposure levels:

1. High-speed abrasive disc saws not equipped with point-of-cut HEPA ventilation or HEPA filtered exhaust air enclosures

2. Blowing with compressed air to remove asbestos-containing materials

3. Dry sweeping, shoveling, or other dry methods to clean up asbestos-containing dust and debris

4. Employee rotation as a means of reducing employee exposure to asbestos

G. Protect adjacent areas, materials and surfaces from damage due to demolition operations, including but not necessarily limited to the following:

1. Water damage

2. Dirt, dust and debris

3. Abrasion

4. Cuts and scratches

5. Holes from fasteners for temporary barriers

3.02 PROTECTIVE CLOTHING

A. Provide personnel utilized during the Project with disposable protective whole body clothing, head coverings, gloves and foot coverings. Provide disposable plastic or rubber gloves to protect hands. Cloth gloves may be worn inside the plastic or rubber for comfort, but shall not be used alone. Make sleeves secure at the wrists and make foot coverings secure at the ankles by the use of tape, or provide disposable coverings with elastic wrists or tops.

B. Authorized visitors shall be provided with suitable protective clothing, headgear, eye protection, and footwear whenever they enter the Work Area.

3.03 SIGNS AND LABELS

A. Provide warning signs and barrier tapes at all approaches to asbestos Work Areas. Locate signs at such distance that personnel may read the sign and take the necessary protective steps required before entering the area.

1. Provide danger signs in vertical format conforming to 29 CFR 1926.1101, minimum 20" x 14" displaying the following legend.

ASBESTOS CANCER AND LUNG DISEASE
HAZARD
AUTHORIZED PERSONNEL ONLY
RESPIRATORS AND PROTECTIVE CLOTHING
ARE REQUIRED IN THIS AREA

2. Provide 3" wide OSHA-Approved barrier tape printed with black lettered, "DANGER ASBESTOS REMOVAL". Locate barrier tape across all corridors, entrances and access routes to asbestos Work Area. Install tape 3' to 4' Above Finished Floor AFF.

B. Provide asbestos danger labels affixed to all asbestos materials, scrap, waste, debris and other products contaminated with asbestos.

1. Provide asbestos danger labels of sufficient size to be clearly legible, displaying the following legend:

DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD

2. Provide the following asbestos labels, of sufficient size to be clearly legible, for display on waste containers (bags or drums) which will be used to transport asbestos

contaminated material in accordance with United States Department of Transportation 49 CFR Parts 171 and 172: (Note: Include “RQ” for friable asbestos waste only.)

RQ, (WASTE) ASBESTOS, 9, NA2212, PGIII

3. Generator identification information shall be affixed to each waste container indicating the following printed in indelible ink:
   Generator Name
   Facility Name
   Facility Address
   EPA Generator ID Number

3.04 FRIABLE ACM REMOVAL BY FULL ENCLOSURE METHOD

A. Preparation of the Work Area

1. Install critical barriers over each opening into the regulated area. The following requirements are in addition to, not in lieu of, other indicated surface and object protection requirements:

   a. Seal each opening between the work area and adjacent areas with not less than 2 layers of 6-mil polyethylene sheeting. Use an expanding-polyurethane foam gun to seal areas with large numbers of pipes, conduits and beams. Openings include, but are not necessarily limited to, windows, skylights, doorways, elevator hoist way openings, corridor entrances, drains, ducts, grills, grates, and diffusers.

   b. Seal intake and exhaust vents and duct seams within the regulated area with not less than 2 layers of 6-mil polyethylene sheeting.

2. HVAC System Shutdown: Owner's maintenance personnel will shut down heating, cooling, and air conditioning systems when necessary. Coordinate scheduling with Owner's personnel.

3. Protection of Surfaces and Objects: The following requirements are in addition to, not in lieu of, indicated work area sealing requirements. Cover the following surfaces and objects as follows:

   a. Protect all surfaces beneath all removal activity. Remove moveable objects from the work area, and cover fixed objects with impermeable drop cloths or plastic sheeting with edges securely sealed with tape.

   b. Provide clean, fresh air to mechanical equipment, where required to maintain proper performance of equipment.

   c. Fully pre-clean all covered surfaces with amended water and a HEPA vacuum.

   d. Cover walls with not less than 2 layers of 6-mil polyethylene sheeting. Construct free-standing enclosure walls of not less than 6-mil polyethylene sheeting, with supports spaced not more than 3 feet on center.

e. Cover floors with not less than 2 layers of 6-mil polyethylene sheeting. Avoid seams where possible. If seams are necessary, overlap not less than 12 inches and tape joints. Extend sheeting 12 inches up the side walls leaving no seams at the wall and floor joint. Immediately repair punctures and leaks, and clean up seepage.

4. Cleaning: Do not use cleaning methods that raise dust, such as sweeping or using vacuum cleaners not equipped with HEPA filters. Do not disturb asbestos materials during pre-cleaning phases. Treat water removed from the enclosure as asbestos contaminated waste. Fully seal floor drains.

5. Deactivate or install ground-fault circuit interrupters on each electrical circuit within the enclosure.

6. Construct a three-chambered decontamination facility that is adjacent to and connected to the regulated area, and that consists of a dirty room, a shower room, and a clean room in series. Construct decontamination facilities that are exposed to weather of lumber and exterior grade plywood. Secure the facility when not in use.

   a. Supply the equipment room with properly labeled, impermeable bags and containers for the containment and disposal of contaminated protective equipment.

   b. Construct showers that comply with the requirements of 29 CFR 1910.141 (d) (3), with the shower room adjacent to both the equipment room and the clean room. Filter water waste and shower water through a 5 micron filter, or remove water from site as asbestos waste.

   c. Equip the clean room with a locker or appropriate storage container for each employee.

7. Employee Decontamination Facilities

   a. Access the work area only through an approved decontamination system. Lock or block other entrances. Seal emergency exits (for use during a fire or accident) with polyethylene sheeting and tape.

   b. Seal the waste pass-out, except during the removal of asbestos waste from the enclosure.

   c. Entrance to The Regulated Area: Employees shall enter the decontamination area through the clean room, remove and store clothing, and put on protective clothing and respiratory protection before passing through to the equipment room.

   d. Exit from The Regulated Area: Employees shall exit the regulated area by removing gross contamination and debris from their protective clothing. The clothing shall be removed and disposed of in the equipment room into labeled impermeable bags or containers. Employees shall then shower and enter the clean room before changing into street clothes.

8. Local Exhaust Ventilation: Maintain portable air filtration units with a HEPA filter in use during asbestos abatement operations requiring enclosures. Units shall conform to

OSHA Standard 1926.1101, Appendix F, and shall be designed in accordance with 40 CFR 61, Subpart M, Section 61.153.

a. Exhaust directly to building exterior. Provide a backup portable air filtration unit at each removal enclosure. Startup ventilation units prior to initiating asbestos removal operations and run until the Owner's consultant has approved their shut-down after cleaning, visual inspection, clearance sampling and tear-down.

b. Direct air movement within the enclosure away from the employees' work area and toward the air filtration device.

c. Provide not less than 4 air changes per hour within the enclosure.

d. Within the enclosure, through the period of its use, maintain a pressure differential of not less than minus 0.02 water gage with respect to ambient conditions outside the enclosure. Provide continuous measurement of the pressure differential at each negative pressure enclosure.

9. Visually inspect the enclosure for breeches and smoke-test for leaks before work begins, and before the start of each work shift. Make all modifications to the enclosure prior to starting removal work.

B. Work Practices

1. Immediately preceding asbestos removal, apply a fine mist of water to the asbestos materials and the surrounding area. Keep surrounding areas wet by spraying periodically with amended water. Maintain a high humidity environment to assist in fiber settling.

2. Remove asbestos material using two-person teams, on staging platforms, if necessary.

3. Remove the wet asbestos material as intact sections or components. Carefully lower the material to the floor or place directly into container. Never drop or throw asbestos material on the floor.

4. At working heights between 15 and 50 feet above the floor, place removed asbestos materials in containers at the elevated levels and lower to floor, or place onto inclined chutes or scaffolding for subsequent collection and placement into containers. Clean all debris at the completion of each workday.

5. Once the asbestos material is at ground level, pack in labeled 6-mil polyethylene bags, wet and, if appropriate, hold in drums prior to starting the next section.

6. Use 2 sealed and labeled 6-mil thick bags for storage and transportation of asbestos waste. Standing water shall be in each bag

7. Wrap large components removed intact in two layers of 6-mil polyethylene sheeting, label, and secure with tape for transport to the landfill. Comply with all wetting requirements.

8. Treat wires, hangers, steel bands, nails, screws, metal lath, tin sheeting, and similar sharp objects removed with asbestos material as asbestos waste. Place in drums for disposal.

9. Label containerized asbestos waste in accordance with OSHA, EPA, and Department of Transportation regulations, as follows:

   a. Label each container with OSHA label that contains the following information:

DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG
DISEASE HAZARD

   b. Label each container with Owner's and Asbestos Abatement Firm's names and addresses as required by NESHAP.

   c. Label each container with Class 9 Label required by DOT and identify waste as "RQ, Asbestos NA 2212."

10. Remove containerized asbestos waste daily from site, or store on site in a locked or secured location until ready for final disposal. Obtain approval of Owner's Representative of the location of disposal containers. Outdoor waste containers shall be fully enclosed and locked. Mark vehicles used to transport waste during the loading and unloading of asbestos waste with a visible sign, as required by NESHAP.

3.05 REMOVAL OF NON-FRIABLE ASBESTOS-CONTAINING MATERIALS

A. Removal of Vinyl Floor Tile (unless rendered Friable)

1. Prior to removal, critical barriers shall be placed over openings to the regulated area.

2. Prior to removal, clean floors of dirt and debris with vacuums equipped with HEPA filter.

3. Sanding the floor or related backing is not permitted.

4. Mechanical chipping of vinyl floor tile is prohibited, except when performed in a negative pressure enclosure.

5. Thoroughly wet vinyl floor tile with water. Use a slip scraper or equivalent to loosen the floor tile from the floor. Remove the floor tile in an intact state. Keep the floor tile wet throughout the removal and cleanup.

6. Place the resilient flooring material and debris in an asbestos disposal bag. Seal the bag and place it in a properly labeled drum. Comply with the disposal and labeling requirements of this document.

B. Asbestos Mastic Removal

1. Use bead blasting or grinding methods and follow friable removal requirements established in Section 3.04 above.

2. Properly dispose of all asbestos waste according to all applicable regulations, and comply with the disposal and labeling requirements of this Section.

C. Asbestos-Containing Siding and Transite Panels

1. Create a regulated work area and place impermeable drop cloths on surfaces beneath removal activity.

2. Cutting, abrading, or breaking material is not permitted.

3. Wet material with water prior to removal.

4. Carefully disassemble material such a manner as to prevent breakage.

5. Wrap and seal material in two layers 6-mil thick polyethylene, asbestos disposal bags, or equivalent. Seal bags or packages and properly label them with appropriate asbestos warning signs.

D. Non-Friable Asbestos Containing Exterior Sealant, Caulk, Putty and Window Glazing

1. Create a regulated work area and place impermeable drop cloths on surfaces beneath removal activity.

2. Any existing loose material shall be HEPA vacuumed prior to removal.

3. The material shall be thoroughly wetted prior to and during its removal.

4. The material should be removed as intact as possible. Manual methods shall be used.

5. Removed ACM shall be immediately bagged.

6. The removal of windows and other whole building components without disturbing the asbestos is encouraged.

7. If the material becomes friable during the abatement process, comply with the requirements for friable asbestos removal.

3.06 WORK AREA DECONTAMINATION AND CLEARANCE PROCEDURES

A. The Asbestos Abatement Contractor’s representative, in presence of Owner's consultant, shall inspect the entire work area for asbestos.

B. If any suspect asbestos dust or debris is found, repeat final cleaning operation, until the visual inspection is satisfactory to the Owner's consultant.

C. After final visual clearance criteria have been achieved in the work areas, the Owner's consultant will notify the Abatement Contractor to encapsulate all walls, floors, ceilings, other exposed surfaces, and decontamination facilities.

D. Clearance air sampling will be completed by the Owner's consultant after the encapsulant has dried. Any costs associated with re-cleaning due to failed clearance results will be the sole responsibility of the Abatement Contractor. All clearance air samples shall be at or below 0.01 fibers per cubic centimeter as measured using Phase Contrast Microscopy (NIOSH 7400 method) or below 70 structures per square millimeter by Transmission Electron Microscopy (TEM) using the AHERA analytical method.

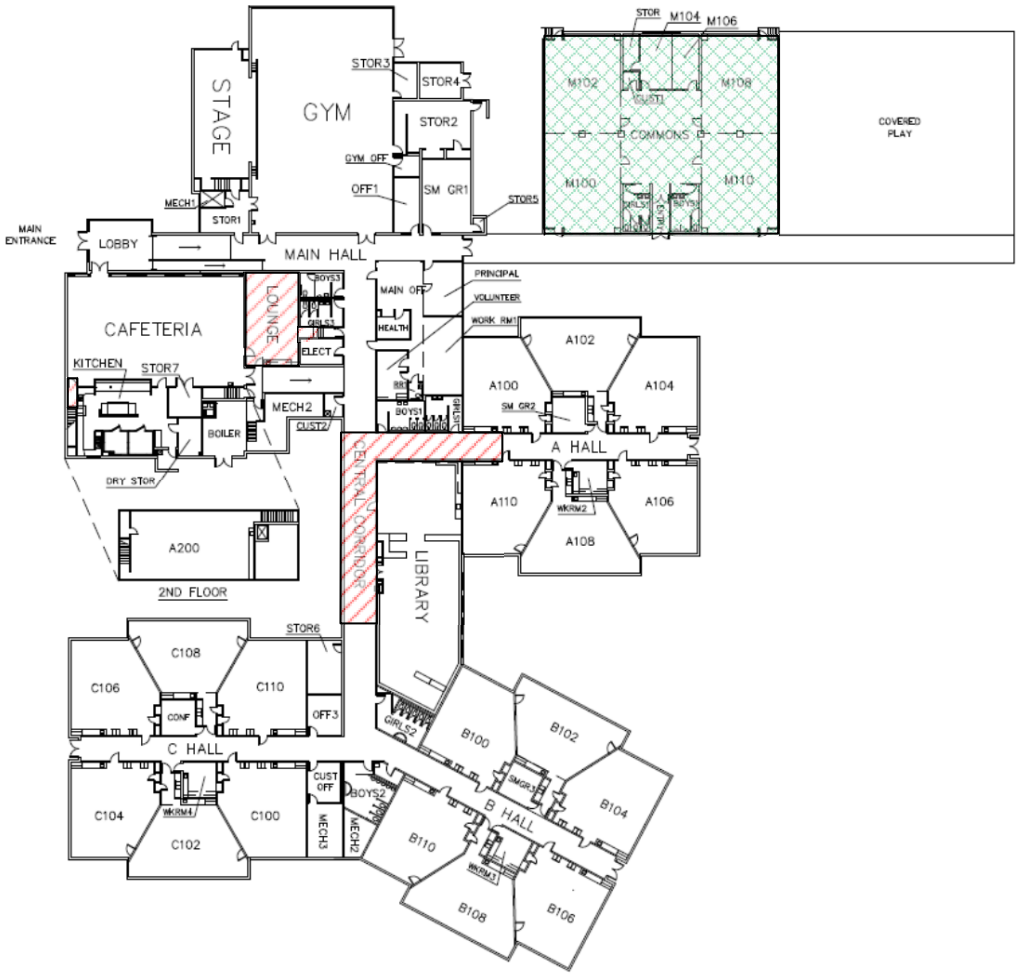
E. After abatement clearance is given by the Asbestos Project Monitor the Abatement Contractor may remove the containment, which shall be disposed of as ACM.

3.07 WASTE DISPOSAL

A. All waste will be transported and disposed of in compliance with DOT requirements and all applicable Federal, State and local regulations. Disposal must occur at an acceptable landfill accompanied by a waste manifest.

B. A copy of all waste manifests shall be given to Owner upon completion of the project.

FIGURES



LEGEND
sbestos-Containing Floor Tile and Mastic
Asbestos-Containing Roofing Materials
s-Containing Pipe Fitting Insulation and med Fire Doors Located Throughout

ASBESTOS ABATEMENT
MATERIAL LOCATION DIAGRAM

COOPER MOUNTAIN ELEMENTARY SCHOOL
7670 SW 170TH AVENUE
BEAVERTON, OREGON 97007

TRC Project No.: 407537		Figure: 1
Drawn by: MC	Reviewed by: RAL	Date: November 2020

TR
4105 SE International Way, S
Milwaukie, Oregon 972
Phone: (503) 387-3251 Fax: (50

APPENDIX A

SUPPLEMEMTAL ASBESTOS SURVEY REPORT
Cooper Mountain Elementary School
7670 SW 170th Avenue
Beaverton, Oregon 97007
Dated: September 21, 2020

SUPPLEMENTAL ASBESTOS SURVEY REPORT

Cooper Mountain Elementary School

7670 SW 170th Avenue
Beaverton, OR 97007

Prepared for:

Beaverton School District

16550 SW Merlo Road
Beaverton, OR 97006

Inspection Dates: September 2, 2020
Report Prepared: September 21, 2020

Prepared By:

4105 SE International Way, Suite 505
Milwaukie, OR 97222
503.387.3251

TRC Project Number: 407537

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Asbestos Sampling and Analytical Procedures 2
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Appendix B – Laboratory Analytical Data Sheets
Appendix C – Prior Documentation
Appendix D – Inspector Certification(s)

EXECUTIVE SUMMARY

TRC Environmental Corporation (TRC) was contracted by the Beaverton School District to conduct a supplemental asbestos survey, including collection of bulk asbestos samples, laboratory analysis, and preparation of a report for Cooper Mountain Elementary School located at 7670 SW 170th Avenue in Beaverton, Oregon 97007. Mr. Jason Stone, AHERA accredited building inspectors performed the survey on September 2nd, 2020. The survey activities included the review of prior sampling documentation and reports provided by the District, inspection and assessment of accessible suspect building materials, collection of bulk samples of suspect asbestos containing building materials that had previously not be sampled, and submission of bulk samples for laboratory analysis.

ASBESTOS MATERIAL SUMMARY

Suspect asbestos containing building materials were sampled and submitted under the chain-of-custody (COC) protocol to an accredited laboratory for polarized light microscopy (PLM) bulk sample analysis. Inspection, sampling and analytical procedures were performed in general accordance with the U.S. Environmental Protection Agency's (EPA's) National Emission Standards for Hazardous Air Pollutants (NESHAP) EPA 40 CFR 61 Subpart M, the EPA Asbestos Hazard Emergency Response Act (AHERA) 40 CFR Part 763, and Federal Occupational Safety and Health Administration (OSHA) 29 CFR 1926.1101 guidelines.

The following materials sampled during this investigation and prior investigations were identified as asbestos containing materials:

- 12" x 12" Tan Floor Tile and Mastic (Previously Sampled)
- MJP Pipe Fittings (Previously Sampled)
- Built-up Roofing (Previously Sampled)
- Fire Doors (Assumed)

Additionally, any materials uncovered during renovation activities that are not addressed in this inspection report or prior reports for the building are considered presumed asbestos containing materials and must be sampled by an accredited asbestos inspector prior to disturbance, or they must be treated as asbestos containing.

INTRODUCTION

A supplemental asbestos survey was conducted by TRC at Cooper Mountain Elementary School, located at 7670 SW 170th Avenue in Beaverton, Oregon. It was reported by the client that this hazardous materials survey is being conducted in conjunction with their seismic renovation project. The survey activities were performed on September 2nd, 2020, and included the review of prior sampling documentation and reports as well as the inspection, assessment and bulk sampling of suspect asbestos containing building materials that had not previously been sampled. Sample locations are presented on the Sample Location Diagrams in Appendix A. Laboratory analytical results are presented in Appendix B and Prior Documentation is presented in Appendix C.

Mr. Jason Stone, AHERA accredited building inspector conducted the survey inspection and sampling activities. Copies of training certificates and state licenses (where applicable) are presented in Appendix D, Inspector Certifications.

BACKGROUND

Asbestos Containing Materials
The United States Environmental Protection Agency (EPA) define an asbestos-containing material (ACM) as any material containing more than one percent (>1.0%) asbestos by weight. In addition, ACMs are designated as:

Friable asbestos - material which can be crumbled, pulverized or reduced to powder by hand pressure, a.k.a. Regulated Asbestos Containing Materials (RACM).

Category I Non-friable - includes resilient floor coverings, asphalt roofing products, gaskets and packing.

Category II Non-friable - any non-friable ACM that is not in Category I (i.e. Asbestos-cement (Transite) siding or roofing material).

OSHA Regulated Materials
The Occupational Safety and Health Administration (OSHA) regulates all materials containing any detectable level of asbestos by weight, including those materials containing 1.0% or less.

Asbestos Sampling and Analytical Procedures
Representative bulk samples of suspect asbestos-containing building materials were randomly collected from the interior of the building. Homogenous material determination was based on the following criteria:

- Similar physical characteristics (same color and texture, etc.),
- Application (sprayed or trowel-on, assembly into a system, etc.),
- Material function (thermal insulation, floor tile, wallboard system, etc.).

The bulk samples were collected, labeled, and shipped to the certified analytical laboratory under proper COC documentation, and condition and approximate quantity assessments were performed by the accredited inspector during the inspection.

Laboratory services were provided by TRC Labs, in Windsor, Connecticut, a National Voluntary Laboratory Accreditation Program (NVLAP code #101424-0).

Bulk samples were analyzed by PLM utilizing the EPA's Test Methods: Methods for the Determination of Asbestos in Bulk Building Materials (EPA 600/R-93/116, July 1993) and the McCrone Research Institute's The Asbestos Particle Atlas as method references.

Analysis by PLM was performed by visual observation of the bulk sample and slides prepared of the bulk sample for microscopic examination and identification. The samples were analyzed for asbestos (Chrysotile, Amosite, Crocidolite, Anthophyllite, and Actinolite/Tremolite), fibrous non-asbestos constituents (mineral wool, cellulose, etc.) and non-fibrous constituents. Using a stereoscope, the microscopist visually estimates the relative amounts of each constituent by determining the estimated area of the asbestos compared with the area estimate of the total sample.

ASBESTOS FINDINGS & RECOMMENDATIONS

The following table presents the location and quantities of each suspect building material identified and sampled during this survey as well as all applicable analytical results:

Sample No.	Material	Sample Location	Asbestos Content	Approximate Quantity
CME-04A CME-04B CME-04C	Gypsum Board and Joint Compound	Throughout M Wing	G.B. – ND J.C. – ND	N/A
CME-05A CME-05B CME-05C CME-05D CME-05E CME-05F CME-05G CME-05H CME-05I	Plaster, Skim Coat with Base Coat	Throughout	ND	N/A
CME-06A CME-06B CME-06C	12" x 12" Floor Tile (Yellow/Blue/Red/Gold) and Associated Glue	Cafeteria, Front Entry, Room Above Kitchen	ND	N/A

ND = Non-detect SF = Square feet LF = Linear Feet N/A = Not Applicable

Asbestos Containing Materials (ACMs)

Asbestos was detected in the following materials sampled during this and prior investigations:

Material	Approximate Location(s)	Approximate Quantity
12" x 12" Tan Floor Tile and Mastic	A Hall , Custodial 2	Unknown **(Previously Sampled)**
MJP Pipe Fittings	Throughout	Unknown **(Previously Sampled)**
Built-up Roofing	North Roof on CMT2	6,500 SF **(Previously Sampled)**

Material	Approximate Location(s)	Approximate Quantity
Fire Doors	Throughout	Assumed

Non-Detect Materials (ND)

Asbestos was not detected in the following materials sampled during this investigation:

Material	Location
Gypsum Board and Joint Compound	Throughout M Wing, Library, Lounge
Plaster, Skim Coat with Base Coat	Throughout
12” x 12” Floor Tile (Yellow/Blue/Red/Gold) and Associated Glue	Cafeteria, Front Entry, Room Above Kitchen
Sheet Floor Covering – Aggregate Pattern	Boy’s 3
4” Tan Cove Base and Mastic	Central Corridor, Staff Workroom, Lounge
4” Brown Cove Base and Mastic	Custodial 2, Main Hall
Gypsum Wallboard	Custodial 2, Boiler Room, Stage
Wall and Ceiling Plaster – Scratch Coat	Custodial 2, C Hall, C106, Central Corridor, Staff Workroom, Storage 6, A200, Library, Lounge, Stage
Skim coat	Custodial 2
Lay-in Ceiling Tile	B Hall, C106, Central Corridor, Unisex Restroom 1, Staff Workroom, Work Room 2, Stage
Mastic	B Hall, C Hall, Work Room 3
Cement Overspray	B108, B110
Pipe Insulation	Boiler Room, Mechanical Room 12
Cove Base Mastic	C106, Custodial 2, Library
Slate Like Material (Layered Black & White)	Gym
Wainscot Paneling Mastic	Main Hall
Hard Fittings – Fiberglass	Mechanical 2, Boiler Room
Brown/Tan Sheet Flooring	Girl’s Restroom 3
Off-White Beige Sheet Flooring	Unisex Restroom 1
Gray Backing	Unisex Restroom 1
Sheet Flooring Material and Mastic	Unisex Restroom 1
MJP Pipe Fitting	Storage 7
4” Black Cove Base and Yellow Mastic	Library
Corkboard	Library
Sheet Floor Covering	Modular Boys 1 and Girls 1 Restrooms
Built-up Roofing	B Hall, C Hall, Cafeteria
Wall Plaster	Stage
Gypsum Board and Joint Compound	CMT2 – Commons, M110
Paper Felt	CMT2 - Roof
Built-up Roofing	CMT2 – South Parapet, South Walkway

Due to the Site being an occupied building at the time of the inspection and sampling, a full destructive investigation for concealed materials was not performed. Hidden building materials (e.g., old floor mastic patches hidden under carpeting, chalkboard mastic, mirror mastic, wood paneling mastic, etc.), other than those discussed in this report, could be uncovered when removing building finishes during renovation activities. Any materials encountered during the renovation activities that are not identified in this report, should either be presumed to be asbestos containing and handled as ACM or be sampled by an accredited asbestos inspector to determine if it contains asbestos.

RECOMMENDATIONS

All identified asbestos containing and OSHA regulated materials from this investigation and previous investigations must be removed by a licensed asbestos abatement contractor prior to them being impacted by any renovation or demolition activities.

Additionally, any materials uncovered during renovation or demolition activities that are not addressed in this inspection report or prior reports for the building are considered presumed asbestos containing materials and must be sampled by an accredited asbestos inspector prior to disturbance, or they must be treated as asbestos containing.

DISCLAIMER

The content presented in this report is based on data collected during the site inspection and survey, review of pertinent regulations, requirements, guidelines and commonly followed industry standards, and information provided by the Beaverton School District, their clients, agents, and representatives.

The work has been conducted in an objective and unbiased manner and in accordance with generally accepted professional practice for this type of work. TRC believes the data and analysis to be accurate and relevant, but cannot accept responsibility for the accuracy or completeness of available documentation or possible withholding of information by other parties.

This asbestos survey report is designed to aid the property owner, architect, construction manager, general contractor, and asbestos abatement contractor in locating potential ACMs. This report is not intended for, and may not be utilized as, a bidding document or as an abatement project specification document.

If you have any questions, or need any further clarification regarding this report, please do not hesitate to contact Mr. Ron Landolt at (503) 407-0734.

Sincerely,
TRC Environmental Corporation

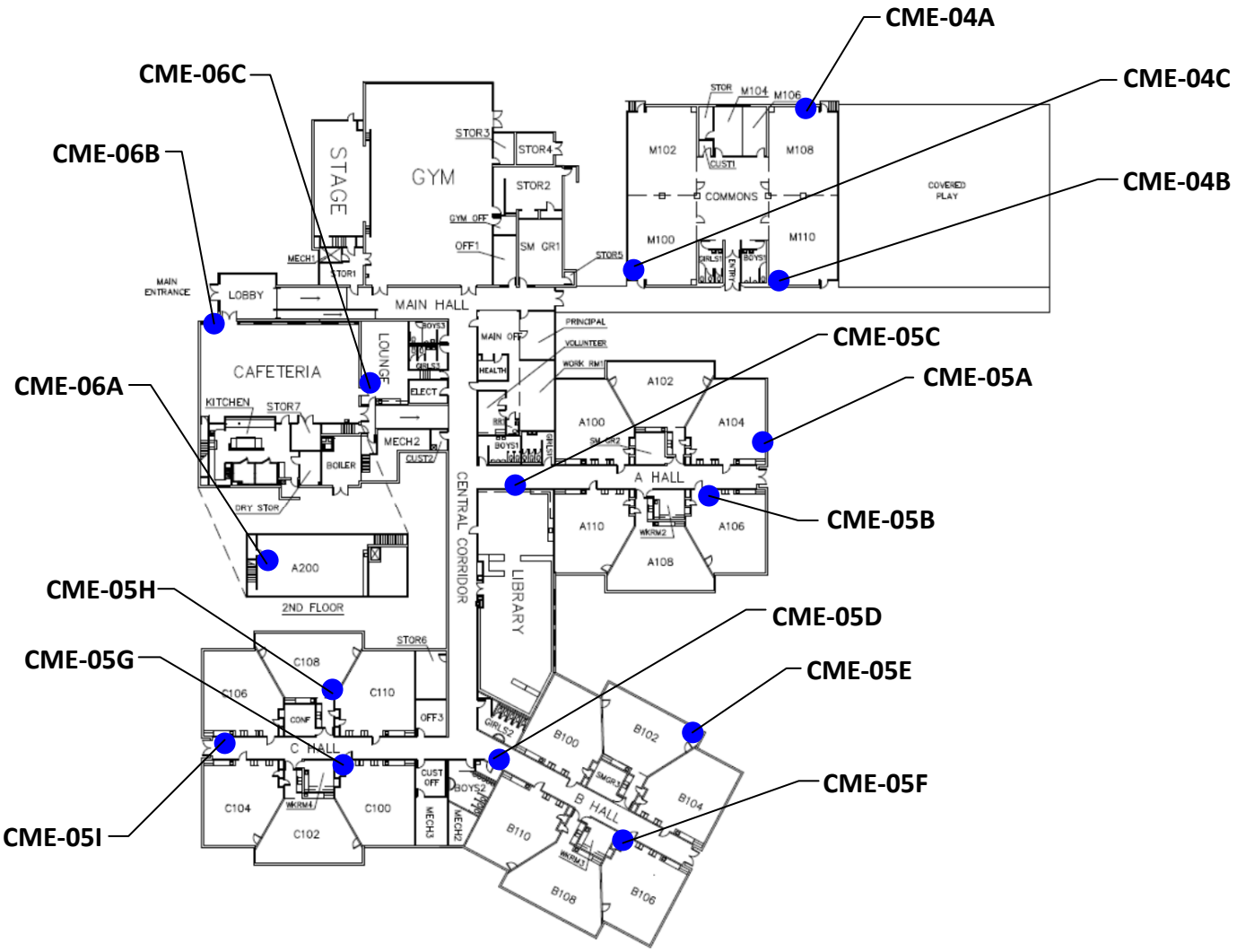


Matthew Cuda
Project Manager



Ron Landolt, CAC
NW Region BSI Practice Manager

Appendix A – Figure(s)



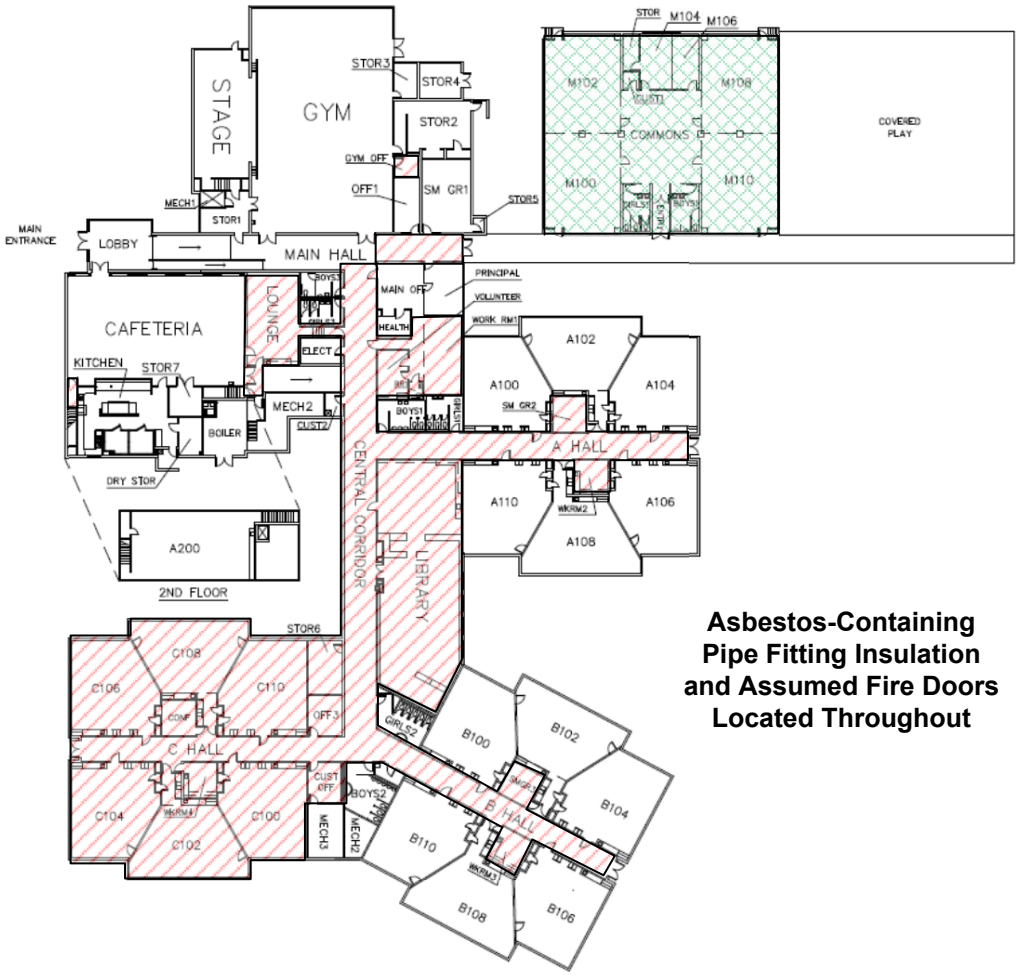
LEGEND
Non-Asbestos Sample Location
Asbestos-Containing Sample Location
OSHA Regulated Sample Location

HAZARDOUS MATERIALS SURVEY REPORT
SAMPLE LOCATION DIAGRAM

COOPER MOUNTAIN ELEMENTARY SCHOOL
7670 SW 170TH AVENUE
BEAVERTON, OREGON 97007

TRC Project No.: 407537		Figure: 1
Drawn by: JS	Reviewed by: RAL	Date: September 2020

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Asbestos-Containing Pipe Fitting Insulation and Assumed Fire Doors Located Throughout

LEGEND

sbestos-Containing Floor Tile and Mastic ome Under Carpet)

Asbestos-Containing Roofing Materials

HAZARDOUS MATERIALS SURVEY REPORT
MATERIAL LOCATION DIAGRAM

COOPER MOUNTAIN ELEMENTARY SCHOOL
7670 SW 170TH AVENUE
BEAVERTON, OREGON 97007

TRC Project No.: 407537		Figure: 2
Drawn by: JS	Reviewed by: RAL	Date: September 2020

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Appendix B – Laboratory Analytical Data Sheets

Industrial Hygiene Laboratory
21 Griffin Road North
Windsor, CT 06095
(860) 298-6308

BULK ASBESTOS ANALYSIS REPORT

CLIENT: Beaverton School District

Lab Log #: 0055564
Project #: 407537.0000.0000
Date Received: 09/03/2020
Date Analyzed: 09/03/2020

Site: Cooper Mountain Elementary School, 7670 SW 170th Avenue, Beaverton, OR

POLARIZED LIGHT MICROSCOPY by EPA 600/R-93/116

Sample No.	Color	Homogenous	Multi-Layered	Layer No.	Other Matrix Materials		Asbestos %	Asbestos Type
CME-04A	White (joint compound)	No	Yes	1		- - -	ND	None
CME-04A	White (gypsum wallboard)	No	Yes	2	2%	cellulose	ND	None
CME-04B	White (joint compound)	No	Yes	1		- - -	ND	None
CME-04B	White (gypsum wallboard)	No	Yes	2	2%	cellulose	ND	None
CME-04C	White (joint compound)	No	Yes	1		- - -	ND	None
CME-04C	White (gypsum wallboard)	No	Yes	2	2%	cellulose	ND	None
CME-05A	White (skim coat)	No	Yes	1		- - -	ND	None
CME-05A	Grey (base coat)	No	Yes	2		- - -	ND	None
CME-05B	White (skim coat)	No	Yes	1		- - -	ND	None
CME-05B	Grey (base coat)	No	Yes	2		- - -	ND	None
CME-05C	White (skim coat)	No	Yes	1		- - -	ND	None
CME-05C	Grey (base coat)	No	Yes	2		- - -	ND	None
CME-05D	White (skim coat)	No	Yes	1		- - -	ND	None
CME-05D	Grey (base coat)	No	Yes	2		- - -	ND	None
CME-05E	White (skim coat)	No	Yes	1		- - -	ND	None
CME-05E	Grey (base coat)	No	Yes	2		- - -	ND	None
CME-05F	White (skim coat)	No	Yes	1		- - -	ND	None
CME-05F	Grey (base coat)	No	Yes	2		- - -	ND	None

Industrial Hygiene Laboratory
21 Griffin Road North
Windsor, CT 06095
(860) 298-6308

POLARIZED LIGHT MICROSCOPY by EPA 600/R-93/116

Sample No.	Color	Homogenous	Multi-Layered	Layer No.	Other Matrix Materials	Asbestos %	Asbestos Type
CME-05G	White (skim coat)	No	Yes	1	- - -	ND	None
CME-05G	Grey (base coat)	No	Yes	2	- - -	ND	None
CME-05H	White (skim coat)	No	Yes	1	- - -	ND	None
CME-05H	Grey (base coat)	No	Yes	2	- - -	ND	None
CME-05I	White (skim coat)	No	Yes	1	- - -	ND	None
CME-05I	Grey (base coat)	No	Yes	2	- - -	ND	None
CME-06A	Yellow (glue)	No	Yes	1	- - -	ND	None
CME-06A	Yellow/Blue/Red/Gold (floor tile)	No	Yes	2	- - -	ND	None
CME-06B	Yellow (glue)	No	Yes	1	- - -	ND	None
CME-06B	Yellow/Blue/Red/Gold (floor tile)	No	Yes	2	- - -	ND	None
CME-06C	Yellow (glue)	No	Yes	1	- - -	ND	None
CME-06C	Yellow/Blue/Red/Gold (floor tile)	No	Yes	2	- - -	ND	None

Reporting limit- asbestos present at 1%
ND - asbestos was not detected
Trace - asbestos was observed at level of less than 1%
NA/PS - Not Analyzed / Positive Stop
SNA- Sample Not Analyzed- See Chain of Custody for details

Note: Polarized-light microscopy is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. In those cases, EPA recommends, and certain states (e.g. NY) require, that negative results be confirmed by quantitative transmission electron microscopy.

The Laboratory at TRC follows the EPA's Interim Method for the Determination of Asbestos in Bulk Insulation 1982 (EPA 600/M4-82-020) Bulk Analysis Code 18/A01 and the EPA recommended Method for the Determination of Asbestos in Bulk Building Materials July 1993, R.L. Perkins and B.W. Harvey, (EPA/600/R-93/116) Bulk Analysis Code 18/A03, which utilize polarized light microscopy (PLM). Our analysts have completed an accredited course in asbestos identification. TRC's Laboratory is accredited under the National Voluntary Laboratory Accreditation Program (NVLAP), for Bulk Asbestos Fiber Analysis, NVLAP Code 18/A01, effective through June 30, 2021. TRC is accredited by the AIHA Laboratory Accreditation Programs (AIHA-LAP), LLC in the Industrial Hygiene Program (IHLAP) for PLM effective through October 1, 2020. Asbestos content is determined by visual estimate unless otherwise indicated. Quality Control is performed in-house on at least 10% of samples and QC data related to the samples is available upon written request from client.

This report shall not be reproduced, except in full, without the written approval of TRC. This report must not be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government. This report relates only to the items tested.

Analyzed by: K. Williamson — Kathleen Williamson, Laboratory Manager

Reviewed by: Joel Corso — Joel Corso, Approved Signatory

Date Issued
09/04/2020

55564

TRC

4105 SE International Way, Suite 505,
Milwaukie, OR 97222

ASBESTOS BULK SAMPLE CHAIN OF CUSTODY FORM

Client:	Project Number:	Inspector(s):
Beaverton School District	407537	Jason Stone
Project Name: BSD-Cooper Mountain Elementary School Cooper Mountain Elementary School 7670 SW 170th Ave Beaverton, OR 97007	Tracking Number:	Requested TAT: 24 HR
Email Results to: jstone@trccompanies.com, mcuda@trccompanies.com, rlandolt@trccompanies.com	Analytical Method: PLM EPA 600/R-93/116	Lab Comments:

Date Collected	Sample Identification	Material Description	Homogeneous Area	Sample Location	Lab Identification (Lab Use Only)
2020-09-02	CME-04A	Wallboard, Gypsum with Joint Compound, White	M Wing	See Diagram	
2020-09-02	CME-04B	Wallboard, Gypsum with Joint Compound, White	M Wing	See Diagram	
2020-09-02	CME-04C	Wallboard, Gypsum with Joint Compound, White	M Wing	See Diagram	
2020-09-02	CME-05A	Plaster, Skim Coat with Base Coat, Gray	Throughout	See Diagram	
2020-09-02	CME-05B	Plaster, Skim Coat with Base Coat, Gray	Throughout	See Diagram	
2020-09-02	CME-05C	Plaster, Skim Coat with Base Coat, Gray	Throughout	See Diagram	

KW
9/3/20
1030

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Date Collected	Sample Identification	Material Description	Homogeneous Area	Sample Location	Lab Identification (Lab Use Only)
2020-09-02	CME-05D	Plaster, Skim Coat with Base Coat, Gray	Throughout	See Diagram	
2020-09-02	CME-05E	Plaster, Skim Coat with Base Coat, Gray	Throughout	See Diagram	
2020-09-02	CME-05F	Plaster, Skim Coat with Base Coat, Gray	Throughout	See Diagram	
2020-09-02	CME-05G	Plaster, Skim Coat with Base Coat, Gray	Throughout	See Diagram	
2020-09-02	CME-05H	Plaster, Skim Coat with Base Coat, Gray	Throughout	See Diagram	
2020-09-02	CME-05I	Plaster, Skim Coat with Base Coat, Gray	Throughout	See Diagram	
2020-09-02	CME-06A	12" x 12" Floor Tile (Yellow/Blue/Red/Gold) & Associated Glue	Cafeteria, Front Entry, & Room Above Kitchen	See Diagram	
2020-09-02	CME-06B	12" x 12" Floor Tile (Yellow/Blue/Red/Gold) & Associated Glue	Cafeteria, Front Entry, & Room Above Kitchen	See Diagram	
2020-09-02	CME-06C	12" x 12" Floor Tile (Yellow/Blue/Red/Gold) & Associated Glue	Cafeteria, Front Entry, & Room Above Kitchen	See Diagram	

Special Instruction to Laboratory:

N/A

CHAIN OF CUSTODY INFORMATION

Relinquished By:	Date	Time	Received By:	Date	Time
I. (Print): Jason Stone	2020-09-02	15:02:52 PDT	I. (Print): K Williamson	09/02/20	1030
(Sign):			(Sign):		
II. (Print):			II. (Print):		
(Sign):			(Sign):		

Appendix C – Prior Documentation

ASBESTOS MATERIALS

The following materials either tested positive or are presumed to be asbestos-containing. Materials that had mixed results are considered positive. Materials not sampled or not listed in this report may contain asbestos and should be tested to verify asbestos content prior to impact, demolition, renovation, etc.

(+) Tested Positive, (M) Mixed Results, (P) Presumed Positive

Cooper Mountain Main Building (CMT1)			
Result	**Material**	**Location**	**Quantity**
P	MJP Pipe Fittings / / / HSA 1,2,3,4,5 [ID: 24602]	Attic	194 ea
P	Pipe Covering / / / [ID: 24603]	Chiller	0 lf
+	Floor Tile and Mastic / Tested Positive / 12 x 12 / HSA 9, Cmnt: Tested 2% chrysotile tan & tan/gray vinyl, 3% & 4% Chrysotile Black mastic (19766.017-0004 & 0005 phase 100) (abated 15 sf-spring 2010 at A102 & A108 entry) [ID: 24604]	Level 1 / A Hall	975 sf
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 9, Cmnt: Abated Summer 2003 [ID: 24605]	Level 1 / A100	0 sf
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 9, Cmnt: Abated Summer 2003 [ID: 24606]	Level 1 / A102	0 sf
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 9, Cmnt: Abated Summer 2003 [ID: 24607]	Level 1 / A104	0 sf
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 9, Cmnt: Abated Summer 2003 [ID: 24608]	Level 1 / A106	0 sf
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 9, Cmnt: Abated Summer 2003 [ID: 24609]	Level 1 / A108	0 sf
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 9, Cmnt: Abated Summer 2003 [ID: 24610]	Level 1 / A110	0 sf
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 9 [ID: 24341]	Level 1 / B Hall	900 sf
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 9, Cmnt: Abated Summer 2003 [ID: 24342]	Level 1 / B100	0 sf
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 9, Cmnt: Abated Summer 2003 [ID: 24343]	Level 1 / B102	0 sf

Cooper Mountain Main Building (CMT1)			
Result	**Material**	**Location**	**Quantity**
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 9, Cmnt: Abated Summer 2003 [ID: 24345]	Level 1 / B104	0 sf
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 9, Cmnt: Abated Summer 2003 [ID: 24346]	Level 1 / B106	0 sf
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 9, Cmnt: Abated Summer 2003 [ID: 24347]	Level 1 / B108	0 sf
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 9, Cmnt: Abated Summer 2003 [ID: 24348]	Level 1 / B110	0 sf
+	Boiler Insulation / Breeching Exhaust Pack / / HSA 1, Cmnt: Pulling away; Tested 20% Amosite (19766.017-0001 phase 3); Abated Summer 2009. [ID: 24349]	Level 1 / Boiler	0 sf
+	MJP Pipe Fittings / / / HSA 1,2,3,4,5 / Tested Positive, Cmnt: Abated Summer 2012 [ID: 24350]	Level 1 / Boiler	0 ea
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 9 [ID: 24351]	Level 1 / C Hall	887 sf
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 9 [ID: 24352]	Level 1 / C100	50 sf
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 9 [ID: 24353]	Level 1 / C102	50 sf
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 9 [ID: 24354]	Level 1 / C104	50 sf
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 9, Cmnt: minor tile separation [ID: 24355]	Level 1 / C106	50 sf
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 9, Cmnt: slightly cracked tiles [ID: 24356]	Level 1 / C108	50 sf
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 9 [ID: 24357]	Level 1 / C110	50 sf
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 9, Cmnt: Abated Summer 2003 [ID: 24358]	Level 1 / Cafeteria	0 sf
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 9, Cmnt: Cracking and chipping by staff room, RR2 and electrical room. Consider repair-inspection note 6/14. [ID: 24359]	Level 1 / Central Corridor	1922 sf

Cooper Mountain Main Building (CMT1)			
Result	**Material**	**Location**	**Quantity**
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 9 [ID: 24360]	Level 1 / Conference	142 sf
+	Floor Tile and Mastic / Tested Positive, Cmnt: abated 3 SF- Dec. 2010 [ID: 28848]	Level 1 / Custodial 2	0 sf
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 9 [ID: 24361]	Level 1 / Custodial Office	200 sf
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 9, Cmnt: Abated 3590 SF - Summer 2007 [ID: 24362]	Level 1 / Gym	0 sf
P	MJP Pipe Fittings / / / HSA 1,2,3,4,5 [ID: 24364]	Level 1 / Gym Office	5 ea
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 9, Cmnt: Chip at the door. [ID: 24363]	Level 1 / Gym Office	75 sf
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 9, (Old Room: Main Building / Level 1 / Office 2), Cmnt: Abated 100 SF- July 2005 [ID: 24371]	Level 1 / Health Room	0 sf
P	Floor Tile and Mastic / Non-Visible PACM / / HSA 9, Cmnt: 70sf where new wall to be constructed abated 7/2005. Carpet. [ID: 24366]	Level 1 / Library	2290 sf
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 9, Cmnt: Abated 960 SF - Summer 2007. abated 2 SF outside sm group1- Spring 2010 [ID: 24367]	Level 1 / Main Hall	138 sf
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 9, Cmnt: Carpeted [ID: 24368]	Level 1 / Main Office	485 sf
P	MJP Pipe Fittings / / / HSA 1,2,3,4,5 [ID: 24369]	Level 1 / Mechanical 1	3 ea
+	MJP Pipe Fittings / Tested Positive, Cmnt: Tested 2% Chrysotile & 5% Amosite (19766.017-0039 phase 3); Abated 60 Hard fittings - Summer 2009. Cmnt: some damage during 2018 inspection, consider repair[ID: 28043]	Level 1 / Mechanical 2	2 ea
P	Floor Tile and Mastic / Non-Visible PACM / / HSA 9, Cmnt: Carpet [ID: 24370]	Level 1 / Office 1	184 sf
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 9 [ID: 24372]	Level 1 / Offices	167 sf
P	Floor Tile and Mastic / Non-Visible PACM / / HSA 9, Cmnt: Carpeted [ID: 24373]	Level 1 / Principal	235 sf

Cooper Mountain Main Building (CMT1)			
Result	**Material**	**Location**	**Quantity**
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 9 [ID: 24374]	Level 1 / Records Room	110 sf
P	Sheet Flooring Material and Mastic / / /, Cmnt: Abated Summer 2005 [ID: 24375]	Level 1 / Restroom Boys 1	0 sf
P	MJP Pipe Fittings, Cmnt: Abated 10 Hard fittings - Summer 2009. [ID: 27967]	Level 1 / Restroom Boys 2	2 ea
P	Sheet Flooring Material and Mastic / / /, Cmnt: Ceramic tile [ID: 24376]	Level 1 / Restroom Boys 2	0 sf
P	MJP Pipe Fittings, Cmnt: Abated 14 Hard fittings - Summer 2009. [ID: 27969]	Level 1 / Restroom Boys 3	2 ea
P	Sheet Flooring Material and Mastic / / /, Cmnt: Ceramic tile [ID: 24377]	Level 1 / Restroom Girls 1	0 sf
P	MJP Pipe Fittings, Cmnt: Abated 11 Hard fittings - Summer 2009. [ID: 27968]	Level 1 / Restroom Girls 2	2 ea
P	MJP Pipe Fittings, Cmnt: Abated 13 Hard fittings - Summer 2009. [ID: 28159]	Level 1 / Restroom Girls 3	2 ea
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 9 [ID: 24378]	Level 1 / Restroom Unisex 1	19 sf
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 9 [ID: 24379]	Level 1 / Small Group 2	145 sf
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 9, Cmnt: Bubbled/chipped tile near door [ID: 24380]	Level 1 / Small Group 3	142 sf
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 9, Cmnt: abated 64 SF- Dec. 2010 [ID: 24381]	Level 1 / Staff	595 sf
P	Asbestos Insulated Wiring	Level 1 / Stage / Portable Stand	4
P	MJP Pipe Fittings / / / HSA 1,2,3,4,5, Cmnt: not observed 1/2010 [ID: 24382]	Level 1 / Storage 1	1 ea
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 9 [ID: 24383]	Level 1 / Storage 6	231 sf
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 9, (Old Room: Main Building / Level 1 / Health Room), Cmnt: Abated 93 SF- July 2005 [ID: 24365]	Level 1 / Volunteer Room	0 sf
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 9, Cmnt: Cracked tile near heating units per inspector. [ID: 24384]	Level 1 / Work Room 1	352 sf
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 9 [ID: 24385]	Level 1 / Work Room 2	145 sf

Cooper Mountain Main Building (CMT1)			
Result	**Material**	**Location**	**Quantity**
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 9, Cmnt: abated 7 SF- Dec. 2010 [ID: 24386]	Level 1 / Work Room 3	135 sf
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 9 [ID: 24387]	Level 1 / Work Room 4	142 sf
P	Floor Tile and Mastic / Non-Visible PACM / / HSA 9, Cmnt: Carpeted. Wood subfloor. [ID: 24388]	Level 2 / A200	0 sf
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 9, Cmnt: Wood subfloor. Tile appears to be new throughout [ID: 24389]	Level 2 / A200	30 sf
M	Stringer Covebase	Stage stairs; tan stair stringer covebase	0
+	Fire Door	Stage storage room; hall door, white fire door insulation	0
P	MJP Pipe Fittings / / / HSA 1,2,3,4,5, Cmnt: abandoned in place, fair condition with some damage, restrict access - 2018 [ID: 24390]	Tunnel	132 ea

MATERIALS THAT TESTED NEGATIVE

The following materials tested negative. Although no asbestos was detected, it is possible that further sampling could indicate asbestos content. It may be prudent to test prior to impact, demolition, renovation, etc.

Cooper Mountain Main Building (CMT1)	
Material	**Location**
Hard Fittings/Fiberglass	Boiler room; gray pipe insulation
Material Debris	Boiler room; wall plaster debris
Sheet Floor Covering	Boys 3; aggregate pattern
Covebase/Mastic	Central corridor; tan 4" covebase, yellow mastic
Covebase/Mastic	Central corridor; tan, 4" covebase, white mastic
Covebase/Mastic	Custodial 2; 4" brown
Gypsum Wallboard	Custodial 2; gypsum substrate
Wall and Ceiling Plaster	Custodial 2; plaster scratch coat
Skimcoat	Custodial 2; plaster skim coat
Lay-in Ceiling Tile / Tested Negative, Cmnt: Non-Detect (19766.017-0041 phase 3) [ID: 28045]	Level 1 / B Hall
Mastic / Tested Negative, Cmnt: Non-Detect (19766.017-0017 phase 3) [ID: 28027]	Level 1 / B Hall

Cooper Mountain Main Building (CMT1)	
Material	**Location**
Cement Overspray / Tested Negative, Cmnt: Non-Detect (19766.017-0001 phase 6) [ID: 28656]	Level 1 / B108
Cement Overspray / Tested Negative, Cmnt: Non-Detect (19766.017-0002 phase 6) [ID: 28657]	Level 1 / B110
Gypsum Wallboard / Tested Negative, Cmnt: Non-Detect (19766.017-0004 phase 3) [ID: 28018]	Level 1 / Boiler
Wall Plaster Debris / white / gray	Level 1 / Boiler Room
Insulation / pipe	Level 1 / Boiler Room / off-white/Gray
Mastic / Tested Negative, Cmnt: Non-Detect (19766.017-0018 phase 3) [ID: 28028]	Level 1 / C Hall
Wall and Ceiling Plaster / Tested Negative, Cmnt: Non-Detect (19766.017-0014 phase 3) [ID: 28024]	Level 1 / C Hall
Covebase/Mastic / Tested Negative, Cmnt: Non-Detect (19766.017-0021 phase 3) [ID: 28031]	Level 1 / C106
Lay-in Ceiling Tile / Tested Negative, Cmnt: Non-Detect (19766.017-0042 phase 3) [ID: 28046]	Level 1 / C106
Wall and Ceiling Plaster / Tested Negative, Cmnt: Non-Detect (19766.017-0020 phase 3) [ID: 28030]	Level 1 / C106
Lay-in Ceiling Tile / Tested Negative, Cmnt: Non-Detect (19766.017-0015 phase 3) [ID: 28025]	Level 1 / Central Corridor
Wall and Ceiling Plaster / Tested Negative, Cmnt: Non-Detect (19766.017-0013 phase 3) [ID: 28023]	Level 1 / Central Corridor
Covebase/Mastic / Brown	Level 1 / Custodial 2
Plaster Skim and Scratch Coat / brown / gray	Level 1 / Custodial 2
Gypsum and Plaster	Level 1 / Custodial 2
Slate like Material / Layered Black & White / Tested Negative all layers, Cmnt: Non-Detect (19766.014-0004 task 0100) [ID: 27798]	Level 1 / Gym
Covebase/Mastic / Tested Negative, Cmnt: Non-Detect (19766.017-0007 phase 3) [ID: 28020]	Level 1 / Library
Wainscot Paneling Mastic / Joint Compound / White / Tested Negative, Cmnt: non-detect (19766.017-0003 phase 100) [ID: 28220]	Level 1 / Main Hall
Wainscot Paneling Mastic / Fibrous / Light Brown / Tested Negative, Cmnt: non-detect (19766.017-0001 - 0003 phase 100) [ID: 28219]	Level 1 / Main Hall
Hard Fittings/Fiberglass	Level 1 / Mechanical 2

Cooper Mountain Main Building (CMT1)	
Material	**Location**
Sheet Flooring / Brown/Tan / Tested Negative, Cmnt: Non-Detect (CM-03 0014603-003, CM-04 0014603-004) [ID: 29067]	Level 1 / Restroom Girls 3
Sheet Flooring / Off White/Beige / Tested Negative, Cmnt: Non-Detect (CM-01 0014603-001, CM-02 0014603-002 Layer 1) [ID: 29068]	Level 1 / Restroom Unisex 1
Backing / Gray / Tested Negative, Cmnt: Non-Detect (CM-01 0014603-001, CM-02 0014603-002 Layer 2) [ID: 29069]	Level 1 / Restroom Unisex 1
Lay-in Ceiling Tile / Tested Negative, Cmnt: Non-Detect (19766.017-0012 phase 3) [ID: 28022]	Level 1 / Restroom Unisex 1
Sheet Flooring Material and Mastic / Tested Negative, Cmnt: Non-Detect (19766.017-0008, -0009, -0010 phase 3) [ID: 28021]	Level 1 / Restroom Unisex 1
Lay-in Ceiling Tile	Level 1 / Staff Work Room
Wall and Ceiling Plaster / Scratch and Finish Coats	Level 1 / Staff Work Room
Covebase/Mastic- Cove base- Tan, Mastic- Beige	Level 1 / Staff Work Room
Wall and Ceiling Plaster / Tested Negative, Cmnt: Non-Detect (19766.017-0019 phase 3) [ID: 28029]	Level 1 / Storage 6
MJP Pipe Fittings / Tested Negative, Cmnt: Non-Detect (19766.017-0035, -0036 phase 3) [ID: 28042]	Level 1 / Storage 7
Lay-in Ceiling Tile / Tested Negative, Cmnt: Non-Detect (19766.017-0040 phase 3) [ID: 28044]	Level 1 / Work Room 2
Mastic / Tested Negative, Cmnt: Non-Detect (19766.017-0016 phase 3) [ID: 28026]	Level 1 / Work Room 3
Wall and Ceiling Plaster / Tested Negative, Cmnt: Non-Detect (19766.017-0005, -0006 phase 3) [ID: 28019]	Level 2 / A200
Covebase/Mastic	Library; south wall, 4" black covebase with yellow mastic
Corkboard	Library; south wall, corkboard
Gypsum Wallboard/Joint Compound	Library; south wall, gypsum and joint compound behind bookcase
Wall and Ceiling Plaster	Library; south wall, lath and plaster wall
Covebase/Mastic	Lounge; northeast wall, 4" tan covebase with yellow mastic
Covebase/Mastic	Lounge; northeast wall, 4" tan covebase with yellow mastic
Gypsum Wallboard/Joint Compound	Lounge; northeast wall, gypsum and joint compound on IT room walls

Cooper Mountain Main Building (CMT1)	
Material	**Location**
Wall and Ceiling Plaster	Lounge; northeast wall, plaster wall
Covebase/Mastic	Main hall; brown, 4" covebase, clear, residual brown mastic
Pipe Insulation	Mechanical room #12
Material Debris	Mechanical room #12
Sheet Floor Covering	Modular / Boys1 and Girls1 Restrooms
Built-up Roofing / Tested Negative, Cmnt: Non-Detect (19766.017-0025 phase 3) [ID: 28034]	Roof / B Hall
Built-up Roofing / Tested Negative, Cmnt: Non-Detect (19766.017-0029,0030 phase 3) [ID: 28039]	Roof / C Hall
Built-up Roofing / Tested Negative, Cmnt: Non-Detect (19766.017-0024 phase 3) [ID: 28033]	Roof / Cafeteria
Wall Plaster	Stage at electrical; wall plaster
Lay-in Ceiling Tile	Stage ceiling; 2' by 4' ceiling tile with pin perf pattern
Ceiling Plaster	Stage stair landing; ceiling plaster
Covebase/Mastic	Stage stairs landing; 4" brown
Wall Plaster	Stage stairs; wall plaster

ASBESTOS SUMMARY

The following shows asbestos activities and projects. For more detailed information or related documents see the individual activity information in the database.

June 2003 to September 2003 - CMT12019-1
Activity: Inspection/Survey - Location: CMT

January 2004 to December 2012 -
Activity: Database Update - Location: CMT1

CMT1 Import Historical Materials without samples

January 2004 to December 2012 - 19766.017 p03
Activity: Database Update - Location: CMT1 p03

CMT1 Import Historical materials with Samples

January 2004 to December 2012 - 19766.017 p06
Activity: Database Update - Location: CMT1 p06

CMT1 Import Historical materials with Samples

January 2004 to December 2012 - 19766.014 p100
Activity: Database Update - Location: CMT1 p100

CMT1 Import Historical materials with Samples

January 2016 to January 2016 - CMTSampling4
Activity: Sampling - Location: Level 1 / Custodial 2 and Boiler Room

August 2016 to August 2016 - 23816.110 Phase 1
Activity: Sampling - Location: Cooper Mountain Elementary

December 2016 to December 2016 - CMTSampling3
Activity: Sampling - Location: Level 1 / Staff Work Room

February 2017 to March 2017 - CMTsampling2
Activity: Sampling - Location: Level 1 / Mech2

floor plan	x
February results	x
March results	x
February invoice received	x
March invoice received	

March 2017 to March 2017 - CMTsampling1
Activity: Sampling - Location: Level 1 / BOYS3 Restroom

floor plan	**x**
results received	**x**
results in verdant	**x**
invoice received	**x**

January 2018 to January 2018 - 23816.176 Phase 1
Activity: Sampling - Location: Modular / Boys1 and Girls1 Restrooms

Tan pebble pattern sheet floor covering non-asbestos and homogeneous in Boys1 and Girls2 Restrooms.

~~Floor Plan~~
Daily Log
~~Contractor Invoice~~
DEQ Notification
Disposal Manifest
Air clearance samples
~~Consultant Close out documentation in Verdant~~
~~Consultant Invoice~~

April 2018 to April 2018 - 23816.189 Phase 0001
Activity: Sampling - Location: CMT1

December 2018 to December 2018 - 23816.219
Activity: Sampling - Location: CMT1

Floor plan X

Results received X

Results in Verdant X

Consultant Invoice X

Consultant's notes:

Sampling white block insulation within wood laminate fire door between the stage storage area and the main hall. Door laminate was partially missing and insulation was exposed beneath a duct tape patch. Insulation tested positive for asbestos. Similar-age doors with fire door labels should be presumed to have asbestos insulation.

June 2019 to June 2019 - 23816.248
Activity: Sampling - Location: Cooper Mountain Main Building (CMT1)

Sampled wall materials in the south of the library behind bookshelves for asbestos. No asbestos detected.

Floor plan X

Results received X

Results in Verdant X

Consultant Invoice X

June 2020 to July 2020 - CMT12020-1
Activity: Sampling - Location: Stage and stage stairs sampling

_ Floor plan
_ Results received
_ Results in Verdant
_ Daily log
_ Consultant Invoice
_ Contractor Invoice
_ DEQ Notification
_ Disposal Manifest
_ Lab samples in Verdant
_ TEM Air clearance samples
_ Consultant Close out documents in Verdant
_ BOLI Form
_ Certified Payroll dates

ACTIVITIES

The following shows historic activities and projects. For more detailed information or related documents see the individual activity information in the database.

Activity Type	Location	Start Date	Related Documents
Sampling	Stage and stage stairs sampling	06/01/2020	Yes
Sampling	Cooper Mountain Main Building (CMT1)	06/27/2019	Yes
Sampling	CMT	02/20/2019	Yes
Sampling	CMT1	12/13/2018	Yes
Sampling	CMT1	04/18/2018	Yes
Sampling	Modular / Boys1 and Girls1 Restrooms	01/02/2018	Yes
Sampling	Level 1 / BOYS3 Restroom	03/27/2017	Yes
Sampling	Level 1 / Mech2	02/06/2017	Yes
Sampling	Level 1 / Staff Work Room	12/01/2016	Yes
Sampling	Cooper Mountain Elementary	08/01/2016	Yes
Sampling	Level 1 / Custodial 2 and Boiler Room	01/11/2016	Yes
Database Update	CMT1	01/01/2004	No
Database Update	CMT1 p03	01/01/2004	No
Database Update	CMT1 p06	01/01/2004	No
Database Update	CMT1 p100	01/01/2004	No
Inspection/Survey	CMT	06/01/2003	Yes

ASBESTOS MATERIALS

The following materials either tested positive or are presumed to be asbestos-containing. Materials that had mixed results are considered positive. Materials not sampled or not listed in this report may contain asbestos and should be tested to verify asbestos content prior to impact, demolition, renovation, etc.

(+) Tested Positive, (M) Mixed Results, (P) Presumed Positive

Cooper Mountain Modular Building (CMT2)			
Result	**Material**	**Location**	**Quantity**
P	Sheet Flooring Material and Mastic / / /, Cmnt: Some edges starting to come up per inspector. [ID: 24392]	Level 1 / Custodial	38 sf
P	Floor Tile and Mastic / Non-Visible PACM / / HSA 9, Cmnt: Carpeted [ID: 24391]	Level 1 / Commons	1000 sf
P	Sheet Flooring Material and Mastic / / / [ID: 24393]	Level 1 / Entrance	69 sf
P	Sheet Flooring Material and Mastic / / /, Cmnt: Minor chipping [ID: 24394]	Level 1 / M100	150 sf
P	Sheet Flooring Material and Mastic / / /, Cmnt: Minor chipping [ID: 24395]	Level 1 / M102	190 sf
P	Floor Tile and Mastic / Non-Visible PACM / / HSA 9, Cmnt: Carpet [ID: 24396]	Level 1 / M104	183 sf
P	Floor Tile and Mastic / Non-Visible PACM / / HSA 9, Cmnt: Carpet [ID: 24397]	Level 1 / M106	183 sf
P	Sheet Flooring Material and Mastic / / / [ID: 24398]	Level 1 / M108	188 sf
P	Sheet Flooring Material and Mastic / / /, Cmnt: minor chipping [ID: 24399]	Level 1 / M110	188 sf
P	Sheet Flooring Material and Mastic / / /, Cmnt: material appears to have been overlayed or replaced - 2018[ID: 24400]	Level 1 / Restroom Boys 1	145 sf
P	Sheet Flooring Material and Mastic Cmnt: material appears to have been overlayed or replaced - 2018 / / / [ID: 24401]	Level 1 / Restroom Girls 1	145 sf
P	Sheet Flooring Material and Mastic / / / [ID: 24402]	Level 1 / Storage	63 sf
+	Built-up Roofing / Tested Positive, Cmnt: Tested 1% Chrysotile (PAINT) (19766.017-0023 phase 3); Non-Detect (19766.017-0022 phase 3). [ID: 28032]	Roof / North	6500 sf

MATERIALS THAT TESTED NEGATIVE

The following materials tested negative. Although no asbestos was detected, it is possible that further sampling could indicate asbestos content. It may be prudent to test prior to impact, demolition, renovation, etc.

Cooper Mountain Modular Building (CMT2)	
Material	**Location**
Gypsum Wallboard/Joint Compound / Tested Negative, Cmnt: Non-Detect (19766.017-0033, -0034 phase 3) [ID: 28041]	Level 1 / Commons
Gypsum Wallboard/Joint Compound / Tested Negative, Cmnt: Non-Detect (19766.017-0032 phase 3) [ID: 28040]	Level 1 / M110
Paper Felt / Tested Negative, Cmnt: Non-Detect (19766.017-0028 phase 3) [ID: 28037]	Roof
Built-up Roofing / Tested Negative, Cmnt: Non-Detect (19766.017-0027 phase 3) [ID: 28036]	Roof / South Parapet
Built-up Roofing / Tested Negative, Cmnt: Non-Detect (19766.017-0026 phase 3) [ID: 28035]	Roof / South Walkway

ASBESTOS SUMMARY

The following shows asbestos activities and projects. For more detailed information or related documents see the individual activity information in the database.

January 2004 to December 2012 -
Activity: Database Update - Location: CMT2

CMT2 Import Historical Materials without samples

January 2004 to December 2012 - 19766.017 p03
Activity: Database Update - Location: CMT2 p03

CMT2 Import Historical materials with Samples

ACTIVITIES

The following shows historic activities and projects. For more detailed information or related documents see the individual activity information in the database.

Activity Type	Location	Start Date	Related Documents
Database Update	CMT2	01/01/2004	No
Database Update	CMT2 p03	01/01/2004	No

Appendix D – Inspector Certification(s)

Certificate of Completion

This is to certify that

Jason Stone

has satisfactorily completed
4 hours of refresher training as an

AHERA Building Inspector

to comply with the training requirements of
TSCA Title II, 40 CFR 763 (AHERA)

EPA Provider # 1085

175978
Certificate Number

Instructor

ARGUS PACIFIC
TRAINING • CONSULTING
A Terracon COMPANY

Dec 9, 2019 Expires in 1 year.
Date(s) of Training

Exam Score: N/A
(if applicable)

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