

# **BEAVERTON SCHOOL DISTRICT**

## **2022 RE-PIPING PROJECTS**

### **PROJECT MANUAL**

03/04/2022 – 100% CONSTRUCTION DOCUMENTS

#### **OWNER:**

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

#### **PREPARED BY:**

KCL Engineering  
312 NW 10th Ave.  
Portland, OR 97209

**SECTION 00 01 03 - PROJECT DIRECTORY**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

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

**1.2 OWNER:**

- A. Name: Beaverton School District.
  - 1. Address Line 1: 16550 SW Merlo Road.
  - 2. City: Beaverton.
  - 3. State: Oregon.
  - 4. Zip Code: 97003.
  - 5. Telephone: (503) 356-4500.
- B. Primary Contact: All correspondence from the Contractor to the Engineer will be direct, with copies to this party, unless alternate arrangements are mutually agreed upon at preconstruction meeting.
  - 1. Title: Construction Project Manager.
  - 2. Name: Doaa Elhaggan.
  - 3. Email: Doaa\_El\_Haggan@beaverton.k12.or.us.

**1.3 CONSULTANTS:**

- A. Engineer: Design Professional of Record. All correspondence from the Contractor regarding construction documents authored by Engineer's consultants will be through this party, unless alternate arrangements are mutually agreed upon at preconstruction meeting.
  - 1. Company Name: KCL Engineering.
    - a. Address Line 1: 312 NW 10th Avenue.
    - b. City: Portland.
    - c. State: Oregon.
    - d. Zip Code: 97209.
    - e. Telephone: 971-400-0416.
  - 2. Primary Contact:
    - a. Title: Senior Mechanical Engineer.
    - b. Name: Stormy L. Shanks, PE.

c. Email: sshanks@kclengineering.com.

B. Architectural Consultant:

1. Company Name: Oh Planning and Design, Architecture.

a. Address Line 1: 115 NW 1st Ave.

b. City: Portland.

c. State: Oregon.

d. Zip Code: 97209.

e. Telephone: (503) 280-8000.

2. Primary Contact:

a. Title: Associate.

b. Name: Caitlin McGehee, AIA, NCARB.

c. Email: caitlin.mcgehee@ohpd.net.

C. Civil Engineering Consultant:

1. Company Name: Harper Houf Peterson Righellis Inc..

a. Address Line 1: 530 Center Street NE.

b. Address Line 2: Suite 240.

c. City: Salem.

d. State: Oregon.

e. Zip Code: 97301.

f. Telephone: (503) 221-1131.

2. Primary Contact:

a. Title: Project Manager | Associate Principal.

b. Name: Beau Braman, PE.

c. Email: BeauB@hhpr.com.

D. Landscape Architecture Consultant:

1. Company Name: Harper Houf Peterson Righellis Inc..

a. Address Line 1: 205 SE Spokane Street.

b. City: Portland.

- c. State: Oregon.
- d. Zip Code: 97202.
- e. Telephone: (503) 221-1131.
- 2. Primary Contact:
  - a. Title: Landscape Architect.
  - b. Name: Jeffery Creel, R.L.A..
  - c. Email: jeffc@hhpr.com.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION - NOT USED**

**END OF SECTION**

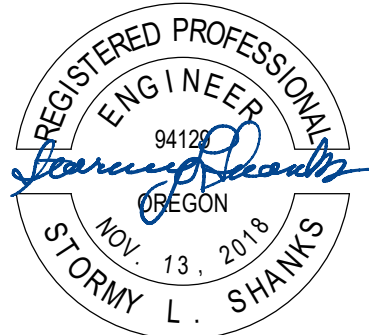
**SECTION 00 01 07 - SEALS PAGE**

**PART 1 GENERAL**

**1.1 ENGINEER OF RECORD:**

- A. Mechanical Engineer: Design Professional of Record. Route all correspondence from the Contractor regarding construction documents authored by Engineer's consultants through the Engineer, unless otherwise agreed upon.

1. Company Name: KCL Engineering.
2. DATE: 03/03/2022
3. SEAL:



EXPIRES: 6/30/2022

- B. Electrical Engineer:

1. Company Name: KCL Engineering.
2. DATE: 03/01/2022
3. SEAL:



EXPIRES: 6/30/2023

**1.2 CONSULTANTS:**

A. Architectural Consultant:

1. Company Name: Oh planning+design, architecture.
2. DATE:
3. SEAL:



B. Civil Engineering Consultant:

1. Company Name: Harper Houf Peterson Righellis Inc.
2. DATE: 03/02/2022
3. STAMP:



C. Landscape Architecture Consultant:

1. Company Name: Harper Houf Peterson Righellis Inc.
2. DATE: March 4, 2022
3. STAMP:



**END OF SECTION**



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- D. 01 30 00 – Administrative Requirements
- E. 01 32 16 – Construction Progress Schedule
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END OF SECTION

## **SECTION 01 10 00 - SUMMARY**

### **PART 1 GENERAL**

#### **1.1 PROJECT**

- A. Project Name: 21194 - BSD 2022 Re-Piping Projects
- B. Owner's Name: Beaverton School District.
- C. Engineer's Name: KCL Engineering.
- D. Additional Project contact information is specified in Section - 000103 - Project Directory.

#### **1.2 DESCRIPTION OF ALTERATIONS WORK**

- A. Scope of demolition and removal work is indicated on drawings.
- B. Scope of alterations work is indicated on drawings.
- C. Plumbing: Selectively replace existing system with new construction as indicated on drawings..

#### **1.3 OWNER OCCUPANCY**

- A. Owner intends to continue to occupy adjacent portions of the existing building during the entire construction period.
- B. Owner intends to occupy the Project upon Substantial Completion.
- C. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
- D. Schedule the Work to accommodate Owner occupancy.

#### **1.4 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. Arrange use of site and premises to allow:
  - 1. Owner occupancy.
  - 2. Work by Others.
  - 3. Work by Owner.
  - 4. Use of site by the public.
- C. 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.

D. 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 alarm system, without 7 days notice to Owner and authorities having jurisdiction.
3. Prevent accidental disruption of utility services to other facilities.

**END OF SECTION**

## **SECTION 01 20 00 - PRICE AND PAYMENT PROCEDURES**

### **PART 1 GENERAL**

#### **1.1 SECTION INCLUDES**

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

#### **1.2 SCHEDULE OF VALUES**

- A. Use Schedule of Values Form: AIA G703, edition stipulated in the Agreement.
  - 1. Provide separate Schedule of Values using Form AIA G703 for each building.
- B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Engineer for approval.
- C. Forms filled out by hand will not be accepted.
- D. Submit Schedule of Values to owner on eBuilder within 15 days after date of Owner-Contractor Agreement.
- E. 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.
- F. Include separately from each line item, a direct proportional amount of Contractor's overhead and profit.
- G. Include separate line item at 2% for closeout.

#### **1.3 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.
  - 1. Submit a separate form AIA G703 pay application for work at each building.
- C. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Engineer for approval.
- D. Forms filled out by hand will not be accepted.
- E. Execute certification by signature of authorized officer.
- F. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.
- G. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.
- H. Submit electronically via eBuilder each Application for Payment.

- I. When Engineer requires substantiating information, submit data justifying dollar amounts in question.

#### **1.4 MODIFICATION PROCEDURES**

- A. Submit name of the individual authorized to receive change documents and who will be responsible for informing others in Contractor's employ or subcontractors of changes to Contract Documents.
- B. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Engineer will issue instructions directly to Contractor.
- C. For other required changes, Engineer 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.
- D. For changes for which advance pricing is desired, Engineer 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 . Contractor shall prepare and submit a fixed price quotation within 5 days.
- E. Contractor may propose a change by submitting a request for change to Engineer, describing the proposed change and its full effect on the work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation.
- F. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
  - 1. For change requested by Engineer for work falling under a fixed price contract, the amount will be based on Contractor's price quotation.
  - 2. For change requested by Contractor, the amount will be based on the Contractor's request for a Change Order as approved by Engineer.
- G. Substantiation of Costs: Provide full information required for evaluation.
  - 1. On request, provide the following data:
    - a. Quantities of products, labor, and equipment.
    - b. Taxes, insurance, and bonds.
    - c. Overhead and profit.
    - d. Justification for any change in Contract Time.
    - e. Credit for deletions from Contract, similarly documented.
  - 2. For Time and Material work, submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.

- H. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.
- I. Promptly enter changes in Project Record Documents.

**1.5 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.

**END OF SECTION**

## **SECTION 01 25 00 - SUBSTITUTION PROCEDURES**

### **PART 1 GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Procedural requirements for proposed substitutions.

#### **1.2 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.

#### **1.3 REFERENCE STANDARDS**

- A. CSI/CSC Form 1.5C - Substitution Request (During the Bidding/Negotiating Stage) Current Edition.

### **PART 2 PRODUCTS - NOT USED**

### **PART 3 EXECUTION**

#### **3.1 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 Engineer 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.
  - 1. Note explicitly any non-compliant characteristics.



- C. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
  - 1. Forms included 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.

### **3.2 SUBSTITUTION PROCEDURES DURING PROCUREMENT**

- A. Submittal Time Restrictions:
  - 1. Instructions to Bidders specifies time restrictions and the documents required for submitting substitution requests during the bidding period.
- B. Submittal Form (before award of contract):
  - 1. Submit substitution requests by completing CSI/CSC Form 1.5C - Substitution Request. See this form for additional information and instructions. Use only this form; other forms of submission are unacceptable.

### **3.3 RESOLUTION**

### **3.4 ACCEPTANCE**

**END OF SECTION**



# SUBSTITUTION REQUEST

(During the Bidding/Negotiating Stage)

Project: \_\_\_\_\_ Substitution Request Number: \_\_\_\_\_

From: \_\_\_\_\_

To: \_\_\_\_\_ Date: \_\_\_\_\_

A/E Project Number: \_\_\_\_\_

Re: \_\_\_\_\_ Contract For: \_\_\_\_\_

Specification Title: \_\_\_\_\_ Description: \_\_\_\_\_

Section: \_\_\_\_\_ Page: \_\_\_\_\_ Article/Paragraph: \_\_\_\_\_

Proposed Substitution: \_\_\_\_\_

Manufacturer: \_\_\_\_\_ Address: \_\_\_\_\_ Phone: \_\_\_\_\_

Trade Name: \_\_\_\_\_ Model No.: \_\_\_\_\_

Attached data includes product description, specifications, drawings, photographs, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.

Submitted by: \_\_\_\_\_

Signed by: \_\_\_\_\_

Firm: \_\_\_\_\_

Address: \_\_\_\_\_

Telephone: \_\_\_\_\_

## A/E's REVIEW AND ACTION

- ☐ Substitution approved - Make submittals in accordance with Specification Section 01 33 00 Submittal Procedures.
- ☐ Substitution approved as noted - Make submittals in accordance with Specification Section 01 33 00 Submittal Procedures.
- ☐ Substitution rejected - Use specified materials.
- ☐ Substitution Request received too late - Use specified materials.

Signed by: \_\_\_\_\_ Date: \_\_\_\_\_

Supporting Data Attached: ☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ \_\_\_\_\_



# SUBSTITUTION REQUEST

(After the Bidding/Negotiating Phase)

Project: \_\_\_\_\_ Substitution Request Number: \_\_\_\_\_  
\_\_\_\_\_  
From: \_\_\_\_\_  
To: \_\_\_\_\_ Date: \_\_\_\_\_  
\_\_\_\_\_  
A/E Project Number: \_\_\_\_\_  
Re: \_\_\_\_\_ Contract For: \_\_\_\_\_

Specification Title: \_\_\_\_\_ Description: \_\_\_\_\_  
Section: \_\_\_\_\_ Page: \_\_\_\_\_ Article/Paragraph: \_\_\_\_\_

Proposed Substitution: \_\_\_\_\_  
Manufacturer: \_\_\_\_\_ Address: \_\_\_\_\_ Phone: \_\_\_\_\_  
Trade Name: \_\_\_\_\_ Model No.: \_\_\_\_\_  
Installer: \_\_\_\_\_ Address: \_\_\_\_\_ Phone: \_\_\_\_\_

History: ☐ New product ☐ 1-4 years old ☐ 5-10 years old ☐ More than 10 years old

Differences between proposed substitution and specified product: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

☐ Point-by-point comparative data attached — REQUIRED BY A/E

Reason for not providing specified item: \_\_\_\_\_  
\_\_\_\_\_

Similar Installation:

Project: \_\_\_\_\_ Architect: \_\_\_\_\_  
Address: \_\_\_\_\_ Owner: \_\_\_\_\_  
\_\_\_\_\_ Date Installed: \_\_\_\_\_

Proposed substitution affects other parts of Work: ☐ No ☐ Yes; explain \_\_\_\_\_  
\_\_\_\_\_

Savings to Owner for accepting substitution: \_\_\_\_\_ (\$ \_\_\_\_\_).

Proposed substitution changes Contract Time: ☐ No ☐ Yes [Add] [Deduct] \_\_\_\_\_ days.

Supporting Data Attached: ☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ \_\_\_\_\_

**SECTION 01 30 00 - ADMINISTRATIVE REQUIREMENTS**

**PART 1 GENERAL**

**1.1 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. Number of copies of submittals.
- I. Requests for Interpretation (RFI) procedures.
- J. Submittal procedures.

**1.2 RELATED REQUIREMENTS**

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

**1.3 REFERENCE STANDARDS**

- A. CSI/CSC Form 12.1A - Submittal Transmittal Current Edition.

**1.4 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 Engineer:
  - 1. Requests for Interpretation (RFI).
  - 2. Requests for substitution.
  - 3. Shop drawings, product data, and samples.
  - 4. Test and inspection reports.
  - 5. Manufacturer's instructions and field reports.
  - 6. Applications for payment and change order requests.
  - 7. Progress schedules.
  - 8. Correction Punch List and Final Correction Punch List for Substantial Completion.

9. Closeout submittals.

## **PART 2 PRODUCTS - NOT USED**

## **PART 3 EXECUTION**

### **3.1 ELECTRONIC DOCUMENT SUBMITTAL SERVICE**

- A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF) format, as appropriate to the document, and transmitted via eBuilder, an Internet-based submittal service that receives, logs and stores documents and notifies addressees via email.
1. Contractor and Engineer are required to use this service for the following processes:
    - a. Submission of shop drawings and other submittals and receiving the processed submittals.
    - b. Submission of Requests for Information (RFI) and receiving RFI responses from the Owner and Engineer.
    - c. Submission of invoices and approval or rejection of same.
    - d. Distribution of meeting minutes.
    - e. Submission of as-built record drawings.
    - f. Submission of test results and Operation and Maintenance (O&M) manuals (electronic format).
    - g. Submission of Change Orders (COs) and contract amendment and approval or rejection of same.
    - h. Transmission of formal letters and notices between the District and the Contractor.
  2. It is Contractor's responsibility to submit documents in allowable format.
  3. Subcontractors, suppliers, and Engineer's consultants will be permitted to use the service at no extra charge.
  4. 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](http://www.adobe.com), or Bluebeam PDF Revu, [www.bluebeam.com](http://www.bluebeam.com)), unless such software capability is provided by the service provider.
  5. Paper document transmittals will not be reviewed; emailed electronic documents will not be reviewed.
  6. 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 will be paid by Owner.
- C. Training: Owner will provide one, one-hour, web-based training session for all participants. Further training is the responsibility of the user of the service.

### **3.2 PRECONSTRUCTION MEETING**

- A. Owner will schedule a meeting after Notice of Award.
- B. Attendance Required:
  - 1. Owner.
  - 2. Engineer.
  - 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. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
  - 7. Scheduling.
  - 8. Asbestos and hazardous material remediation. Reference "Asbestos Abatement Contractor Bid Document and Specifications"
- D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Engineer, Owner, participants, and those affected by decisions made.

### **3.3 SITE MOBILIZATION MEETING**

- A. Owner will schedule meeting at the Project site prior to Contractor occupancy.
- B. Attendance Required:
  - 1. Contractor.
  - 2. Owner.
  - 3. Engineer.
  - 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 two copies to Engineer, Owner, participants, and those affected by decisions made.

### **3.4 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. Engineer.
  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 two copies to Engineer, Owner, participants, and those affected by decisions made.

### **3.5 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.

### **3.6 PROGRESS PHOTOGRAPHS**

- A. Submit new photographs at least once a month, within 3 days after being taken.
- B. Photography Type: Digital; electronic files.
- C. Provide photographs of site and construction throughout progress of work produced by an experienced photographer, acceptable to Engineer.
- D. In addition to periodic, recurring views, take photographs of each of the following events:
  1. Excavations in progress.
  2. Final completion, minimum of ten (10) photos.
- E. Views:
  1. Provide non-aerial photographs from four cardinal views at each specified time, until date of Substantial Completion.
  2. Consult with Engineer 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.
- F. Digital Photographs: 24 bit color, minimum resolution of 1024 by 768, in JPG format; provide files unaltered by photo editing software.
1. Delivery Medium: eBuilder.
  2. File Naming: Include project identification, date and time of view, and view identification.

### **3.7 REQUESTS FOR INTERPRETATION (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 in eBuilder internet software.
  3. Prepare using software provided by the Electronic Document Submittal Service.
  4. 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).
  - d. Different methods of performing work than those indicated in the Contract Drawings and Specifications (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 Engineer, 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, Engineer'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: RFI log is automatically built in the eBuilder software.
- G. Review Time: Engineer 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 Engineer 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.

### **3.8 SUBMITTAL SCHEDULE**

- A. Submit to Engineer for review a schedule for submittals in tabular format.
1. Submit at the same time as the preliminary schedule specified in Section - 01 32 16 - Construction Progress Schedule.
  2. Coordinate with Contractor's construction schedule and schedule of values.
  3. Format schedule to allow tracking of status of submittals throughout duration of construction.
  4. 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.
  5. 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.

### **3.9 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 Engineer 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.

### **3.10 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 Engineer's knowledge as contract administrator or for Owner.

### **3.11 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.

### **3.12 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.

### **3.13 SUBMITTAL PROCEDURES**

- A. General Requirements:

1. Use a separate transmittal for each item.
  2. Submit separate packages of submittals for review and submittals for information, when included in the same specification section.
  3. Transmit on eBuilder, including approved form in the electronic submittal uploaded to eBuilder.
    - a. Use Form CSI/CSC Form 12.1A.
  4. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
  5. 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.
  6. 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 Engineer'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 Engineer's approval, allow an additional 30 days.
  7. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
  8. Provide space for Contractor and Engineer review stamps.
  9. When revised for resubmission, identify all changes made since previous submission.
  10. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.
  11. 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.
  12. 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.

### **3.14 SUBMITTAL REVIEW**

- A. Submittals for Review: Engineer will review each submittal, and approve, or take other appropriate action.
- B. Submittals for Information: Engineer will acknowledge receipt and review. See below for actions to be taken.
- C. Engineer's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.
- D. Engineer'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, Resubmission not required", 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. Engineer'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**

#### **1.1 SECTION INCLUDES**

- A. Preliminary schedule.

#### **1.2 REFERENCE STANDARDS**

#### **1.3 SUBMITTALS**

- A. Within 10 days after date of Agreement, submit preliminary schedule.
- 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 electronic PDF format to eBuilder.

### **PART 2 PRODUCTS - NOT USED**

### **PART 3 EXECUTION**

#### **3.1 PRELIMINARY SCHEDULE**

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

#### **3.2 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.

### **END OF SECTION**

## **SECTION 01 35 53 - SECURITY PROCEDURES**

### **PART 1 GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Security measures including personnel identification.
- B. Background Screenings.
- C. Covid-19 Procedures.

#### **1.2 SECURITY PROGRAM**

- A. Protect Work, existing premises and Owner's operations from theft, vandalism, and unauthorized entry.
- B. Initiate program in coordination with Owner's existing security system at project mobilization.
- C. Maintain program throughout construction period until Owner acceptance precludes the need for Contractor security.

#### **1.3 PERSONNEL IDENTIFICATION**

- A. All personnel under the employment of the Contractor and its Subcontractors that travel to, or spend time at the project site are to wear photo ID badges while on the work site. individuals not wearing badges will be removed from the project work site.
- B. Badge To Include:
  - 1. Individual's full name (no nicknames).
  - 2. Individual's company affiliation.
  - 3. Recent photograph of the individual, taken within the last 4 years.
- C. Require return of badges at expiration of their employment on the Work.

#### **1.4 BACKGROUND SCREENING**

- A. All personnel under the employment of the Contractor and its Subcontractors that spend time at the project site must complete a formal background screening by the Contractor and pass that screening review before being allowed on the work site. Background screening is to be done by a professional screening firm meeting the following qualifications:
  - 1. Must have a minimum of five years of screening experience specifically for construction industry clients.
  - 2. Must have a minimum of fifteen employees.
  - 3. Must be able to provide access to an internet based screening management software system which has a feature to allow access by the District to view the pass-no pass result for each screened Contractor/Subcontractor employee working on a District project.



- 4. Must be accredited by the National Association of Professional Background Screeners (NAPBS).
- B. Each individual will be screened for having committed any crime as listed in ORS 342.143, most recent edition.

**1.5 COVID-19 PROCEDURES**

- A. All personnel under the employment of the Contractor and its Subcontractors that spend time at the project site must adhere to the Covid-19 infection prevention procedures of Beaverton School District, the State of Oregon, and Washington County.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION - NOT USED**

**END OF SECTION**

## **SECTION 01 40 00 - QUALITY REQUIREMENTS**

### **PART 1 GENERAL**

#### **1.1 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. Control of installation.
- G. Tolerances.
- H. Defect Assessment.

#### **1.2 REFERENCE STANDARDS**

- A. IAS AC89 - Accreditation Criteria for Testing Laboratories 2020.

#### **1.3 DEFINITIONS**

#### **1.4 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 foundation underpinning.
  - 5. Temporary stairs or steps required for construction access only.

#### **1.5 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Designer's Qualification Statement: Submit for Engineer's knowledge as contract administrator, or for Owner's information.
  - 1. Include information for each individual professional responsible for producing, or supervising production of, design-related professional services provided by Contractor.

- a. Full name.
  - b. Professional licensure information.
  - c. Statement addressing extent and depth of experience specifically relevant to design of items assigned to Contractor.
- C. Test Reports: After each test/inspection, promptly submit two copies of report to Engineer and to Contractor.
- D. Test Reports: After each test/inspection, promptly submit two copies of report to Engineer 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 Engineer, provide interpretation of results.
  - 2. Test report submittals are for Engineer'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.

## **1.6 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. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
  - 3. Qualification Statement: Provide documentation showing testing laboratory is accredited under IAS AC89.

## **1.7 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 Engineer before proceeding.
- F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Engineer shall be altered from Contract Documents by mention or inference otherwise in any reference document.

## **1.8 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**

## **2.1 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 Engineer 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.

## **2.2 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 Engineer before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

## **2.3 TESTING AND INSPECTION**

- A. Testing Agency Duties:
  - 1. Provide qualified personnel at site. Cooperate with Engineer 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 Engineer and Contractor of observed irregularities or non-compliance of Work or products.
  - 5. Perform additional tests and inspections required by Engineer.
  - 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 Engineer 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 Engineer.
- E. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

#### **2.4 DEFECT ASSESSMENT**

- A. Replace Work or portions of the Work not complying with specified requirements.
- B. If, in the opinion of Owner, it is not practical to remove and replace the work, Owner will direct an appropriate remedy or adjust payment.

**END OF SECTION**

## **SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS**

### **PART 1 GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Dewatering
- B. Temporary sanitary facilities.
- C. Temporary Controls: Barriers, enclosures, and fencing.
- D. Vehicular access and parking.
- E. Waste removal facilities and services.

#### **1.2 REFERENCE STANDARDS**

#### **1.3 DEWATERING**

- A. Provide temporary means and methods for dewatering all temporary facilities and controls.
- B. Maintain temporary facilities in operable condition.

#### **1.4 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.

#### **1.5 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. Provide protection for plants designated to remain. Replace damaged plants.
- D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

#### **1.6 FENCING**

- A. Construction: Commercial grade chain link fence.
- B. Provide 6 foot high fence around construction site; equip with vehicular and pedestrian gates with locks.

#### **1.7 SECURITY - SEE SECTION 01 35 53**

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

- B. Coordinate with Owner's security program.

**1.8 VEHICULAR ACCESS AND PARKING**

- 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. Designated existing on-site roads may be used for construction traffic.
- E. Existing parking areas may be used for construction parking.

**1.9 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.

**1.10 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 60 00 - PRODUCT REQUIREMENTS**

### **PART 1 GENERAL**

#### **1.1 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.

#### **1.2 RELATED REQUIREMENTS**

- A. Section 01 25 00 - Substitution Procedures: Substitutions made during procurement and/or construction phases.
- B. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.
- C. Section 01 74 19 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.

#### **1.3 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**

#### **2.1 EXISTING PRODUCTS**

- A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.
- B. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.
- C. 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.

- D. Specific Products to be Reused: The reuse of certain materials and equipment already existing on the project site is required.

## **2.2 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.

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

## **2.4 MAINTENANCE MATERIALS**

- A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
- B. Deliver to Project site; obtain receipt prior to final payment.

## **PART 3 EXECUTION**

### **3.1 SUBSTITUTION LIMITATIONS**

- A. See Section 01 25 00 - Substitution Procedures.

### **3.2 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.

### **3.3 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.
- 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. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- K. Prevent contact with material that may cause corrosion, discoloration, or staining.
- L. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- M. 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**

#### **1.1 SECTION INCLUDES**

- A. Examination, preparation, and general installation procedures.
- B. Requirements for alterations work, including selective demolition, except removal, disposal, and/or remediation of hazardous materials and toxic substances.
- C. Cutting and patching.
- D. Cleaning and protection.
- E. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

#### **1.2 REFERENCE STANDARDS**

#### **1.3 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. 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.
- C. Closeout Submittal Log: Submit to owner on eBuilder within 30 days of start of contract.
- D. Closeout Submittals: Submit only final, complete, and correct closeout documents by uploading to eBuilder.
  - 1. Red-Lined As-Built Documents: Accurately record actual locations of capped and active utilities, supplemental instructions, change orders, and all as-built conditions that differ from the Construction Documents. Submit by uploading electronic version to eBuilder according to Beaverton School District's Closeout process instructions.
  - 2. Operation and Maintenance Manual: Include all operation and maintenance information required in individual sections.
  - 3. Warranties completed in the owner's name.
  - 4. Record Documents prepared by the Engineering incorporating contractor's red-lined as-built documents. Provide Record Documents to owner in hard copy, PDF, and AutoCAD formats.

5. Permit Drawings

**1.4 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 barriers between construction areas and areas continuing to be occupied by Owner.
- 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.
  - 1. Minimize amount of bare soil exposed at one time.
  - 2. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
  - 3. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
  - 4. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.
- G. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
  - 1. Outdoors: Limit conduct of especially noisy exterior work to the hours of 8 am to 5 pm.
- 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.

**1.5 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**

### **2.1 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**

### **3.1 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.

### **3.2 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.

### **3.3 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.

### **3.4 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 Engineer before disturbing existing installation.
  - 3. Beginning of alterations work constitutes acceptance of existing conditions.
- B. 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.
- C. Services (Including but not limited to Plumbing): 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 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.
- D. 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.
- E. Adapt existing work to fit new work: Make as neat and smooth transition as possible.
- F. 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.
- G. 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.
- H. Clean existing systems and equipment.
- I. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.
- J. Do not begin new construction in alterations areas before demolition is complete.
- K. Comply with all other applicable requirements of this section.



### 3.5 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.

### **3.6 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.

### **3.7 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. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

### **3.8 ADJUSTING**

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

### **3.9 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 site; sweep paved areas, rake clean landscaped surfaces.
- F. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

### **3.10 CLOSEOUT PROCEDURES**

- A. Make submittals that are required by governing or other authorities.
  - 1. Provide hard copies to Owner and upload to eBuilder.
- B. Accompany Engineer 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 Engineer when work is considered ready for Engineer'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 Engineer's Substantial Completion inspection.
- E. Conduct Substantial Completion inspection and create Final Correction Punch List containing Engineer's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Engineer.
- F. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.
- G. Notify Engineer when work is considered finally complete and ready for Engineer's Substantial Completion final inspection.
- H. Complete items of work determined by Engineer listed in executed Certificate of Substantial Completion.

### **END OF SECTION**

## **SECTION 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL**

### **PART 1 GENERAL**

#### **1.1 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. 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.
- E. 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.

#### **1.2 RELATED REQUIREMENTS**

- A. Section 01 30 00 - Administrative Requirements: Additional requirements for project meetings, reports, submittal procedures, and project documentation.
- B. Section 01 50 00 - Temporary Facilities and Controls: Additional requirements related to trash/waste collection and removal facilities and services.
- C. Section 01 60 00 - Product Requirements: Waste prevention requirements related to delivery, storage, and handling.
- D. Section 01 70 00 - Execution and Closeout Requirements: Trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

#### **1.3 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., ignitability, 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.

#### **1.4 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 2 PRODUCTS (NOT USED)**

**PART 3 EXECUTION**

**3.1 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.

**3.2 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 Engineer.
- 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. 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.
- E. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.
- F. 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.
- G. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.
- H. 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**

#### **1.1 SECTION INCLUDES**

- A. Closeout Submittal Log.
- B. Contractor's Redlined As-Built Documents.
- C. Operation and Maintenance Data.
- D. Closeout Deliverables for Plumbing Piping and Fixtures.
- E. Warranties and bonds.

#### **1.2 RELATED REQUIREMENTS**

- A. Section 01 30 00 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
- B. Individual Product Sections: Specific requirements for operation and maintenance data.
- C. Individual Product Sections: Warranties required for specific products or Work.

#### **1.3 SUBMITTALS**

- A. Contractor's Redlined As-Built Documents: Submit documents to eBuilder with claim for final Application for Payment.
- B. Closeout Submittal Log
- 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 Engineer comments. Revise content of all document sets as required prior to final submission.
  - 3. Submit two sets of revised final documents in final form within 10 days after final inspection.
- D. Closeout Deliverables for Plumbing Piping and Fixtures
  - 1. Architect or Engineer (A/E) shall provide a statement:
    - a. Certifying that drawings and specifications were designed in compliance with low-lead or lead-free standards.
    - b. Affirming that approved submittals met the design requirements
    - c. Listing the applicable specifications and drawings for reference.



2. Contractor shall provide a statement certifying that materials and construction met the design documents' low-lead or lead-free requirements.
  3. Submittals for all potable water components and systems, marked up to document all deviations from the original submittal that occurred in O&M info and shop drawings, include the reason for the change, and the A/E's submittal approval stamp.
  4. Copies of final test reports and any deficiency lists
- E. 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.
- F. Stamped Authority Having Jurisdiction Permit Drawings: submit electronic documents to Engineer and Owner on eBuilder.

## **PART 2 PRODUCTS - NOT USED**

## **PART 3 EXECUTION**

### **3.1 GENERAL**

- A. Submit only final, complete, and correct closeout materials by uploading to eBuilder. Do not submit drafts or versions of closeout materials for review.

### **3.2 CLOSEOUT SUBMITTAL LOG**

- A. A log listing the closeout deliverables in order of specification number.
- B. Include a column in the log for each of the following: specification number, specification title, responsible contractor, product data, operation and maintenance data, shop drawings, warranty, and record documents.

### **3.3 CONTRACTOR'S REDLINED AS-BUILT DOCUMENTS**

- A. Maintain on site one set of the following red-lined as-built documents; record actual revisions to the Work:
1. Drawings.
  2. Specifications.
  3. Addenda.
  4. Change Orders and other modifications to the Contract.
  5. Manufacturer's instruction for assembly, installation, and adjusting.

- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store red-lined as-built 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. Red-Lined As-Built Drawings: Legibly mark each item to record actual construction including:
  - 1. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
  - 2. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
  - 3. Field changes of dimension and detail.
  - 4. Details not on original Contract drawings.

### **3.4 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.
- C. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

### **3.5 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES**

- A. For Each Product, Applied Material, and Finish:
  - 1. Product data, with catalog number, size, composition, and color and texture designations.
  - 2. Information for re-ordering custom manufactured products.
- 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. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.
- D. Additional information as specified in individual product specification sections.
- E. 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.

**3.6 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 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.
- D. Abandonment and removal of existing utilities and utility structures.

**1.02 REFERENCE STANDARDS**

- A. 29 CFR 1926 - Safety and Health Regulations for Construction; Current Edition.
- B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2019.

**1.03 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 paving and curbs as required to accomplish new work.
- B. Remove other items indicated, for relocation and recycling.
- C. Fill excavations, open pits, and holes in ground areas generated as result of removals, using specified fill; compact fill as specified.

**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. Comply with applicable requirements of NFPA 241.
  - 3. Use of explosives is not permitted.
  - 4. 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.
  - 5. Provide, erect, and maintain temporary barriers and security devices.
  - 6. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
  - 7. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
  - 8. Do not close or obstruct roadways or sidewalks without permit.

9. 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.
  10. 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. Do not begin removal until built elements to be salvaged or relocated have been removed.
  - E. 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.
  - F. 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.
  - G. If hazardous materials are discovered during removal operations, stop work and notify Architect and Owner; hazardous materials include regulated asbestos containing materials, lead, PCB's, and mercury.
  - H. Hazardous Materials: Comply with 29 CFR 1926 and state and local regulations.
  - I. 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.
  - J. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

### **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.
- H. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone; identify and mark utilities to be subsequently reconnected, in same manner as other utilities to remain.

### **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 02 82 13 ASBESTOS ABATEMENT

### PART 1 GENERAL

#### 1.1 SCOPE

- A. This section covers the removal of materials that contain, or are presumed to contain, greater than one percent asbestos.
- B. The abatement contractor shall provide all labor, materials, equipment, services, permits, and insurance required to complete asbestos abatement procedures as indicated in these Specifications and the drawings.
- C. The following tables list asbestos-containing materials (ACM) to be removed. Abatement includes soft (non-structural) demolition, asbestos-containing materials removal, and disposal. Refer to drawing HA1 for additional asbestos abatement information.

**Table 1. Asbestos-Containing Materials to be Removed**

<b>Asbestos-Containing Building Materials</b>	<b>Approximate Quantity</b>	<b>Location</b>
Hard Fittings on Fiberglass Pipe Insulation	Up to 200 each	Domestic Water Pipes
Joint Compound on Gypsum Wallboard	As Necessary	Refer to keynote CF6, Demolition Plan AD-201C

- D. The quantities and location of ACM indicated above, and on drawing HA1 are only best estimates limited by the physical constraints imposed by the occupancy of the building. Accordingly, minor variations of plus or minus 10 percent of the estimated quantities of ACM within the limits of containment for each abatement stage are considered as having no impact on contract price and schedule of this contract. Locations of ACM different than indicated on drawings, but within the limits of building, are considered as having no impact on contract price and schedule of this contract.
- E. Asbestos-containing building materials are present within work areas, or immediately adjacent to work areas, that are to remain. Refer to the Pre-Renovation Hazardous Building Materials Survey Report, PBS Engineering and Environmental, January 2022 for additional asbestos-containing building material information. Protect and do not disturb asbestos-containing materials that are to remain.

#### 1.2 DEFINITIONS

- A. Abatement: Procedures to control fiber release from asbestos-containing building materials, which include encapsulation, enclosure, removal, repair, and related activities.
- B. Aggressive Sampling: Air sampling method that assures that asbestos fibers remain airborne during sampling. All surfaces inside the work area will be agitated by the liberal use of compressed air, leaf blowers, or similar. Fans will then be run throughout the sampling period to keep all suspended fibers airborne.
- C. AHERA: Asbestos Hazard Emergency Response Act, 40 CFR Part 763.
- D. Air Lock: A system for permitting ingress or egress without permitting air movement between a contaminated area and an uncontaminated area, typically consisting of two curtained doorways at least three feet apart.

- E. Air Monitoring: The process of measuring the asbestos fiber content of a specific volume of air in a stated period of time.
- F. Amended Water: Water containing a surfactant additive.
- G. Asbestos-containing Material (ACM): Any material containing more than one percent asbestos as defined under NESHAPS CFR 40, Part 61, OAR Chapter 340, Division 248, OR-OSHA 437, 1926.1101, and OSHA 29 CFR Part 1926.1101.
- H. Authorized Visitor: The owner or designated representative, or a representative of any regulatory or other agency having jurisdiction over the project, and having required training, medical, fit test, etc.
- I. Certified Industrial Hygienist (CIH): An industrial hygienist certified in comprehensive practice by the American Board of Industrial Hygiene.
- J. Construction, Manager/General Contractor (CMGC): A construction delivery method in which the construction manager acts as the general contractor with schedule and cost risk. The CMGC provides design phase assistance in evaluating costs, schedule, and implications of systems and materials during design.
- K. Class I Asbestos Work: Activities involving the removal of TSI and surfacing ACM and PACM.
- L. Class II Asbestos Work: Activities involving the removal of ACM, which is not thermal system insulation or surfacing material. This includes, but is not limited to, the removal of asbestos-containing wallboard, floor tile and sheeting, roofing and siding shingles, and mastics.
- M. Clean Room: An uncontaminated area or room that is part of the worker decontamination enclosure system, with provisions for storing workers' street clothes and clean protective equipment.
- N. Critical Barrier: Solid barrier constructed from minimum of 2- by 4-inch studs, 16-inch o.c.; 0.5-inch plywood or drywall sealed airtight and covered on both sides (where applicable) with two layers of 6-mil plastic.
- O. Curtained Doorway: A device to allow ingress or egress from one room to another while permitting minimal air movement between the rooms, typically constructed by placing three overlapping sheets of plastic over an existing or temporarily-framed doorway, securing each along the top of the doorway in a pleated fashion and securing one vertical side of each sheet on alternating sides of consecutive sheets. Two curtained doorways spaced a minimum of three feet apart to form an air lock.
- P. Disposal: Procedures necessary to transport and deposit the asbestos-contaminated material in an approved waste disposal site in compliance with the Environmental Protection Agency (EPA) and other applicable regulations.
- Q. Enclosure: Procedures necessary to completely seal all asbestos-containing material behind airtight, impermeable, permanent barriers, including PVC jackets.
- R. Encapsulant (Sealant): A liquid material that can be applied to asbestos-containing material and that controls the possible release of asbestos fibers from the material either by creating a membrane over the surface (bridging encapsulant), or by penetrating the material and binding its components together (penetrating encapsulant).
- S. Environmental Consultant: Environmental consultant specializing in asbestos abatement—PBS Engineering and Environmental Inc., 4412 SW Corbett Avenue, Portland, Oregon, 97239, 503.248.1939—or any subcontractor designated by PBS.



- T. Equipment Room: A contaminated area or room, which is part of the worker decontamination enclosure system, with provisions for storage of contaminated clothing and equipment.
- U. Fitting: With regard to pipe insulation, a fitting is any elbow, offset, reducer, tee, etc.
- V. Fixed Object: Fixtures that are attached to the building or too heavy or bulky to remove from the work area.
- W. Glovebag: A manufactured device consisting of a transparent plastic bag with inward projecting sleeves, an internal tool pouch, provisions for fastening and sealing at the top and sides, and a receptacle in the bottom to hold asbestos waste. The glovebag is installed to surround the material to be removed and contain all fibers released during the process. Glovebags are used to remove insulation from small sections of pipe and fittings.
- X. HEPA Filter: A high efficiency particulate air (absolute) filter capable of trapping and retaining 99.97 percent of asbestos fibers greater than 0.3 microns in length.
- Y. HEPA Vacuum Equipment: High efficiency particulate air (absolute) filtered vacuuming equipment with a filter system capable of collecting and retaining asbestos fibers. Filters of 99.97 percent efficiency for retaining fibers of 0.3 microns in length or larger shall be installed for filtering discharge air.
- Z. Independent Testing Laboratory: A laboratory financially independent from and hired by the owner, architect, or contractor that is either AIHA-accredited for asbestos with demonstrated proficiency via the AIHA PAT program, or has analysts proficient in the AIHA AAR program for air sample analysis.
- AA. Industrial Hygienist: An employee of the Independent Testing Laboratory who is experienced and trained in asbestos sampling and analysis as specified.
- BB. Insulating Cement: Cementitious material applied to pipe reducers, manifolds, etc.
- CC. Isolated Work Area: A totally contained area of the facility where abatement activities are performed.
- DD. Movable Object: Furnishings not attached to the building structure that can be removed from the work area.
- EE. Negative-air Glovebag: A manufactured device consisting of a transparent plastic bag with inward projecting sleeves, an internal tool pouch, provisions for fastening and sealing it at the top and sides, and a receptacle in the bottom to hold asbestos waste. The glovebag is installed to surround the material to be removed and contain all fibers released through the process, with provisions for allowing continuous airflow through the bag while maintaining negative pressure inside.
- FF. Owner Representative: Designated by the Owner, and/or designated employee(s) of the Owner Representative.
- GG. PACM: Presumed asbestos-containing materials.
- HH. Pressure Differential Fan System: An air-purifying fan system located inside or outside the isolated work area that draws air out of the work area through a HEPA filter, keeping static air pressure in the work area lower than in adjacent areas, and preventing escape of contaminated air from work area to adjacent areas.
- II. Public Area: Any area outside the isolated work area. When work area isolation measures are removed, the work area becomes a public area.
- JJ. Removal: All operations where ACM and/or PACM are taken out or stripped from structures or substrates, and include demolition activities.

- KK. Shower Room: A room between the clean room and the equipment room in the worker decontamination enclosure system that is equipped with soap, shampoo, and hot and cold running water controllable at the faucet, and suitably arranged for complete showering during decontamination. The shower room must be separated from the clean room and equipment room by air locks.
- LL. Special Fitting: With regard to pipe insulation, a special fitting is any valve, union, strainer, thermometer, flange, etc.
- MM. Surfactant: A chemical wetting agent added to water to improve penetration, thus reducing the quantity of water required for a given operation or area.
- NN. Tack Coat: A coat of penetrating encapsulant applied to all surfaces from which asbestos-containing materials have been removed.
- OO. Thermal System Insulation (TSI): ACM applied to pipes, fittings, boilers, breeching, tanks, ducts, or other structural components to prevent heat loss or gain.
- PP. Vacuum Loader Removal: Wetting and pneumatic conveying of loose material through a vacuum hose to a sealed collection tank specially equipped to prevent escape of fibers.
- QQ. Wet Cleaning: The process of eliminating asbestos from building surfaces and objects by using cloths, mops, or other cleaning tools that have been dampened with water.
- RR. Worker Decontamination Enclosure System: A showering facility for workers, typically consisting of a clean room, a shower room, and an equipment room. Each of these rooms is separated from the others by air locks. The equipment room is separated from the work area by a curtained doorway. The clean room is separated from the public area by a curtained doorway.
- SS. Worksite Entry Logbook: A logbook kept in the clean room that must be signed by everyone entering or leaving the work area. All pages of the logbook must be the same as the sample page bound into these Specifications.

### **1.3 DOCUMENTS INCORPORATED BY REFERENCE**

- A. The current issue of each document shall govern. Where conflict among requirements or with these Specifications exists, the most stringent requirements shall apply.
  - 1. US Environmental Protection Agency National Emissions Standards for Hazardous Air Pollutants (NESHAPS). (Code of Federal Regulations Title 40, Part 61, Subparts A and M.)
  - 2. US Environmental Protection Agency Office of Toxic Substances Guidance Document, "Guidance for Controlling Friable Asbestos-Containing Materials in Buildings." EPA Report Number 560/5-85-024 ("Purple Book").
  - 3. US Department of Labor Occupational Safety and Health Administration (OSHA):
    - a. Title 29 Code of Federal Regulations Section 1910.1001—General Industry Standard for Asbestos.
    - b. Title 29 Code of Federal Regulations Section 1910.134—General Industry Standard for Respiratory Protection.
    - c. Title 29 Code of Federal Regulations Section 1910 et al.—Occupational Exposure to Asbestos; Final Rule.
    - d. Title 29 Code of Federal Regulations 1926.1101—Construction Standard for Asbestos.

- e. Title 29 Code of Federal Regulations Section 1910.1020—Access to Employee Exposure and Medical Records.
- f. Title 29 Code of Federal Regulations Section 1910.1200—Hazard Communication.
- 4. National Institute for Occupational Safety and Health (NIOSH), 42 CFR, Part 84, Respiratory Protective Devices.
- 5. American National Standards Institute (ANSI) NY; ANSI Standard Z 88.2-1980 "American National Standards Practice for Respiratory Protection," latest edition.
- 6. Oregon Administrative Rules Chapter 340, Division 248, Department of Environmental Quality; Chapter 340, Division 33, Licensing and Certification Requirements.
- 7. Oregon Administrative Rules Chapter 437, Divisions 2 and 3.
- 8. Oregon Revised Statutes (ORS), Chapters 279C, Certified Asbestos Contractors and Prevailing Wage; 656, Workers Compensation; and 701, Construction Contractors and Contracts.
- 9. All related electrical work shall be performed in accordance with the National Electrical Code.
- 10. All local ordinances, regulations, or rules pertaining to asbestos, including its storage, transportation, and disposal.

#### **1.4 SUBMITTALS AND NOTICES**

- A. Contractors shall submit three bound indexed copies of each submittal package as indicated below.
- B. Contractors shall submit to the architect and environmental consultant the following information prior to beginning work on the project:
  - 1. CONTRACTOR'S LICENSE. Submit proof that the asbestos abatement contractor is currently and for the duration of the project licensed in the state of Oregon to perform asbestos abatement, per ORS Chapter 701, and OAR Chapter 340, Division 248.
  - 2. ASBESTOS SUPERVISOR. Submit the name and resume of the assigned on-site foreman. At minimum, the foreman shall have successfully completed the Department of Environmental Quality (DEQ) asbestos supervisor course as approved by the State of Oregon. Other criteria such as references and similar projects will also be reviewed. At the architect or environmental consultant's request, the contractor shall arrange an oral interview with the assigned on-site foreman. The owner, architect, and the environmental consultant reserve the right to reject the foreman from the work at any time during the project. The contractor shall then assign another on-site foreman for the owner, architect, and environmental consultant's approval as described above.
  - 3. INSURANCE CERTIFICATE. Submit a copy of the certificate of asbestos-specific liability insurance policy.
  - 4. WORKER CERTIFICATION. Submit written proof indicating that all employees impacting asbestos-containing materials are Oregon state certified asbestos workers. Proof shall include photocopies of certificates and a signature from the contractor's principal indicating that all employees assigned to this project have completed such a program.
  - 5. RESPIRATOR PROGRAM. Submit written proof indicating respirator program complies with all parts of OSHA Asbestos Regulations CFR Title 29, Part 1910.134 and 1926.1101, OR-OSHA Chapter 437, 1910.134 and 1926.1101.

6. MEDICAL PROGRAM. Submit written proof medical exam program complies with OSHA Asbestos Regulations CFR Title 29, Section 1926.1101 and OR-OSHA Chapter 437, 1926.1101.
  7. EMERGENCY PLANS. Submit a written emergency control and cleanup plan to be followed by the contractor in the event of an accidental breach in containment, power failure, and accidental disturbance of ACMs in non-isolated areas.
  8. NOTIFICATION. Submit copy of written notification to DEQ of the proposed asbestos work not fewer than 10 days before work commences on this project.
  9. DISPOSAL PLAN. Submit written proof that all required permits and arrangements regarding the transportation and disposal of asbestos-containing or contaminated materials, supplies, etc. have been obtained. The disposal site must be approved by the EPA and/or DEQ and other responsible agencies.
  10. WORK PLAN. Submit a written "work plan" satisfactory to the architect and environmental consultant describing the schedule for asbestos abatement, decontamination procedures, and plans for construction and location of decontamination enclosure systems, pressure differential exhaust fans, etc. in compliance with these Specifications and applicable regulations, including calculations for determining required number of negative-air filtration units. The plan shall schedule the systematic flow of work throughout the facility per Specifications on a day-by-day basis, outlining room-by-room, or area-by-area procedures and planned alternative control measures. The contractor shall keep close coordination of his work with the architect and environmental consultant.
  11. AIR MONITORING. Submit information pertaining to the proposed Air Monitoring Program for this project, if appropriate. This information shall include the name(s) of the certified industrial hygienist appointed, the name of the on-site industrial hygiene technician working under his supervision, types of equipment, and sampling schedule, sampling procedures, calibration recordkeeping, and testing laboratory proposed.
  12. PRODUCT INFORMATION. Submit complete product information for any materials and products for which the contractor requests approval for use on this job (other than those specified).
  13. EMERGENCY PHONE NUMBER. Submit a local phone number at which the contractor or on-site foreman can be reached on a 24-hour basis during the course of the work.
- C. Contractor shall not begin work until submittals are reviewed and accepted by architect and the environmental consultant. Allow a ten-day review period.
- D. During the work, the contractor shall submit the following to the architect and environmental consultant, on a periodic basis as agreed to by the architect, environmental consultant, and contractor:
1. Waste shipment and disposal documentation.
  2. Air monitoring data.
  3. Notification updates.
- E. Contractor shall submit to the environmental consultant, in writing, all information required above regarding any new asbestos workers hired by, or subcontracted to, the contractor before these new asbestos abatement workers begin work.
- F. Prior to removal of decontamination systems and isolation barriers, the contractor shall obtain specific written permission from the environmental consultant.

- G. Prior to making final application for payment the contractor shall:
  - 1. Complete all work under this contract.
  - 2. Submit to the environmental consultant all required submittals, including all waste shipment records completely filled out and signed.
  - 3. Submit to the owner all payroll reports for work on this contract and other information as described elsewhere in the Specifications, if appropriate, under the contract.
  - 4. Submit to the environmental consultant "as-abated" drawings along with a signed affidavit stating that all asbestos-containing materials have been removed as indicated on the drawings.
- H. See other sections of these Specifications, and EPA, OSHA, and other standards referenced therein, for further information and requirements not included above.

## **1.5 BUILDING PROTECTION**

- A. Building Security and Protection
  - 1. The contractor shall post adequate warning signs at all potential entrances to work areas as required by EPA and OSHA.
  - 2. The contractor shall protect all existing fixed equipment, building finishes that are to remain, and existing systems and functions from damage during the abatement process. Extra precautions are to be taken in protecting existing electrical panels, light fixtures, etc. Any damage to existing building, services, and/or equipment shall be remedied by the contractor at their expense.
  - 3. Contractor shall clean external surfaces of contaminated containers and equipment thoroughly by wet sponging and HEPA vacuum.
  - 4. Contractor shall maintain access and use of existing fire lanes.

## **1.6 PERSONAL PROTECTION**

- A. Training
  - 1. Prior to commencement of work, contractor shall ensure all workers have been trained as specified.
  - 2. The contractor shall provide and post, in the clean room(s) and the equipment room(s), the decontamination, respirator, and work procedures to be followed by the workers.
- B. Personnel Personal Protective Equipment for Asbestos Removal
  - 1. Work clothes shall consist of disposable full-body coveralls and head and foot covers ("Tyvek" or approved), boots, or sneakers. Eye, hearing, fall protection, and hard hats should be available as appropriate.
  - 2. At minimum, respiratory protection shall be approved by National Institute for Occupational Safety and Health/Mine Safety and Health Administration (NIOSH/MSHA); US Department of Labor; US Department of Health, Education, and Welfare; Centers for Disease Control; and as listed below. Respiratory protection shall provide workers with a maximum calculated fiber level inside the mask of 0.01 f/cc.
    - a. Glovebag or modified glovebag; full-face mask, powered air-purifying respirator with disposable HEPA filter cartridges (magenta/purple color code). Protection factor: 100.

- b. Demolition of walls and ceilings that may impact friable asbestos-containing material: half-face mask, negative-pressure respirator with disposable HEPA filter cartridges (magenta/purple color code). Protection factor: 10.
  - c. Pre-abatement work in close proximity to friable asbestos-containing materials: half-face mask, negative-pressure respirator with disposable HEPA filter cartridges (magenta/purple color code). Protection factor: 10.
  - d. Abatement in isolated areas: full-face mask, powered air-purifying respirator with disposable HEPA filter cartridges (magenta/purple color code). Protection factor: 100.
  - e. HEPA vacuuming and wet cleaning of surfaces: half-face mask, negative-pressure respirator with disposable HEPA filter cartridges (magenta/purple color code). Protection factor: 10.
  - f. Vinyl asbestos floor tile removal: half-face mask, negative-pressure respirator with disposable HEPA filter cartridges (magenta/purple color code). Protection factor: 10.
  - g. Handling of double-bagged asbestos-contaminated waste: half-face mask, negative-pressure respirator with disposable HEPA filter cartridges (magenta/purple color code). Protection factor: 10.
- 3. Additional respiratory protection shall be as required by CFR 29 1910.134 and 1926.1101, OR-OSHA Chapter 437, 1910.134 and 1926.1101.
  - 4. As part of the Contractor's Respiratory Protection Program, all workers shall be provided with a selection of brands and sizes of respirators to choose from. At a minimum, all workers shall be qualitatively fit-tested at the time of respirator selection per OR-OSHA Worker's Compensation Department Rule 22-069 (4)(e)(5)(i), and semiannually thereafter.
  - 5. Contractor shall supply replacement filter cartridges, as required. Cartridges that have become wet or clogged shall be replaced immediately.

C. Worker Decontamination Enclosure System

- 1. The contractor shall construct a personnel decontamination facility immediately outside of the isolated work area consisting of three chambers and two air locks as follows:
  - a. The equipment room shall consist of an air lock to the shower room, and a curtained doorway to the work area.
  - b. The shower room shall have two air locks, one to the equipment room and one to the clean room. All showers shall have hot and cold water controllable at the taps and installed in this room. The contractor shall supply and maintain soap, shampoo, and towels at all times in the shower area. Shower wastewater shall be filtered to remove all fibers larger than five microns, or as required by local regulations, before disposal in the municipal sewer system, or shall be collected and disposed of as asbestos-contaminated material. Permits shall be obtained and all water discharge regulations complied with, as required by local municipalities. Water filters shall be disposed of as asbestos-contaminated material.
  - c. The clean room shall consist of an air lock to the shower room and a curtained doorway to the adjacent building area. The clean room shall contain a first aid kit, a place to sit down, the Worksite Entry Logbook, and storage for workers' and visitors' clothing and shoes. Work, respirator, and decontamination procedures; regulations; and prevailing

wage rates shall be conspicuously posted. There shall be a supply of clean, protective clothing, and respirators and cartridges in the clean room at all times.

- d. A monometer measuring pressure differential within and outside the containment shall be installed and remain operable on any containment from the start of abatement work until work is complete, and satisfactory clearance results are obtained. Air pressure within the containment shall remain at or below -0.02 inches of water (compared to ambient air pressure) throughout.
2. Contractor shall not begin asbestos abatement work unless this system is functional, in good repair, and has been found acceptable for specification compliance by the environmental consultant.

D. Personnel Protection Procedures in Isolated Work Areas

1. Each worker shall, upon entering the jobsite, remove street clothes in the clean change room, put on and fit-test their respirator, put on clean protective clothing, and sign in on the Worksite Entry Logbook before entering the equipment room or the work area.
2. Workers shall, each time they leave the work area, remove gross contamination from clothing before leaving the work area; proceed to the equipment room and remove and dispose of disposable work clothes; remove and store shoes, boots, and other equipment except respirators; still wearing the respirator, proceed to the showers and clean the outside of the respirator with soap and water while showering; remove the respirator; thoroughly shampoo and wash themselves; remove filters, dispose of filters in the container provided for that purpose, and wash and rinse the inside of the respirator.
3. Following showering and drying off, each worker shall proceed directly to the clean change room and dress in clean clothes at the end of each day's work or before eating, smoking, or drinking. Before reentering the work area from the clean change room, each worker shall put on his respirator with clean filters, dress in clean protective clothing, and sign in on the Worksite Entry Logbook.
4. Contaminated work footwear and other equipment shall be stored in the equipment room when not in use in the work area. Upon completion of asbestos abatement, footwear shall be disposed of as contaminated waste or cleaned thoroughly inside and out, using soap and water, before removing from work area.
5. Workers shall not eat, drink, or chew gum at the worksite except in the established clean room. Smoking or using other tobacco products is prohibited.
6. Workers shall be fully protected with respirators and protective clothing immediately prior to the first disturbance of asbestos-containing or contaminated material and until final cleanup is completed.

E. Access to Isolated Work Area by Others

1. Except for emergency personnel, the contractor shall limit access to the work area to authorized visitors.
2. The contractor shall provide protective clothing, respirators, and equipment for all authorized visitors, as specified above.
3. All authorized visitors shall be subject to the personnel protection provisions specified above, and shall sign in and out on the Worksite Entry Logbook.

F. Personal Protection during Work in Non-Isolated Work Areas:

1. Work clothes per Section 1.06 B.
2. Respiratory protection per Section 1.06 B.
3. Worker protection procedures will differ from Section 1.06 D, in that two layers of coveralls shall be worn after removal of street clothes. Worker decontamination through a Worker decontamination enclosure is required. The first layer of coveralls must be removed when exiting the glovebag work area. The worker shall immediately proceed to the worker decontamination unit. The remaining requirements of Section 1.06 D still apply.
4. Contractor shall submit to the architect and environmental consultant for approval an emergency control and cleanup plan to be followed in the event of asbestos contamination during glovebag use. Contractor shall ensure all workers are thoroughly familiar with approved plan.
5. Contractor shall promptly remove all bags as they are used to the bag-holding and decontamination enclosure system.

G. Emergency Precautions

1. The contractor shall establish emergency and fire exits from the work area. Contractor shall ensure these exits are well marked and remain unobstructed.
2. The contractor shall be prepared to administer first aid to injured personnel after decontamination. Seriously injured personnel shall be treated immediately or evacuated without delay for decontamination.
3. Contractor shall notify the local fire department of the asbestos abatement project prior to beginning work area preparation.

## **1.7 SAFETY**

With regard to the work of this contract, the safety of the contractor's employees, the owner's employees, and the public is the sole responsibility of the contractor.

## **1.8 LIABILITY**

The contractor is an independent contractor and not an employee of the owner, architect, or the environmental consultant. The owner, architect, and environmental consultant shall have no liability to the contractor, or any third persons, for contractor's failure to faithfully perform and follow the provisions of these Specifications and the requirements of the governing agencies. Notwithstanding the failure of the owner, architect, or the environmental consultant to discover a violation by the contractor of any of the provisions of these Specifications, or to require the contractor to fully perform and follow any of them, shall not constitute a waiver of any of the requirements of these Specifications, which shall remain fully binding upon the contractor.

## **1.9 DELIVERY**

Contractor shall deliver all materials to the worksite in the original packages, containers or bundles bearing the name of the manufacturer and the brand name.

## **1.10 STORAGE**

Contractor shall store all materials subject to damage off the ground, away from wet or damp surfaces, away from heat sources, and under cover sufficient to prevent damage, contamination, or fire.



### **1.11 PROTECTION**

Damaged or deteriorating materials shall not be used and shall be removed from the premises by the contractor. Materials that become contaminated with asbestos shall be disposed of in accordance with the applicable regulations by the contractor.

### **1.12 SUBCONTRACTORS**

Any subcontractors employed by the contractor shall be bound to all the work and safety standards specified elsewhere in this Specification. Subcontractor's personnel shall be fully trained and supervised by the contractor during performance of this work.

### **1.13 AIR MONITORING BY ABATEMENT CONTRACTOR**

- A. An Independent Testing Laboratory shall be retained by the Abatement Contractor. All air-monitoring analysis shall be performed by an Industrial Hygienist. The Industrial Hygienist must be experienced and trained in asbestos sampling and analysis. At a minimum, documentation of prior asbestos sampling and analysis experience, plus satisfactory completion of the NIOSH 582 course or equivalent formal asbestos education, will be required. The laboratory must meet the requirements specified in Section 02 82 13. Air sample collection may be performed by an Industrial Hygienist or the Abatement Contractor's foreman at the Abatement Contractor's option.
- B. Documentation shall be kept for each filter sample procured as to worker sampled, work area location, date, and time taken, volume of air drawn through filter, pump identification number and calibration. Documentation shall indicate in what areas tests were taken and shall clearly indicate the specified maximum allowable fiber levels for each area tested. Submit chain-of-custody records along with all samples.
- C. The samples shall be collected on 25 millimeter (mm) filters and analyzed within 12 hours using the membrane filter method at 400-500x magnification with phase contrast illumination - NIOSH Analytical Method No. 7400 - for laboratory and field analysis. The analyst shall sign and submit permanent records of all samples analyzed directly to the Environmental Consultant. The Independent Testing Laboratory shall seal the unused portion of all filters in airtight containers so that individual samples can be reanalyzed at a later date if necessary. The containers shall be clearly labeled with project name and sample number and shall become property of the Owner at work completion at the Owner's request.
- D. The Abatement Contractor's testing laboratory shall submit sample analysis results to the Environmental Consultant verbally within 18 hours from the time of collection and written within two weeks including chain-of-custody and equipment calibration records.
- E. Abatement Contractor's Sampling During Abatement:
  - 1. Air monitoring shall be performed to provide samples during the period of asbestos abatement in each work area. Begin sampling when asbestos removal commences. Samples are to be taken where Class I or II work is being conducted during each 8-hour work shift until abatement is complete in that work area or until a negative exposure assessment is established per 29 CFR 1926.1101.
  - 2. The Abatement Contractor shall determine which worker(s) in each work area is probably experiencing the most severe exposure. This is the "Most Contaminated Worker(s)". Eight (8)-hour TWA and 30-minute excursion samples shall be collected on this worker(s). This worker shall wear a personal sampling pump and the sample shall be drawn from the breathing zone of this worker. All other samples are area samples.

3. The number of air samples collected shall be determined by the Abatement Contractor, and may be altered during the project based on work activity and results.
  4. The maximum allowable fiber levels shall be as determined by the Environmental Consultant based on the respiratory protection being utilized.
- F. Abatement Contractor shall notify the Department of Environmental Quality of air monitoring clearance results as supplied by Environmental Consultant. Notification shall be within 30 days after monitoring procedures were performed in accordance to OAR 340-32-465.

#### 1.14 AIR MONITORING BY OWNER

- A. The Owner will retain an experienced Industrial Hygienist/Environmental Consultant to collect and analyze asbestos air samples. Documentation of sample results will be forwarded to the Abatement Contractor as appropriate to regulatory requirements.
- B. Samples analyzed by phase contrast microscopy (PCM) will use NIOSH Analytical Method No. 7400. Samples analyzed by transmission electron microscopy (TEM) will use either the AHERA methodology, 40 CFR Part 763, or Yamate Level Two.
- C. Owner's Air Sampling During and After Abatement:
  1. Air Sampling Table is to be used as a guide. The Owner's Industrial Hygienist/Environmental Consultant may modify criteria. Modifications to the Maximum Allowable Fiber Count shall be made in writing by the Owner.

Type of Sample	Average Samples per 8-hour Work Shift	Sample Volume--L (Liters [L])	Approximate Flow Rate	Maximum Allowable Fiber Count (f/cc)
HEPA Fan Exhaust	0 or selected units	400-2000 L	2 to 10 LPM	0.01 f/cc
Outside of Work Area	0-5	400-2000 L	2 to 10 LPM	0.01 f/cc or <pre-abatement
Clearance PCM	5/work area	800-3000 L	2 to 10 LPM	0.01 f/cc
Clearance TEM	5/work area	1200-1800 L	2 to 10 LPM	<70 s/mm <sup>2</sup> average

LPM = liters per minute

f/cc = fibers per cubic centimeter

s/mm<sup>2</sup> = structures per millimeters squared

2. Air sampling for post-abatement work in isolated work areas will use the aggressive sampling method. Use of aggressive sampling in other areas shall be as directed by the Environmental Consultant. Aggressive sampling shall be conducted to assure that fibers remain airborne during sample collection.
3. Analysis of all clearance samples shall be via PCM.

4. The Abatement Contractor shall allow 48 hours for the collection and analysis of final PCM air clearance samples. In addition, the Abatement Contractor must provide at least 24 hours advance notice to the Environmental Consultant for final visual Inspection and clearance air monitoring.
5. The Owner reserves the right to monitor Abatement Contractor's performance via air samples on abatement workers and in the work area in addition to the Abatement Contractor's air monitoring.

#### **1.15 QUALITY ASSURANCE**

- A. If, at any time during the work, analysis of an air sample taken by the Abatement Contractor, Owner, or Owner's representative, indicates a fiber count in excess of the allowable maximums specified, the Industrial Hygienist who analyzed the air sample shall immediately notify:
  1. The Abatement Contractor's Foreman
  2. The Environmental Consultant: PBS Engineering and Environmental Inc.
  3. Other workers, employees, occupants, etc. in affected area(s).
- B. Immediately upon being notified of fiber count exceeding the specified maximum allowable levels, the Abatement Contractor shall perform the following steps in the order presented, at no additional cost to the Owner:
  1. Stop abatement work.
  2. Identify source of high fiber counts.
  3. Immediately correct any containment breaches, pressure differential changes or other potential cause, and other concerns with the Environmental Consultant, and the Owner, if the Owner is available. The Environmental Consultant will determine the affected area and affected adjacent areas considered to be contaminated. The Environmental Consultant will determine the actions to be taken by the Abatement Contractor at no additional cost to the Owner.
    - a. Clean the affected area and the affected adjacent areas. Cleaning shall use wet methods and HEPA vacuuming.
    - b. Resample air until fiber counts are determined to be below one half of the specified maximum levels.
    - c. Secure and repair containment barriers, repair or add equipment.
    - d. Modify work procedures, and make other changes determined to be the possible cause of high fiber counts.
  4. Carefully resume work under close air monitoring.
  5. The Abatement Contractor shall be responsible for costs of any testing, cleanup, repair, down time loss, etc. that is a result of the Abatement Contractor's negligence, poor maintenance of isolated areas or improper procedures.

## **PART 2 PRODUCTS**

### **2.1 MATERIALS**

- A. Plastic Sheet: Plastic sheet shall be flame-retardant polyethylene material sized in lengths and widths to minimize the frequency of joints. The minimum thickness shall be 6-mil.
- B. Plastic Bags: Plastic bags shall be 6-mil polyethylene printed with warning labels per OSHA and EPA regulations.
- C. Tape: Tape shall be capable of sealing joints of adjacent sheets of plastic; attaching plastic sheet to finished or unfinished surfaces of dissimilar materials; and adhering under dry and wet conditions, including use of amended water. Minimum of 2-inch-wide tape must be used.
- D. Disposal Containers: Disposal containers shall be suitable to receive and retain any asbestos-containing or contaminated materials until disposal at an approved site. The containers shall be labeled in accordance with OSHA and EPA regulations. Containers must be both airtight and watertight, and have hard top, bottom, and sides.
- E. Warning Labels and Signs: Warning labels and signs shall be posted as required by OR-OSHA, ODOT, and DEQ regulations.
- F. Amended Water: Clean potable water containing a surfactant additive. The surfactant additive shall be 50 percent polyoxyethylene ether and 50 percent polyethylene ester, or equivalent, and shall be mixed with water at a concentration of one ounce surfactant to five gallons of water, or as recommended by the manufacturer in the case of an equivalent.
- G. Encapsulants (Sealants): Encapsulants shall be of the bridging or penetrating variety and shall be listed as "satisfactory" by the EPA. Encapsulants shall provide a suitable substrate bonding agent for application of new material where appropriate. Penetrating Encapsulant: No. 207 Special Sealer #33775-27A as manufactured by Makus-Cincinnati, Inc.; "Asbestop 30B-2" as manufactured by Asbesco Corp.; "Cable Coating 22-P" as manufactured by American Coatings Corp., or approved. Bridging Encapsulant: Decadex Firecheck, manufacturer's standard color "Magnolia," as manufactured by Pentagon Plastics, Inc.; "Cable Coating 2-B," manufacturer's standard color gray, as manufactured by American Coatings Corp.; or approved.
- H. Rewettable Lagging Cloth: Twelve ounce glass fabric lagging cloth saturated with dried lagging adhesive. "Dip-Lag" as manufactured by Claremont Co. or approved.
- I. Enclosure: Protective plastic jacketing systems, framed gypsum board enclosures, suspended ceilings or other materials as specified elsewhere.
- J. Other Materials: Provide all other materials such as lumber, nails, and hardware, which may be required to construct and dismantle the decontamination area, and the barriers that isolate the work area, and as required to complete the work, as specified.

### **2.2 TOOLS AND EQUIPMENT**

- A. Water Sprayer: The water sprayer shall be an airless or other low-pressure sprayer for amended water application.
- B. Air-Purifying Equipment: Air-purifying equipment shall consist of high-efficiency particulate air (HEPA) filtration systems. No air movement system or air equipment shall discharge asbestos fibers outside the work area. Each unit shall be capable of variable volume from a minimum of 500 cubic feet per minute (CFM) to at least 1700 CFM under load and shall have at least two stages of pre-filtration

ahead of the HEPA final filter. Each unit shall be overload protected, and equipped with an elapsed time indicator (hour meter), static pressure gauge with low flow alarm, and heat and smoke sensors that visually and audibly warn workers and shut unit fan down within 30 seconds. The units shall be: Micro-Trap Portable Air Filtration System manufactured by Asbestos Control Technology, Inc., "HOG 2000" Negative-air Protection System manufactured by Control Resource Systems, or approved.

- C. Pressure Differential Monitoring Equipment: A combination sensing, alarm, and recording device shall be in operation at all times during use of the HEPA air-purifying equipment. The unit shall be a "Neg-A-Master," manufactured by Control Resource Systems, Inc., or approved.
- D. Water-purifying Equipment: Water-purifying equipment shall be capable of removing all fibers longer than five microns, or as required by local regulations, from water used in abatement work and decontamination showers. Control Resource Systems, Inc. "AQUA-HOG" or approved.
- E. Airless Sprayer: An airless sprayer, suitable for application of penetrating encapsulant material, shall be used.
- F. Vacuum Equipment: All vacuum equipment used in the work area shall be High-efficiency Particulate Air (HEPA) equipment, and suitable for wet/dry usage.
- G. Scaffolding: Scaffolding, as required to accomplish the specified work, shall meet all applicable safety regulations. All special scaffolding shall have drawings and calculations stamped and signed by a civil or structural engineer registered in the state of Oregon.
- H. Transportation Equipment: Transportation equipment, as required, shall be suitable for loading, temporary storage, transit, and unloading of contaminated waste without exposure to persons or property. Equipment shall have a hard top, bottom, and sides. If equipment is rented, notify rental agency in advance, in writing, of intended use of equipment.
- I. Electrical: Electrical tools, equipment, and lighting shall meet all applicable codes and regulations. Ground fault protection as required by OSHA, shall be in effect at all times. Contractor shall take all additional precautions and measures necessary to ensure a safe working environment during wet removal.
- J. Glovebags: Bags shall be clean poly bags seamless at the bottom, with pre-printed asbestos warning labels, 6-mil PVC with attached TYVEK arms, and latex gloves. Bags shall be Profo' Bag manufactured by Asbestos Control Technology, Inc., or Asbest'O'Saf/SAC by Control Resource Systems, Inc., or approved.
- K. Remote Filter Housing: Stainless steel housing shall have pre-filters and HEPA filter sealed to cabinet flanges by Century Equipment "Advance Guard II" or approved equal.
- L. Other Tools and Equipment: Other suitable tools shall be provided for the removal, enclosure, encapsulation, patching, and disposal activities including, but not limited to, hand-held scrapers, wire brushes, sponges, and rounded-edge shovels.

## **PART 3 EXECUTION**

### **3.1 FULL ISOLATION WORK AREA PREPARATION**

- A. Contractor shall perform the following isolation procedures in the order in which they are presented. Any alternative control measures considered for Class I/II work shall be performed in accordance with 29 CFR 1926.1101.

1. Shut down, remove filters, and isolate HVAC systems to prevent contamination and fiber dispersal. Coordinate with building users and CMGC prior to shutdown.
2. Coordinate all electrical, safety, and other service connections, requirements and equipment with the CMGC. Use a journeyman electrician at a minimum. It is the contractor's responsibility to verify operation of systems that will be shut off during abatement. If any system is found to be defective or not operating satisfactorily, the contractor shall notify the CMGC or environmental consultant in writing prior to shutoff.
3. Install critical barriers as follows: seal off all openings including, but not limited to, doorways, windows, and other penetrations of the work area with solid critical barriers except openings left for HEPA air-purification system, which shall be properly HEPA-filtered. Where doors exist, sealing may be done by closing door, sealing with tape on both sides, and then covering both sides with two layers of plastic sheeting.
4. Pre-clean movable objects, such as furniture and equipment to be removed (and carpeting), within the proposed work areas using HEPA-filtered vacuum equipment and/or wet cleaning methods as appropriate, and remove such objects from work areas to a temporary location, or consolidate such objects away from removal work and enclose with critical barriers.
5. Pre-clean fixed objects within the proposed work areas using HEPA-filtered vacuum equipment and/or wet cleaning methods as appropriate, and enclose with critical barriers. Equipment that must continue operating shall be enclosed and ventilated to avoid damage.
6. Set up the worker decontamination enclosure system (decon). Once this system is installed and abatement commences, it shall be used in the specified manner for the ingress and egress of all personnel and equipment, except in emergency situations. All personnel shall sign the Worksite Entry Logbook each time they pass in or out of the decontamination enclosure.
7. Install HEPA air-purifying equipment pressure differential fan system so as to ensure lower static pressure in the isolated work area than in surrounding areas, a flow of air through all parts of the isolated work area towards the air-purifying equipment, and minimum air contamination levels at abatement worker breathing zones. Discharge from air-purifying equipment shall be ducted outside the building. Use one or more units of capacity as recommended by the manufacturer for the volume of the isolated work area, but in no case shall airflow be less than six air changes every 60 minutes with a minimum pressure differential of 0.02 inches wg between the work area and the decon clean room.
8. Cover floor and wall surfaces with plastic sheeting sealed with tape. Cover floors first so that plastic extends at least 12 inches up on walls, then cover walls with plastic sheeting to overlap floor plastic by a minimum of 24 inches, thus overlapping the horizontal floor material by a minimum of 12 inches. Install additional layer of plastic sheeting on floor and walls in similar manner. Contractor may use mechanical fastening techniques, such as tack strips, as necessary to secure wall plastic sheeting. Contractor shall repair any damage resulting from mechanical fasteners.
9. Maintain emergency and fire exits from the work areas, or establish alternative exits satisfactory to the local building or fire department officials. Ensure that all exits remain unobstructed and well marked.
10. Adequate portable fire extinguishing equipment shall be maintained within work area as defined by OSHA and/or local fire department officials.

- B. No asbestos abatement work shall occur unless the work area isolation has been found acceptable for Specification compliance by the environmental consultant.
- C. Isolated work area enclosure system maintenance. The contractor shall be responsible for daily documentation of the following:
  - 1. Prior to the first use, and at the beginning of each shift during abatement work, containments shall be given a complete visual inspection by the contractor's shift foreman and industrial hygienist. Inspection shall include the HEPA air-purification system and associated filters. A smoke tube test by the shift foreman shall then be made of the worker decontamination enclosure system and other critical areas to verify that the isolated area is under negative air pressure. Work shall not begin until all defects have been repaired.
  - 2. Periodic inspections shall be made, as required, during each shift to assure continued proper functioning of the containment and HEPA system.

### **3.2 NON-ISOLATED WORK AREA PREPARATION**

- A. Contractor shall perform the following procedures in the order in which they are presented and describe procedures for glovebag work and other work in non-isolated work areas. Any alternative control measures considered for Class II work shall be performed in accordance with 29 CFR 1926.1101.
  - 1. Shut down heating, ventilation, and air conditioning (HVAC) systems. Coordinate with building users and the CMGC prior to shutdown.
  - 2. Restrict access to work area and post warning signs. Do not perform glovebag work or any abatement work in an occupied area.
  - 3. Completely pre-clean entire work area using HEPA vacuum equipment or wet cleaning methods.
  - 4. Set up the worker decontamination enclosure system. Once this system is installed and abatement commences, it shall be used in the specified manner for the ingress and egress of all personnel, except in emergency situations. All personnel shall sign the Worksite Entry Logbook each time they pass in or out of the decontamination enclosure.
  - 5. At the direction of the environmental consultant, install HEPA exhaust fan in work area. Duct fan intake to immediate area of work in such a manner that any fibers released will be drawn away from the worker and into intake duct.
  - 6. Cover floor and other surfaces below work area with 6-mil plastic sheeting. Seal openings and install curtained doorways and air locks as directed by the environmental consultant.
  - 7. Have emergency cleanup equipment and supplies, including HEPA vacuum, amended water, disposal bags, mop, buckets, towels, and sponges on hand prior to start of abatement work.
- B. No asbestos abatement work shall occur unless the work area has been found acceptable for Specification compliance by the environmental consultant or industrial hygiene technician.

### **3.3 REMOVAL OF ASBESTOS-CONTAINING MATERIALS IN FULL ISOLATION WORK AREAS**

- A. Contractor shall isolate work area as specified.
- B. Remove all asbestos-containing vinyl floor tile as Class 1 friable asbestos removal.
  - 1. Contractor shall spray the asbestos material with amended water. A fine spray of this solution shall be applied to prevent fiber disturbance preceding the removal of the asbestos material. The

asbestos shall be sufficiently saturated to prevent emission of airborne fibers in excess of specified fiber levels.

2. Contractor shall remove asbestos material while damp and pack it in sealable containers. Containers shall be moved to bag load out facility or equipment room in the worker decontamination system.
  3. Contractor shall collect all water used in the removal and cleaning process and dispose of as contaminated waste or filter to remove all fibers more than five microns in length before disposal in the municipal sewer system, or as required by local regulations. Water filters shall be disposed of as asbestos-contaminated material.
- C. All wooden subfloor associated with asbestos-containing mastic shall be wholly removed and disposed of as asbestos waste in accordance with section 3.9, Disposal.
- D. Contractor shall maintain a safe and uncluttered work area, worker decontamination system, and bag load out facility on a daily basis.

### **3.4 REMOVAL OF ASBESTOS-CONTAINING MATERIALS IN NON-ISOLATED AREAS**

- A. Contractor shall apply spray coat of amended water to material to be removed; material shall be kept damp during entire removal process.
- B. Glovebag work shall be as follows. All removal using the glovebag method shall be performed strictly according to regulations, manufacturer's printed instructions, and as demonstrated by the manufacturer's representative or as further specified in this section. Workers are not to smoke or wear hand or wrist jewelry while using glovebags.
1. Contractor shall install port for hose of HEPA vacuum to create reduced pressure inside glovebag. Installing of fresh air intake and/or bridging to prevent collapse of bag are acceptable. Reduced pressure shall be maintained throughout entire abatement procedure.
  2. During the removal phase, contractor shall use amended water to reduce potential for airborne fibers.
  3. Contractor shall seal flap if used and, using a HEPA vacuum, remove all contaminated air in the upper chamber.
  4. Contractor shall promptly double-bag the glovebag after removal is complete, place it into a sealed container, and remove to the bag holding enclosure.
- C. Exterior door and window caulking shall be removed using the following methods:
1. Caulking shall be removed in a non-friable state. Caulking that is determined to be friable or which is rendered friable during the abatement process shall be removed using either containment or glovebag methods.
  2. The contractor shall utilize wet methods during removal and packaging for disposal.
  3. The contractor may utilize a heat gun if at any time the caulking has the potential to become friable during removal.
  4. The contractor shall have HEPA vacuums available and shall use them during removal.
  5. The use of abrasive or mechanical methods to remove the caulking is prohibited.
  6. Burning or blistering of the caulk with excessive heat by the heat gun is prohibited.



7. All asbestos-containing caulk and building components with residual asbestos caulk shall be disposed of as asbestos-containing waste as specified below.

### **3.5 CLEANUP IN FULL ISOLATION WORK AREAS**

- A. At the conclusion of removal in the isolated work area, conduct cleanup in the sequence described below. Windows, doors, HVAC vents, etc. shall remain sealed and HEPA-filtered pressure differential fan systems shall remain in service.
  1. REMOVE MATERIAL AND EQUIPMENT. Contractor shall remove visible accumulations of material and debris (including filters removed from HVAC equipment and HEPA air-purification equipment). Contractor shall include all sealed containers and equipment used in the work area in the cleanup, and remove them from work area after decontamination of outer surfaces.
  2. FIRST CLEAN. Contractor shall clean all surfaces in the work area and any other contaminated areas with water and/or with HEPA-filtered vacuum equipment.
  3. WAIT 24 HOURS. After the first cleaning of the work area, wait 24 hours to allow for settlement of dust. During this settling period, no entry to the work area shall be allowed.
  4. SECOND CLEAN. Wet-clean or clean with HEPA-filtered vacuum equipment all surfaces in the work area. After completion of the second cleaning operation, perform a complete visual inspection of the work area to ensure that the work area is free of visible debris.
  5. VISUAL INSPECTION. Prior to application of post-removal encapsulant, contact the environmental consultant for a visual observation of the work area. The work area shall be free of visible debris. Observation by the consultant does not alleviate the contractor of responsibility to provide work in compliance with Specifications. Contractor shall contact environmental consultant at least 24 hours prior to desired inspection time.
  6. REMOVE PLASTIC SHEETING. After visual observation by the consultant, contractor shall apply a coat of approved encapsulant to all surfaces in the work area where asbestos has been removed and to disposable plastic sheeting as a post-removal encapsulant. Encapsulant application shall follow all applicable manufacturer's recommendations and shall provide a compatible bonding agent for application of new material.
  7. FINAL CLEAN. After the encapsulation is complete, the contractor shall remove all noncritical plastic and clean all floors, walls, fixtures, and other surfaces within the work area with only critical barriers in place using wet methods or HEPA-filtered vacuum equipment. Plastic sheeting over carpets may remain in place.
  8. CONTACT ENVIRONMENTAL CONSULTANT. Contact the environmental consultant for a visual observation of the work area. The work area shall be free of visible debris. Observation by the consultant does not alleviate the contractor of responsibility to provide work in compliance with Specifications. Contractor shall contact environmental consultant at least 24 hours prior to desired inspection time. Consultant shall conduct final air monitoring as specified after work area has been allowed sufficient time to dry.
  9. TEARDOWN. When the final observation by the environmental consultant and air sampling test results are satisfactory, the contractor shall then remove the decontamination systems and remaining barriers.

10. DISPOSAL. Contractor shall properly dispose of all waste materials. All polyethylene material, tape, cleaning material, and contaminated clothing shall be double-bagged, sealed, and labeled as described above for asbestos waste material.

### **3.6 CLEANUP IN NON-ISOLATED WORK AREAS**

- A. FIRST CLEAN. Contractor shall remove visible accumulations of asbestos material and debris. All surfaces shall be cleaned within the affected work area. Cleaning shall be with amended water and/or HEPA-filtered vacuum equipment. In a large open area, the affected work area shall include the immediate work area and an area that encompasses at least 6 feet in all directions or as defined by the environmental consultant. In small work areas, the affected work area shall include the entire room.
- B. AFFECTED AREA. The affected work area may be further defined in the scope of work by the environmental consultant. During the work, high fiber levels, as indicated by air monitoring results, may increase the area to be cleaned. The increase in the affected area due to high fiber levels or other indications of fiber dispersal will be defined by the environmental consultant, and the contractor shall bear all costs of additional cleaning.
- C. VISUAL INSPECTION. After completion of the cleaning operation, the environmental consultant shall perform a visual observation of the affected work area to ensure that the affected work area is free of visible dust and debris. Observation by the consultant does not alleviate the contractor of responsibility to provide work in compliance with Specifications. Contractor shall contact environmental consultant at least 24 hours prior to desired inspection time.
- D. ENCAPSULANT. After visual observation by the environmental consultant, contractor shall spray-apply encapsulant to the material substrate, all temporary plastic sheeting, and other temporary protective materials.
- E. CLEARANCE SAMPLING. Post-abatement air sampling shall be at the discretion of the Environmental Consultant and will be determined by the ongoing sample results.
- F. TEARDOWN. When the final observation by the environmental consultant and air sampling test results (if required) are satisfactory, the temporary plastic sheeting and other temporary protective materials shall be removed by the contractor.
- G. DISPOSAL. Contractor shall properly dispose of all waste materials, all polyethylene material, tape, and cleaning material, and contaminated clothing shall be double-bagged, sealed, and labeled as described for asbestos waste material.

### **3.7 RE-ESTABLISHMENT OF OBJECTS AND SYSTEMS**

- A. When cleanup is complete, contractor shall:
  1. Relocate objects moved to temporary locations in the course of the work to their former positions. Coordinate with the CMGC.
  2. Clean, repair and/or repaint all surfaces soiled, discolored, or damaged by removal of tape, adhesive, or other work of this contract to match existing surfaces. The contractor shall bear all costs associated with damage incurred during the abatement, which includes, but is not limited to, perimeter plaster walls, wall murals, windows, and mullions
  3. If the contractor uses caulking to seal cracks in concrete floor, the caulking must be removed to architect's satisfaction at completion of project.

4. Return mechanical, electrical, and other systems shut down by the contractor to complete and functional operation.
5. Re-secure objects removed in the course of work in their former positions, including air dampers in plenums, and adjust for proper operation.
6. Clean, repair and/or repaint all surfaces soiled, discolored, or damaged by removal of tape, adhesive, or other work of this contract to match adjacent surfaces.

### **3.8 DISPOSAL**

- A. Contractor shall affix warning labels having waterproof print and permanent adhesive to the lid and sides of all containers. Warning labels shall be conspicuous and legible, and contain the following words:

**DANGER  
CONTAINS ASBESTOS FIBERS  
AVOID CREATING DUST  
CANCER AND LUNG DISEASE HAZARD  
AVOID BREATHING AIRBORNE ASBESTOS FIBERS**

- B. The contractor shall determine current waste handling, transportation, and disposal regulations for the work site and for each waste disposal landfill. The contractor must comply with these regulations and all US Department of Transportation, DEQ, and EPA requirements. Double-bagged material in containers shall be delivered to the pre-designated disposal site for burial. Labels and all necessary signs shall be in accordance with DEQ and OSHA standards.
- C. Contractor shall remove decontaminated containers from the site as soon as possible. Notify disposal site in advance of delivery of material to assure immediate burial of containers.
- D. If the bags are broken or damaged, or the container is contaminated, the contractor shall clean and decontaminate the entire container for reuse.
- E. Contractor shall submit three copies of written proof of disposal at approved disposal site to the environmental consultant prior to completion of the abatement work specified in this section. Use copies of the DEQ Waste Shipment Record ASN-4, completely filled out and signed, and accompanied by tickets and/or receipts from disposal site.

**END OF SECTION**

## SECTION 02 82 13 ASBESTOS ABATEMENT

### PART 1 GENERAL

#### 1.1 SCOPE

- A. This section covers the removal of materials that contain, or are presumed to contain, greater than one percent asbestos.
- B. The abatement contractor shall provide all labor, materials, equipment, services, permits, and insurance required to complete asbestos abatement procedures as indicated in these Specifications and the drawings.
- C. The following tables list asbestos-containing materials (ACM) to be removed. Abatement includes soft (non-structural) demolition, asbestos-containing materials removal, and disposal. Refer to drawing HA1 for additional asbestos abatement information.

**Table 1. Asbestos-Containing Materials to be Removed**

<b>Asbestos-Containing Building Materials</b>	<b>Approximate Quantity</b>	<b>Location</b>
Hard Fittings on Fiberglass Pipe Insulation	Up to 120 each	Domestic Water Pipes in Classrooms and Attic

- D. The quantities and location of ACM indicated above, and on drawing HA1 are best estimates limited by the physical constraints imposed by the occupancy of the building. Accordingly, minor variations of plus or minus 10 percent of the estimated quantities of ACM within the limits of containment for each abatement stage are considered as having no impact on contract price and schedule of this contract. Locations of ACM different than indicated on drawings, but within the limits of building, are considered as having no impact on contract price and schedule of this contract.
- E. Asbestos-containing building materials are present within work areas, or immediately adjacent to work areas, that are to remain. Refer to the Pre-Renovation Hazardous Building Materials Survey Report, PBS Engineering and Environmental, January 2022 for additional asbestos-containing building material information. Protect and do not disturb asbestos-containing materials that are to remain.

#### 1.2 DEFINITIONS

- A. Abatement: Procedures to control fiber release from asbestos-containing building materials, which include encapsulation, enclosure, removal, repair, and related activities.
- B. Aggressive Sampling: Air sampling method that assures that asbestos fibers remain airborne during sampling. All surfaces inside the work area will be agitated by the liberal use of compressed air, leaf blowers, or similar. Fans will then be run throughout the sampling period to keep all suspended fibers airborne.
- C. AHERA: Asbestos Hazard Emergency Response Act, 40 CFR Part 763.
- D. Air Lock: A system for permitting ingress or egress without permitting air movement between a contaminated area and an uncontaminated area, typically consisting of two curtained doorways at least three feet apart.
- E. Air Monitoring: The process of measuring the asbestos fiber content of a specific volume of air in a stated period of time.

- F. Amended Water: Water containing a surfactant additive.
- G. Asbestos-containing Material (ACM): Any material containing more than one percent asbestos as defined under NESHAPS CFR 40, Part 61, OAR Chapter 340, Division 248, OR-OSHA 437, 1926.1101, and OSHA 29 CFR Part 1926.1101.
- H. Authorized Visitor: The owner or designated representative, or a representative of any regulatory or other agency having jurisdiction over the project, and having required training, medical, fit test, etc.
- I. Certified Industrial Hygienist (CIH): An industrial hygienist certified in comprehensive practice by the American Board of Industrial Hygiene.
- J. Construction, Manager/General Contractor (CMGC): A construction delivery method in which the construction manager acts as the general contractor with schedule and cost risk. The CMGC provides design phase assistance in evaluating costs, schedule, and implications of systems and materials during design.
- K. Class I Asbestos Work: Activities involving the removal of TSI and surfacing ACM and PACM.
- L. Class II Asbestos Work: Activities involving the removal of ACM, which is not thermal system insulation or surfacing material. This includes, but is not limited to, the removal of asbestos-containing wallboard, floor tile and sheeting, roofing and siding shingles, and mastics.
- M. Clean Room: An uncontaminated area or room that is part of the worker decontamination enclosure system, with provisions for storing workers' street clothes and clean protective equipment.
- N. Critical Barrier: Solid barrier constructed from minimum of 2- by 4-inch studs, 16-inch o.c.; 0.5-inch plywood or drywall sealed airtight and covered on both sides (where applicable) with two layers of 6-mil plastic.
- O. Curtained Doorway: A device to allow ingress or egress from one room to another while permitting minimal air movement between the rooms, typically constructed by placing three overlapping sheets of plastic over an existing or temporarily-framed doorway, securing each along the top of the doorway in a pleated fashion and securing one vertical side of each sheet on alternating sides of consecutive sheets. Two curtained doorways spaced a minimum of three feet apart to form an air lock.
- P. Disposal: Procedures necessary to transport and deposit the asbestos-contaminated material in an approved waste disposal site in compliance with the Environmental Protection Agency (EPA) and other applicable regulations.
- Q. Enclosure: Procedures necessary to completely seal all asbestos-containing material behind airtight, impermeable, permanent barriers, including PVC jackets.
- R. Encapsulant (Sealant): A liquid material that can be applied to asbestos-containing material and that controls the possible release of asbestos fibers from the material either by creating a membrane over the surface (bridging encapsulant), or by penetrating the material and binding its components together (penetrating encapsulant).
- S. Environmental Consultant: Environmental consultant specializing in asbestos abatement—PBS Engineering and Environmental Inc., 4412 SW Corbett Avenue, Portland, Oregon, 97239, 503.248.1939—or any subcontractor designated by PBS.
- T. Equipment Room: A contaminated area or room, which is part of the worker decontamination enclosure system, with provisions for storage of contaminated clothing and equipment.
- U. Fitting: With regard to pipe insulation, a fitting is any elbow, offset, reducer, tee, etc.

- V. Fixed Object: Fixtures that are attached to the building or too heavy or bulky to remove from the work area.
- W. Glovebag: A manufactured device consisting of a transparent plastic bag with inward projecting sleeves, an internal tool pouch, provisions for fastening and sealing at the top and sides, and a receptacle in the bottom to hold asbestos waste. The glovebag is installed to surround the material to be removed and contain all fibers released during the process. Glovebags are used to remove insulation from small sections of pipe and fittings.
- X. HEPA Filter: A high efficiency particulate air (absolute) filter capable of trapping and retaining 99.97 percent of asbestos fibers greater than 0.3 microns in length.
- Y. HEPA Vacuum Equipment: High efficiency particulate air (absolute) filtered vacuuming equipment with a filter system capable of collecting and retaining asbestos fibers. Filters of 99.97 percent efficiency for retaining fibers of 0.3 microns in length or larger shall be installed for filtering discharge air.
- Z. Independent Testing Laboratory: A laboratory financially independent from and hired by the owner, architect, or contractor that is either AIHA-accredited for asbestos with demonstrated proficiency via the AIHA PAT program, or has analysts proficient in the AIHA AAR program for air sample analysis.
- AA. Industrial Hygienist: An employee of the Independent Testing Laboratory who is experienced and trained in asbestos sampling and analysis as specified.
- BB. Insulating Cement: Cementitious material applied to pipe reducers, manifolds, etc.
- CC. Isolated Work Area: A totally contained area of the facility where abatement activities are performed.
- DD. Movable Object: Furnishings not attached to the building structure that can be removed from the work area.
- EE. Negative-air Glovebag: A manufactured device consisting of a transparent plastic bag with inward projecting sleeves, an internal tool pouch, provisions for fastening and sealing it at the top and sides, and a receptacle in the bottom to hold asbestos waste. The glovebag is installed to surround the material to be removed and contain all fibers released through the process, with provisions for allowing continuous airflow through the bag while maintaining negative pressure inside.
- FF. Owner Representative: Designated by the Owner, and/or designated employee(s) of the Owner Representative.
- GG. PACM: Presumed asbestos-containing materials.
- HH. Pressure Differential Fan System: An air-purifying fan system located inside or outside the isolated work area that draws air out of the work area through a HEPA filter, keeping static air pressure in the work area lower than in adjacent areas, and preventing escape of contaminated air from work area to adjacent areas.
- II. Public Area: Any area outside the isolated work area. When work area isolation measures are removed, the work area becomes a public area.
- JJ. Removal: All operations where ACM and/or PACM are taken out or stripped from structures or substrates, and include demolition activities.
- KK. Shower Room: A room between the clean room and the equipment room in the worker decontamination enclosure system that is equipped with soap, shampoo, and hot and cold running water controllable at the faucet, and suitably arranged for complete showering during

decontamination. The shower room must be separated from the clean room and equipment room by air locks.

- LL. Special Fitting: With regard to pipe insulation, a special fitting is any valve, union, strainer, thermometer, flange, etc.
- MM. Surfactant: A chemical wetting agent added to water to improve penetration, thus reducing the quantity of water required for a given operation or area.
- NN. Tack Coat: A coat of penetrating encapsulant applied to all surfaces from which asbestos-containing materials have been removed.
- OO. Thermal System Insulation (TSI): ACM applied to pipes, fittings, boilers, breeching, tanks, ducts, or other structural components to prevent heat loss or gain.
- PP. Vacuum Loader Removal: Wetting and pneumatic conveying of loose material through a vacuum hose to a sealed collection tank specially equipped to prevent escape of fibers.
- QQ. Wet Cleaning: The process of eliminating asbestos from building surfaces and objects by using cloths, mops, or other cleaning tools that have been dampened with water.
- RR. Worker Decontamination Enclosure System: A showering facility for workers, typically consisting of a clean room, a shower room, and an equipment room. Each of these rooms is separated from the others by air locks. The equipment room is separated from the work area by a curtained doorway. The clean room is separated from the public area by a curtained doorway.
- SS. Worksite Entry Logbook: A logbook kept in the clean room that must be signed by everyone entering or leaving the work area. All pages of the logbook must be the same as the sample page bound into these Specifications.

### **1.3 DOCUMENTS INCORPORATED BY REFERENCE**

- A. The current issue of each document shall govern. Where conflict among requirements or with these Specifications exists, the most stringent requirements shall apply.
  - 1. US Environmental Protection Agency National Emissions Standards for Hazardous Air Pollutants (NESHAPS). (Code of Federal Regulations Title 40, Part 61, Subparts A and M.)
  - 2. US Environmental Protection Agency Office of Toxic Substances Guidance Document, "Guidance for Controlling Friable Asbestos-Containing Materials in Buildings." EPA Report Number 560/5-85-024 ("Purple Book").
  - 3. US Department of Labor Occupational Safety and Health Administration (OSHA):
    - a. Title 29 Code of Federal Regulations Section 1910.1001—General Industry Standard for Asbestos.
    - b. Title 29 Code of Federal Regulations Section 1910.134—General Industry Standard for Respiratory Protection.
    - c. Title 29 Code of Federal Regulations Section 1910 et al.—Occupational Exposure to Asbestos; Final Rule.
    - d. Title 29 Code of Federal Regulations 1926.1101—Construction Standard for Asbestos.
    - e. Title 29 Code of Federal Regulations Section 1910.1020—Access to Employee Exposure and Medical Records.

- f. Title 29 Code of Federal Regulations Section 1910.1200—Hazard Communication.
- 4. National Institute for Occupational Safety and Health (NIOSH), 42 CFR, Part 84, Respiratory Protective Devices.
- 5. American National Standards Institute (ANSI) NY; ANSI Standard Z 88.2-1980 "American National Standards Practice for Respiratory Protection," latest edition.
- 6. Oregon Administrative Rules Chapter 340, Division 248, Department of Environmental Quality; Chapter 340, Division 33, Licensing and Certification Requirements.
- 7. Oregon Administrative Rules Chapter 437, Divisions 2 and 3.
- 8. Oregon Revised Statutes (ORS), Chapters 279C, Certified Asbestos Contractors and Prevailing Wage; 656, Workers Compensation; and 701, Construction Contractors and Contracts.
- 9. All related electrical work shall be performed in accordance with the National Electrical Code.
- 10. All local ordinances, regulations, or rules pertaining to asbestos, including its storage, transportation, and disposal.

#### **1.4 SUBMITTALS AND NOTICES**

- A. Contractors shall submit three bound indexed copies of each submittal package as indicated below.
- B. Contractors shall submit to the architect and environmental consultant the following information prior to beginning work on the project:
  - 1. CONTRACTOR'S LICENSE. Submit proof that the asbestos abatement contractor is currently and for the duration of the project licensed in the state of Oregon to perform asbestos abatement, per ORS Chapter 701, and OAR Chapter 340, Division 248.
  - 2. ASBESTOS SUPERVISOR. Submit the name and resume of the assigned on-site foreman. At minimum, the foreman shall have successfully completed the Department of Environmental Quality (DEQ) asbestos supervisor course as approved by the State of Oregon. Other criteria such as references and similar projects will also be reviewed. At the architect or environmental consultant's request, the contractor shall arrange an oral interview with the assigned on-site foreman. The owner, architect, and the environmental consultant reserve the right to reject the foreman from the work at any time during the project. The contractor shall then assign another on-site foreman for the owner, architect, and environmental consultant's approval as described above.
  - 3. INSURANCE CERTIFICATE. Submit a copy of the certificate of asbestos-specific liability insurance policy.
  - 4. WORKER CERTIFICATION. Submit written proof indicating that all employees impacting asbestos-containing materials are Oregon state certified asbestos workers. Proof shall include photocopies of certificates and a signature from the contractor's principal indicating that all employees assigned to this project have completed such a program.
  - 5. RESPIRATOR PROGRAM. Submit written proof indicating respirator program complies with all parts of OSHA Asbestos Regulations CFR Title 29, Part 1910.134 and 1926.1101, OR-OSHA Chapter 437, 1910.134 and 1926.1101.
  - 6. MEDICAL PROGRAM. Submit written proof medical exam program complies with OSHA Asbestos Regulations CFR Title 29, Section 1926.1101 and OR-OSHA Chapter 437, 1926.1101.



7. EMERGENCY PLANS. Submit a written emergency control and cleanup plan to be followed by the contractor in the event of an accidental breach in containment, power failure, and accidental disturbance of ACMs in non-isolated areas.
  8. NOTIFICATION. Submit copy of written notification to DEQ of the proposed asbestos work not fewer than 10 days before work commences on this project.
  9. DISPOSAL PLAN. Submit written proof that all required permits and arrangements regarding the transportation and disposal of asbestos-containing or contaminated materials, supplies, etc. have been obtained. The disposal site must be approved by the EPA and/or DEQ and other responsible agencies.
  10. WORK PLAN. Submit a written "work plan" satisfactory to the architect and environmental consultant describing the schedule for asbestos abatement, decontamination procedures, and plans for construction and location of decontamination enclosure systems, pressure differential exhaust fans, etc. in compliance with these Specifications and applicable regulations, including calculations for determining required number of negative-air filtration units. The plan shall schedule the systematic flow of work throughout the facility per Specifications on a day-by-day basis, outlining room-by-room, or area-by-area procedures and planned alternative control measures. The contractor shall keep close coordination of his work with the architect and environmental consultant.
  11. AIR MONITORING. Submit information pertaining to the proposed Air Monitoring Program for this project, if appropriate. This information shall include the name(s) of the certified industrial hygienist appointed, the name of the on-site industrial hygiene technician working under his supervision, types of equipment, and sampling schedule, sampling procedures, calibration recordkeeping, and testing laboratory proposed.
  12. PRODUCT INFORMATION. Submit complete product information for any materials and products for which the contractor requests approval for use on this job (other than those specified).
  13. EMERGENCY PHONE NUMBER. Submit a local phone number at which the contractor or on-site foreman can be reached on a 24-hour basis during the course of the work.
- C. Contractor shall not begin work until submittals are reviewed and accepted by architect and the environmental consultant. Allow a ten-day review period.
- D. During the work, the contractor shall submit the following to the architect and environmental consultant, on a periodic basis as agreed to by the architect, environmental consultant, and contractor:
1. Waste shipment and disposal documentation.
  2. Air monitoring data.
  3. Notification updates.
- E. Contractor shall submit to the environmental consultant, in writing, all information required above regarding any new asbestos workers hired by, or subcontracted to, the contractor before these new asbestos abatement workers begin work.
- F. Prior to removal of decontamination systems and isolation barriers, the contractor shall obtain specific written permission from the environmental consultant.
- G. Prior to making final application for payment the contractor shall:
1. Complete all work under this contract.

2. Submit to the environmental consultant all required submittals, including all waste shipment records completely filled out and signed.
  3. Submit to the owner all payroll reports for work on this contract and other information as described elsewhere in the Specifications, if appropriate, under the contract.
  4. Submit to the environmental consultant "as-abated" drawings along with a signed affidavit stating that all asbestos-containing materials have been removed as indicated on the drawings.
- H. See other sections of these Specifications, and EPA, OSHA, and other standards referenced therein, for further information and requirements not included above.

## **1.5 BUILDING PROTECTION**

- A. Building Security and Protection
1. The contractor shall post adequate warning signs at all potential entrances to work areas as required by EPA and OSHA.
  2. The contractor shall protect all existing fixed equipment, building finishes that are to remain, and existing systems and functions from damage during the abatement process. Extra precautions are to be taken in protecting existing electrical panels, light fixtures, etc. Any damage to existing building, services, and/or equipment shall be remedied by the contractor at their expense.
  3. Contractor shall clean external surfaces of contaminated containers and equipment thoroughly by wet sponging and HEPA vacuum.
  4. Contractor shall maintain access and use of existing fire lanes.

## **1.6 PERSONAL PROTECTION**

- A. Training
1. Prior to commencement of work, contractor shall ensure all workers have been trained as specified.
  2. The contractor shall provide and post, in the clean room(s) and the equipment room(s), the decontamination, respirator, and work procedures to be followed by the workers.
- B. Personnel Personal Protective Equipment for Asbestos Removal
1. Work clothes shall consist of disposable full-body coveralls and head and foot covers ("Tyvek" or approved), boots, or sneakers. Eye, hearing, fall protection, and hard hats should be available as appropriate.
  2. At minimum, respiratory protection shall be approved by National Institute for Occupational Safety and Health/Mine Safety and Health Administration (NIOSH/MSHA); US Department of Labor; US Department of Health, Education, and Welfare; Centers for Disease Control; and as listed below. Respiratory protection shall provide workers with a maximum calculated fiber level inside the mask of 0.01 f/cc.
    - a. Glovebag or modified glovebag: full-face mask, powered air-purifying respirator with disposable HEPA filter cartridges (magenta/purple color code). Protection factor: 100.
    - b. Demolition of walls and ceilings that may impact friable asbestos-containing material: half-face mask, negative-pressure respirator with disposable HEPA filter cartridges (magenta/purple color code). Protection factor: 10.

- c. Pre-abatement work in close proximity to friable asbestos-containing materials: half-face mask, negative-pressure respirator with disposable HEPA filter cartridges (magenta/purple color code). Protection factor: 10.
  - d. Abatement in isolated areas: full-face mask, powered air-purifying respirator with disposable HEPA filter cartridges (magenta/purple color code). Protection factor: 100.
  - e. HEPA vacuuming and wet cleaning of surfaces: half-face mask, negative-pressure respirator with disposable HEPA filter cartridges (magenta/purple color code). Protection factor: 10.
  - f. Vinyl asbestos floor tile removal: half-face mask, negative-pressure respirator with disposable HEPA filter cartridges (magenta/purple color code). Protection factor: 10.
  - g. Handling of double-bagged asbestos-contaminated waste: half-face mask, negative-pressure respirator with disposable HEPA filter cartridges (magenta/purple color code). Protection factor: 10.
- 3. Additional respiratory protection shall be as required by CFR 29 1910.134 and 1926.1101, OR-OSHA Chapter 437, 1910.134 and 1926.1101.
  - 4. As part of the Contractor's Respiratory Protection Program, all workers shall be provided with a selection of brands and sizes of respirators to choose from. At a minimum, all workers shall be qualitatively fit-tested at the time of respirator selection per OR-OSHA Worker's Compensation Department Rule 22-069 (4)(e)(5)(i), and semiannually thereafter.
  - 5. Contractor shall supply replacement filter cartridges, as required. Cartridges that have become wet or clogged shall be replaced immediately.

C. Worker Decontamination Enclosure System

- 1. The contractor shall construct a personnel decontamination facility immediately outside of the isolated work area consisting of three chambers and two air locks as follows:
  - a. The equipment room shall consist of an air lock to the shower room, and a curtained doorway to the work area.
  - b. The shower room shall have two air locks, one to the equipment room and one to the clean room. All showers shall have hot and cold water controllable at the taps and installed in this room. The contractor shall supply and maintain soap, shampoo, and towels at all times in the shower area. Shower wastewater shall be filtered to remove all fibers larger than five microns, or as required by local regulations, before disposal in the municipal sewer system, or shall be collected and disposed of as asbestos-contaminated material. Permits shall be obtained and all water discharge regulations complied with, as required by local municipalities. Water filters shall be disposed of as asbestos-contaminated material.
  - c. The clean room shall consist of an air lock to the shower room and a curtained doorway to the adjacent building area. The clean room shall contain a first aid kit, a place to sit down, the Worksite Entry Logbook, and storage for workers' and visitors' clothing and shoes. Work, respirator, and decontamination procedures; regulations; and prevailing wage rates shall be conspicuously posted. There shall be a supply of clean, protective clothing, and respirators and cartridges in the clean room at all times.

- d. A monometer measuring pressure differential within and outside the containment shall be installed and remain operable on any containment from the start of abatement work until work is complete, and satisfactory clearance results are obtained. Air pressure within the containment shall remain at or below -0.02 inches of water (compared to ambient air pressure) throughout.
  2. Contractor shall not begin asbestos abatement work unless this system is functional, in good repair, and has been found acceptable for specification compliance by the environmental consultant.
- D. Personnel Protection Procedures in Isolated Work Areas
1. Each worker shall, upon entering the jobsite, remove street clothes in the clean change room, put on and fit-test their respirator, put on clean protective clothing, and sign in on the Worksite Entry Logbook before entering the equipment room or the work area.
  2. Workers shall, each time they leave the work area, remove gross contamination from clothing before leaving the work area; proceed to the equipment room and remove and dispose of disposable work clothes; remove and store shoes, boots, and other equipment except respirators; still wearing the respirator, proceed to the showers and clean the outside of the respirator with soap and water while showering; remove the respirator; thoroughly shampoo and wash themselves; remove filters, dispose of filters in the container provided for that purpose, and wash and rinse the inside of the respirator.
  3. Following showering and drying off, each worker shall proceed directly to the clean change room and dress in clean clothes at the end of each day's work or before eating, smoking, or drinking. Before reentering the work area from the clean change room, each worker shall put on his respirator with clean filters, dress in clean protective clothing, and sign in on the Worksite Entry Logbook.
  4. Contaminated work footwear and other equipment shall be stored in the equipment room when not in use in the work area. Upon completion of asbestos abatement, footwear shall be disposed of as contaminated waste or cleaned thoroughly inside and out, using soap and water, before removing from work area.
  5. Workers shall not eat, drink, or chew gum at the worksite except in the established clean room. Smoking or using other tobacco products is prohibited.
  6. Workers shall be fully protected with respirators and protective clothing immediately prior to the first disturbance of asbestos-containing or contaminated material and until final cleanup is completed.
- E. Access to Isolated Work Area by Others
1. Except for emergency personnel, the contractor shall limit access to the work area to authorized visitors.
  2. The contractor shall provide protective clothing, respirators, and equipment for all authorized visitors, as specified above.
  3. All authorized visitors shall be subject to the personnel protection provisions specified above, and shall sign in and out on the Worksite Entry Logbook.
- F. Personal Protection during Work in Non-Isolated Work Areas:
1. Work clothes per Section 1.06 B.

2. Respiratory protection per Section 1.06 B.
3. Worker protection procedures will differ from Section 1.06 D, in that two layers of coveralls shall be worn after removal of street clothes. Worker decontamination through a Worker decontamination enclosure is required. The first layer of coveralls must be removed when exiting the glovebag work area. The worker shall immediately proceed to the worker decontamination unit. The remaining requirements of Section 1.06 D still apply.
4. Contractor shall submit to the architect and environmental consultant for approval an emergency control and cleanup plan to be followed in the event of asbestos contamination during glovebag use. Contractor shall ensure all workers are thoroughly familiar with approved plan.
5. Contractor shall promptly remove all bags as they are used to the bag-holding and decontamination enclosure system.

G. Emergency Precautions

1. The contractor shall establish emergency and fire exits from the work area. Contractor shall ensure these exits are well marked and remain unobstructed.
2. The contractor shall be prepared to administer first aid to injured personnel after decontamination. Seriously injured personnel shall be treated immediately or evacuated without delay for decontamination.
3. Contractor shall notify the local fire department of the asbestos abatement project prior to beginning work area preparation.

## **1.7 SAFETY**

With regard to the work of this contract, the safety of the contractor's employees, the owner's employees, and the public is the sole responsibility of the contractor.

## **1.8 LIABILITY**

The contractor is an independent contractor and not an employee of the owner, architect, or the environmental consultant. The owner, architect, and environmental consultant shall have no liability to the contractor, or any third persons, for contractor's failure to faithfully perform and follow the provisions of these Specifications and the requirements of the governing agencies. Notwithstanding the failure of the owner, architect, or the environmental consultant to discover a violation by the contractor of any of the provisions of these Specifications, or to require the contractor to fully perform and follow any of them, shall not constitute a waiver of any of the requirements of these Specifications, which shall remain fully binding upon the contractor.

## **1.9 DELIVERY**

Contractor shall deliver all materials to the worksite in the original packages, containers or bundles bearing the name of the manufacturer and the brand name.

## **1.10 STORAGE**

Contractor shall store all materials subject to damage off the ground, away from wet or damp surfaces, away from heat sources, and under cover sufficient to prevent damage, contamination, or fire.

### **1.11 PROTECTION**

Damaged or deteriorating materials shall not be used and shall be removed from the premises by the contractor. Materials that become contaminated with asbestos shall be disposed of in accordance with the applicable regulations by the contractor.

### **1.12 SUBCONTRACTORS**

Any subcontractors employed by the contractor shall be bound to all the work and safety standards specified elsewhere in this Specification. Subcontractor's personnel shall be fully trained and supervised by the contractor during performance of this work.

### **1.13 AIR MONITORING BY ABATEMENT CONTRACTOR**

- A. An Independent Testing Laboratory shall be retained by the Abatement Contractor. All air-monitoring analysis shall be performed by an Industrial Hygienist. The Industrial Hygienist must be experienced and trained in asbestos sampling and analysis. At a minimum, documentation of prior asbestos sampling and analysis experience, plus satisfactory completion of the NIOSH 582 course or equivalent formal asbestos education, will be required. The laboratory must meet the requirements specified in Section 02 82 13. Air sample collection may be performed by an Industrial Hygienist or the Abatement Contractor's foreman at the Abatement Contractor's option.
- B. Documentation shall be kept for each filter sample procured as to worker sampled, work area location, date, and time taken, volume of air drawn through filter, pump identification number and calibration. Documentation shall indicate in what areas tests were taken and shall clearly indicate the specified maximum allowable fiber levels for each area tested. Submit chain-of-custody records along with all samples.
- C. The samples shall be collected on 25 millimeter (mm) filters and analyzed within 12 hours using the membrane filter method at 400-500x magnification with phase contrast illumination - NIOSH Analytical Method No. 7400 - for laboratory and field analysis. The analyst shall sign and submit permanent records of all samples analyzed directly to the Environmental Consultant. The Independent Testing Laboratory shall seal the unused portion of all filters in airtight containers so that individual samples can be reanalyzed at a later date if necessary. The containers shall be clearly labeled with project name and sample number and shall become property of the Owner at work completion at the Owner's request.
- D. The Abatement Contractor's testing laboratory shall submit sample analysis results to the Environmental Consultant verbally within 18 hours from the time of collection and written within two weeks including chain-of-custody and equipment calibration records.
- E. Abatement Contractor's Sampling During Abatement:
  - 1. Air monitoring shall be performed to provide samples during the period of asbestos abatement in each work area. Begin sampling when asbestos removal commences. Samples are to be taken where Class I or II work is being conducted during each 8-hour work shift until abatement is complete in that work area or until a negative exposure assessment is established per 29 CFR 1926.1101.
  - 2. The Abatement Contractor shall determine which worker(s) in each work area is probably experiencing the most severe exposure. This is the "Most Contaminated Worker(s)". Eight (8)-hour TWA and 30-minute excursion samples shall be collected on this worker(s). This worker shall wear a personal sampling pump and the sample shall be drawn from the breathing zone of this worker. All other samples are area samples.

3. The number of air samples collected shall be determined by the Abatement Contractor, and may be altered during the project based on work activity and results.
  4. The maximum allowable fiber levels shall be as determined by the Environmental Consultant based on the respiratory protection being utilized.
- F. Abatement Contractor shall notify the Department of Environmental Quality of air monitoring clearance results as supplied by Environmental Consultant. Notification shall be within 30 days after monitoring procedures were performed in accordance to OAR 340-32-465.

#### 1.14 AIR MONITORING BY OWNER

- A. The Owner will retain an experienced Industrial Hygienist/Environmental Consultant to collect and analyze asbestos air samples. Documentation of sample results will be forwarded to the Abatement Contractor as appropriate to regulatory requirements.
- B. Samples analyzed by phase contrast microscopy (PCM) will use NIOSH Analytical Method No. 7400. Samples analyzed by transmission electron microscopy (TEM) will use either the AHERA methodology, 40 CFR Part 763, or Yamate Level Two.
- C. Owner's Air Sampling During and After Abatement:
  1. Air Sampling Table is to be used as a guide. The Owner's Industrial Hygienist/Environmental Consultant may modify criteria. Modifications to the Maximum Allowable Fiber Count shall be made in writing by the Owner.

Type of Sample	Average Samples per 8-hour Work Shift	Sample Volume--L (Liters [L])	Approximate Flow Rate	Maximum Allowable Fiber Count (f/cc)
HEPA Fan Exhaust	0 or selected units	400-2000 L	2 to 10 LPM	0.01 f/cc
Outside of Work Area	0-5	400-2000 L	2 to 10 LPM	0.01 f/cc or <pre-abatement
Clearance PCM	5/work area	800-3000 L	2 to 10 LPM	0.01 f/cc
Clearance TEM	5/work area	1200-1800 L	2 to 10 LPM	<70 s/mm <sup>2</sup> average

LPM = liters per minute

f/cc = fibers per cubic centimeter

s/mm<sup>2</sup> = structures per millimeters squared

2. Air sampling for post-abatement work in isolated work areas will use the aggressive sampling method. Use of aggressive sampling in other areas shall be as directed by the Environmental Consultant. Aggressive sampling shall be conducted to assure that fibers remain airborne during sample collection.
3. Analysis of all clearance samples shall be via PCM.

4. The Abatement Contractor shall allow 48 hours for the collection and analysis of final PCM air clearance samples. In addition, the Abatement Contractor must provide at least 24 hours advance notice to the Environmental Consultant for final visual inspection and clearance air monitoring.
5. The Owner reserves the right to monitor Abatement Contractor's performance via air samples on abatement workers and in the work area in addition to the Abatement Contractor's air monitoring.

#### **1.15 QUALITY ASSURANCE**

- A. If, at any time during the work, analysis of an air sample taken by the Abatement Contractor, Owner, or Owner's representative, indicates a fiber count in excess of the allowable maximums specified, the Industrial Hygienist who analyzed the air sample shall immediately notify:
  1. The Abatement Contractor's Foreman
  2. The Environmental Consultant: PBS Engineering and Environmental Inc.
  3. Other workers, employees, occupants, etc. in affected area(s).
- B. Immediately upon being notified of fiber count exceeding the specified maximum allowable levels, the Abatement Contractor shall perform the following steps in the order presented, at no additional cost to the Owner:
  1. Stop abatement work.
  2. Identify source of high fiber counts.
  3. Immediately correct any containment breaches, pressure differential changes or other potential cause, and other concerns with the Environmental Consultant, and the Owner, if the Owner is available. The Environmental Consultant will determine the affected area and affected adjacent areas considered to be contaminated. The Environmental Consultant will determine the actions to be taken by the Abatement Contractor at no additional cost to the Owner.
    - a. Clean the affected area and the affected adjacent areas. Cleaning shall use wet methods and HEPA vacuuming.
    - b. Resample air until fiber counts are determined to be below one half of the specified maximum levels.
    - c. Secure and repair containment barriers, repair or add equipment.
    - d. Modify work procedures, and make other changes determined to be the possible cause of high fiber counts.
  4. Carefully resume work under close air monitoring.
  5. The Abatement Contractor shall be responsible for costs of any testing, cleanup, repair, down time loss, etc. that is a result of the Abatement Contractor's negligence, poor maintenance of isolated areas or improper procedures.



## **PART 2 PRODUCTS**

### **2.1 MATERIALS**

- A. Plastic Sheet: Plastic sheet shall be flame-retardant polyethylene material sized in lengths and widths to minimize the frequency of joints. The minimum thickness shall be 6-mil.
- B. Plastic Bags: Plastic bags shall be 6-mil polyethylene printed with warning labels per OSHA and EPA regulations.
- C. Tape: Tape shall be capable of sealing joints of adjacent sheets of plastic; attaching plastic sheet to finished or unfinished surfaces of dissimilar materials; and adhering under dry and wet conditions, including use of amended water. Minimum of 2-inch-wide tape must be used.
- D. Disposal Containers: Disposal containers shall be suitable to receive and retain any asbestos-containing or contaminated materials until disposal at an approved site. The containers shall be labeled in accordance with OSHA and EPA regulations. Containers must be both airtight and watertight, and have hard top, bottom, and sides.
- E. Warning Labels and Signs: Warning labels and signs shall be posted as required by OR-OSHA, ODOT, and DEQ regulations.
- F. Amended Water: Clean potable water containing a surfactant additive. The surfactant additive shall be 50 percent polyoxyethylene ether and 50 percent polyethylene ester, or equivalent, and shall be mixed with water at a concentration of one ounce surfactant to five gallons of water, or as recommended by the manufacturer in the case of an equivalent.
- G. Encapsulants (Sealants): Encapsulants shall be of the bridging or penetrating variety and shall be listed as "satisfactory" by the EPA. Encapsulants shall provide a suitable substrate bonding agent for application of new material where appropriate. Penetrating Encapsulant: No. 207 Special Sealer #33775-27A as manufactured by Makus-Cincinnati, Inc.; "Asbestop 30B-2" as manufactured by Asbesco Corp.; "Cable Coating 22-P" as manufactured by American Coatings Corp., or approved. Bridging Encapsulant: Decadex Firecheck, manufacturer's standard color "Magnolia," as manufactured by Pentagon Plastics, Inc.; "Cable Coating 2-B," manufacturer's standard color gray, as manufactured by American Coatings Corp.; or approved.
- H. Rewettable Lagging Cloth: Twelve ounce glass fabric lagging cloth saturated with dried lagging adhesive. "Dip-Lag" as manufactured by Claremont Co. or approved.
- I. Enclosure: Protective plastic jacketing systems, framed gypsum board enclosures, suspended ceilings or other materials as specified elsewhere.
- J. Other Materials: Provide all other materials such as lumber, nails, and hardware, which may be required to construct and dismantle the decontamination area, and the barriers that isolate the work area, and as required to complete the work, as specified.

### **2.2 TOOLS AND EQUIPMENT**

- A. Water Sprayer: The water sprayer shall be an airless or other low-pressure sprayer for amended water application.
- B. Air-Purifying Equipment: Air-purifying equipment shall consist of high-efficiency particulate air (HEPA) filtration systems. No air movement system or air equipment shall discharge asbestos fibers outside the work area. Each unit shall be capable of variable volume from a minimum of 500 cubic feet per minute (CFM) to at least 1700 CFM under load and shall have at least two stages of pre-filtration

ahead of the HEPA final filter. Each unit shall be overload protected, and equipped with an elapsed time indicator (hour meter), static pressure gauge with low flow alarm, and heat and smoke sensors that visually and audibly warn workers and shut unit fan down within 30 seconds. The units shall be: Micro-Trap Portable Air Filtration System manufactured by Asbestos Control Technology, Inc., "HOG 2000" Negative-air Protection System manufactured by Control Resource Systems, or approved.

- C. Pressure Differential Monitoring Equipment: A combination sensing, alarm, and recording device shall be in operation at all times during use of the HEPA air-purifying equipment. The unit shall be a "Neg-A-Master," manufactured by Control Resource Systems, Inc., or approved.
- D. Water-purifying Equipment: Water-purifying equipment shall be capable of removing all fibers longer than five microns, or as required by local regulations, from water used in abatement work and decontamination showers. Control Resource Systems, Inc. "AQUA-HOG" or approved.
- E. Airless Sprayer: An airless sprayer, suitable for application of penetrating encapsulant material, shall be used.
- F. Vacuum Equipment: All vacuum equipment used in the work area shall be High-efficiency Particulate Air (HEPA) equipment, and suitable for wet/dry usage.
- G. Scaffolding: Scaffolding, as required to accomplish the specified work, shall meet all applicable safety regulations. All special scaffolding shall have drawings and calculations stamped and signed by a civil or structural engineer registered in the state of Oregon.
- H. Transportation Equipment: Transportation equipment, as required, shall be suitable for loading, temporary storage, transit, and unloading of contaminated waste without exposure to persons or property. Equipment shall have a hard top, bottom, and sides. If equipment is rented, notify rental agency in advance, in writing, of intended use of equipment.
- I. Electrical: Electrical tools, equipment, and lighting shall meet all applicable codes and regulations. Ground fault protection as required by OSHA, shall be in effect at all times. Contractor shall take all additional precautions and measures necessary to ensure a safe working environment during wet removal.
- J. Glovebags: Bags shall be clean poly bags seamless at the bottom, with pre-printed asbestos warning labels, 6-mil PVC with attached TYVEK arms, and latex gloves. Bags shall be Profo' Bag manufactured by Asbestos Control Technology, Inc., or Asbest'O'Saf/SAC by Control Resource Systems, Inc., or approved.
- K. Remote Filter Housing: Stainless steel housing shall have pre-filters and HEPA filter sealed to cabinet flanges by Century Equipment "Advance Guard II" or approved equal.
- L. Other Tools and Equipment: Other suitable tools shall be provided for the removal, enclosure, encapsulation, patching, and disposal activities including, but not limited to, hand-held scrapers, wire brushes, sponges, and rounded-edge shovels.

## **PART 3 EXECUTION**

### **3.1 FULL ISOLATION WORK AREA PREPARATION**

- A. Contractor shall perform the following isolation procedures in the order in which they are presented. Any alternative control measures considered for Class I/II work shall be performed in accordance with 29 CFR 1926.1101.

1. Shut down, remove filters, and isolate HVAC systems to prevent contamination and fiber dispersal. Coordinate with building users and CMGC prior to shutdown.
2. Coordinate all electrical, safety, and other service connections, requirements and equipment with the CMGC. Use a journeyman electrician at a minimum. It is the contractor's responsibility to verify operation of systems that will be shut off during abatement. If any system is found to be defective or not operating satisfactorily, the contractor shall notify the CMGC or environmental consultant in writing prior to shutoff.
3. Install critical barriers as follows: seal off all openings including, but not limited to, doorways, windows, and other penetrations of the work area with solid critical barriers except openings left for HEPA air-purification system, which shall be properly HEPA-filtered. Where doors exist, sealing may be done by closing door, sealing with tape on both sides, and then covering both sides with two layers of plastic sheeting.
4. Pre-clean movable objects, such as furniture and equipment to be removed (and carpeting), within the proposed work areas using HEPA-filtered vacuum equipment and/or wet cleaning methods as appropriate, and remove such objects from work areas to a temporary location, or consolidate such objects away from removal work and enclose with critical barriers.
5. Pre-clean fixed objects within the proposed work areas using HEPA-filtered vacuum equipment and/or wet cleaning methods as appropriate, and enclose with critical barriers. Equipment that must continue operating shall be enclosed and ventilated to avoid damage.
6. Set up the worker decontamination enclosure system (decon). Once this system is installed and abatement commences, it shall be used in the specified manner for the ingress and egress of all personnel and equipment, except in emergency situations. All personnel shall sign the Worksite Entry Logbook each time they pass in or out of the decontamination enclosure.
7. Install HEPA air-purifying equipment pressure differential fan system so as to ensure lower static pressure in the isolated work area than in surrounding areas, a flow of air through all parts of the isolated work area towards the air-purifying equipment, and minimum air contamination levels at abatement worker breathing zones. Discharge from air-purifying equipment shall be ducted outside the building. Use one or more units of capacity as recommended by the manufacturer for the volume of the isolated work area, but in no case shall airflow be less than six air changes every 60 minutes with a minimum pressure differential of 0.02 inches wg between the work area and the decon clean room.
8. Cover floor and wall surfaces with plastic sheeting sealed with tape. Cover floors first so that plastic extends at least 12 inches up on walls, then cover walls with plastic sheeting to overlap floor plastic by a minimum of 24 inches, thus overlapping the horizontal floor material by a minimum of 12 inches. Install additional layer of plastic sheeting on floor and walls in similar manner. Contractor may use mechanical fastening techniques, such as tack strips, as necessary to secure wall plastic sheeting. Contractor shall repair any damage resulting from mechanical fasteners.
9. Maintain emergency and fire exits from the work areas, or establish alternative exits satisfactory to the local building or fire department officials. Ensure that all exits remain unobstructed and well marked.
10. Adequate portable fire extinguishing equipment shall be maintained within work area as defined by OSHA and/or local fire department officials.

- B. No asbestos abatement work shall occur unless the work area isolation has been found acceptable for Specification compliance by the environmental consultant.
- C. Isolated work area enclosure system maintenance. The contractor shall be responsible for daily documentation of the following:
  - 1. Prior to the first use, and at the beginning of each shift during abatement work, containments shall be given a complete visual inspection by the contractor's shift foreman and industrial hygienist. Inspection shall include the HEPA air-purification system and associated filters. A smoke tube test by the shift foreman shall then be made of the worker decontamination enclosure system and other critical areas to verify that the isolated area is under negative air pressure. Work shall not begin until all defects have been repaired.
  - 2. Periodic inspections shall be made, as required, during each shift to assure continued proper functioning of the containment and HEPA system.

### **3.2 NON-ISOLATED WORK AREA PREPARATION**

- A. Contractor shall perform the following procedures in the order in which they are presented and describe procedures for glovebag work and other work in non-isolated work areas. Any alternative control measures considered for Class II work shall be performed in accordance with 29 CFR 1926.1101.
  - 1. Shut down heating, ventilation, and air conditioning (HVAC) systems. Coordinate with building users and the CMGC prior to shutdown.
  - 2. Restrict access to work area and post warning signs. Do not perform glovebag work or any abatement work in an occupied area.
  - 3. Completely pre-clean entire work area using HEPA vacuum equipment or wet cleaning methods.
  - 4. Set up the worker decontamination enclosure system. Once this system is installed and abatement commences, it shall be used in the specified manner for the ingress and egress of all personnel, except in emergency situations. All personnel shall sign the Worksite Entry Logbook each time they pass in or out of the decontamination enclosure.
  - 5. At the direction of the environmental consultant, install HEPA exhaust fan in work area. Duct fan intake to immediate area of work in such a manner that any fibers released will be drawn away from the worker and into intake duct.
  - 6. Cover floor and other surfaces below work area with 6-mil plastic sheeting. Seal openings and install curtained doorways and air locks as directed by the environmental consultant.
  - 7. Have emergency cleanup equipment and supplies, including HEPA vacuum, amended water, disposal bags, mop, buckets, towels, and sponges on hand prior to start of abatement work.
- B. No asbestos abatement work shall occur unless the work area has been found acceptable for Specification compliance by the environmental consultant or industrial hygiene technician.

### **3.3 REMOVAL OF ASBESTOS-CONTAINING MATERIALS IN FULL ISOLATION WORK AREAS**

- A. Contractor shall isolate work area as specified.
- B. Remove all asbestos-containing vinyl floor tile as Class 1 friable asbestos removal.
  - 1. Contractor shall spray the asbestos material with amended water. A fine spray of this solution shall be applied to prevent fiber disturbance preceding the removal of the asbestos material. The

asbestos shall be sufficiently saturated to prevent emission of airborne fibers in excess of specified fiber levels.

2. Contractor shall remove asbestos material while damp and pack it in sealable containers. Containers shall be moved to bag load out facility or equipment room in the worker decontamination system.
  3. Contractor shall collect all water used in the removal and cleaning process and dispose of as contaminated waste or filter to remove all fibers more than five microns in length before disposal in the municipal sewer system, or as required by local regulations. Water filters shall be disposed of as asbestos-contaminated material.
- C. All wooden subfloor associated with asbestos-containing mastic shall be wholly removed and disposed of as asbestos waste in accordance with section 3.9, Disposal.
- D. Contractor shall maintain a safe and uncluttered work area, worker decontamination system, and bag load out facility on a daily basis.

### **3.4 REMOVAL OF ASBESTOS-CONTAINING MATERIALS IN NON-ISOLATED AREAS**

- A. Contractor shall apply spray coat of amended water to material to be removed; material shall be kept damp during entire removal process.
- B. Glovebag work shall be as follows. All removal using the glovebag method shall be performed strictly according to regulations, manufacturer's printed instructions, and as demonstrated by the manufacturer's representative or as further specified in this section. Workers are not to smoke or wear hand or wrist jewelry while using glovebags.
1. Contractor shall install port for hose of HEPA vacuum to create reduced pressure inside glovebag. Installing of fresh air intake and/or bridging to prevent collapse of bag are acceptable. Reduced pressure shall be maintained throughout entire abatement procedure.
  2. During the removal phase, contractor shall use amended water to reduce potential for airborne fibers.
  3. Contractor shall seal flap if used and, using a HEPA vacuum, remove all contaminated air in the upper chamber.
  4. Contractor shall promptly double-bag the glovebag after removal is complete, place it into a sealed container, and remove to the bag holding enclosure.
- C. Exterior door and window caulking shall be removed using the following methods:
1. Caulking shall be removed in a non-friable state. Caulking that is determined to be friable or which is rendered friable during the abatement process shall be removed using either containment or glovebag methods.
  2. The contractor shall utilize wet methods during removal and packaging for disposal.
  3. The contractor may utilize a heat gun if at any time the caulking has the potential to become friable during removal.
  4. The contractor shall have HEPA vacuums available and shall use them during removal.
  5. The use of abrasive or mechanical methods to remove the caulking is prohibited.
  6. Burning or blistering of the caulk with excessive heat by the heat gun is prohibited.

7. All asbestos-containing caulk and building components with residual asbestos caulk shall be disposed of as asbestos-containing waste as specified below.

### **3.5 CLEANUP IN FULL ISOLATION WORK AREAS**

- A. At the conclusion of removal in the isolated work area, conduct cleanup in the sequence described below. Windows, doors, HVAC vents, etc. shall remain sealed and HEPA-filtered pressure differential fan systems shall remain in service.
  1. REMOVE MATERIAL AND EQUIPMENT. Contractor shall remove visible accumulations of material and debris (including filters removed from HVAC equipment and HEPA air-purification equipment). Contractor shall include all sealed containers and equipment used in the work area in the cleanup, and remove them from work area after decontamination of outer surfaces.
  2. FIRST CLEAN. Contractor shall clean all surfaces in the work area and any other contaminated areas with water and/or with HEPA-filtered vacuum equipment.
  3. WAIT 24 HOURS. After the first cleaning of the work area, wait 24 hours to allow for settlement of dust. During this settling period, no entry to the work area shall be allowed.
  4. SECOND CLEAN. Wet-clean or clean with HEPA-filtered vacuum equipment all surfaces in the work area. After completion of the second cleaning operation, perform a complete visual inspection of the work area to ensure that the work area is free of visible debris.
  5. VISUAL INSPECTION. Prior to application of post-removal encapsulant, contact the environmental consultant for a visual observation of the work area. The work area shall be free of visible debris. Observation by the consultant does not alleviate the contractor of responsibility to provide work in compliance with Specifications. Contractor shall contact environmental consultant at least 24 hours prior to desired inspection time.
  6. REMOVE PLASTIC SHEETING. After visual observation by the consultant, contractor shall apply a coat of approved encapsulant to all surfaces in the work area where asbestos has been removed and to disposable plastic sheeting as a post-removal encapsulant. Encapsulant application shall follow all applicable manufacturer's recommendations and shall provide a compatible bonding agent for application of new material.
  7. FINAL CLEAN. After the encapsulation is complete, the contractor shall remove all noncritical plastic and clean all floors, walls, fixtures, and other surfaces within the work area with only critical barriers in place using wet methods or HEPA-filtered vacuum equipment. Plastic sheeting over carpets may remain in place.
  8. CONTACT ENVIRONMENTAL CONSULTANT. Contact the environmental consultant for a visual observation of the work area. The work area shall be free of visible debris. Observation by the consultant does not alleviate the contractor of responsibility to provide work in compliance with Specifications. Contractor shall contact environmental consultant at least 24 hours prior to desired inspection time. Consultant shall conduct final air monitoring as specified after work area has been allowed sufficient time to dry.
  9. TEARDOWN. When the final observation by the environmental consultant and air sampling test results are satisfactory, the contractor shall then remove the decontamination systems and remaining barriers.

10. DISPOSAL. Contractor shall properly dispose of all waste materials. All polyethylene material, tape, cleaning material, and contaminated clothing shall be double-bagged, sealed, and labeled as described above for asbestos waste material.

### **3.6 CLEANUP IN NON-ISOLATED WORK AREAS**

- A. FIRST CLEAN. Contractor shall remove visible accumulations of asbestos material and debris. All surfaces shall be cleaned within the affected work area. Cleaning shall be with amended water and/or HEPA-filtered vacuum equipment. In a large open area, the affected work area shall include the immediate work area and an area that encompasses at least 6 feet in all directions or as defined by the environmental consultant. In small work areas, the affected work area shall include the entire room.
- B. AFFECTED AREA. The affected work area may be further defined in the scope of work by the environmental consultant. During the work, high fiber levels, as indicated by air monitoring results, may increase the area to be cleaned. The increase in the affected area due to high fiber levels or other indications of fiber dispersal will be defined by the environmental consultant, and the contractor shall bear all costs of additional cleaning.
- C. VISUAL INSPECTION. After completion of the cleaning operation, the environmental consultant shall perform a visual observation of the affected work area to ensure that the affected work area is free of visible dust and debris. Observation by the consultant does not alleviate the contractor of responsibility to provide work in compliance with Specifications. Contractor shall contact environmental consultant at least 24 hours prior to desired inspection time.
- D. ENCAPSULANT. After visual observation by the environmental consultant, contractor shall spray-apply encapsulant to the material substrate, all temporary plastic sheeting, and other temporary protective materials.
- E. CLEARANCE SAMPLING. Post-abatement air sampling shall be at the discretion of the Environmental Consultant and will be determined by the ongoing sample results.
- F. TEARDOWN. When the final observation by the environmental consultant and air sampling test results (if required) are satisfactory, the temporary plastic sheeting and other temporary protective materials shall be removed by the contractor.
- G. DISPOSAL. Contractor shall properly dispose of all waste materials, all polyethylene material, tape, and cleaning material, and contaminated clothing shall be double-bagged, sealed, and labeled as described for asbestos waste material.

### **3.7 RE-ESTABLISHMENT OF OBJECTS AND SYSTEMS**

- A. When cleanup is complete, contractor shall:
  1. Relocate objects moved to temporary locations in the course of the work to their former positions. Coordinate with the CMGC.
  2. Clean, repair and/or repaint all surfaces soiled, discolored, or damaged by removal of tape, adhesive, or other work of this contract to match existing surfaces. The contractor shall bear all costs associated with damage incurred during the abatement, which includes, but is not limited to, perimeter plaster walls, wall murals, windows, and mullions
  3. If the contractor uses caulking to seal cracks in concrete floor, the caulking must be removed to architect's satisfaction at completion of project.

4. Return mechanical, electrical, and other systems shut down by the contractor to complete and functional operation.
5. Re-secure objects removed in the course of work in their former positions, including air dampers in plenums, and adjust for proper operation.
6. Clean, repair and/or repaint all surfaces soiled, discolored, or damaged by removal of tape, adhesive, or other work of this contract to match adjacent surfaces.

### **3.8 DISPOSAL**

- A. Contractor shall affix warning labels having waterproof print and permanent adhesive to the lid and sides of all containers. Warning labels shall be conspicuous and legible, and contain the following words:

**DANGER  
CONTAINS ASBESTOS FIBERS  
AVOID CREATING DUST  
CANCER AND LUNG DISEASE HAZARD  
AVOID BREATHING AIRBORNE ASBESTOS FIBERS**

- B. The contractor shall determine current waste handling, transportation, and disposal regulations for the work site and for each waste disposal landfill. The contractor must comply with these regulations and all US Department of Transportation, DEQ, and EPA requirements. Double-bagged material in containers shall be delivered to the pre-designated disposal site for burial. Labels and all necessary signs shall be in accordance with DEQ and OSHA standards.
- C. Contractor shall remove decontaminated containers from the site as soon as possible. Notify disposal site in advance of delivery of material to assure immediate burial of containers.
- D. If the bags are broken or damaged, or the container is contaminated, the contractor shall clean and decontaminate the entire container for reuse.
- E. Contractor shall submit three copies of written proof of disposal at approved disposal site to the environmental consultant prior to completion of the abatement work specified in this section. Use copies of the DEQ Waste Shipment Record ASN-4, completely filled out and signed, and accompanied by tickets and/or receipts from disposal site.

**END OF SECTION**



**SECTION 05 50 00**  
**METAL FABRICATIONS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Shop fabricated steel and aluminum items.

**1.02 RELATED REQUIREMENTS**

- A. Section 09 91 23 - Interior Painting: Paint finish.

**1.03 REFERENCE STANDARDS**

- A. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2021.
- B. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes; 2017.
- C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.
- D. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021.
- E. 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; 2021.
- F. SSPC-SP 2 - Hand Tool Cleaning; 2018.

**1.04 SUBMITTALS**

- A. See Section 01 30 00 - 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.
- C. Designer's Qualification Statement.
- D. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

**PART 2 PRODUCTS**

**2.01 MATERIALS - STEEL**

- A. Stainless Steel, General: ASTM A666, Type 304.
- B. Stainless Steel Bars, Shapes and Moldings: ASTM A276/A276M, Type 304.
- C. Mechanical Fasteners: Same material as or compatible with materials being fastened; type consistent with design and specified quality level.

**2.02 MATERIALS - ALUMINUM**

- A. Sheet Aluminum: ASTM B209/B209M, 5052 alloy, H32 or H22 temper.
- B. Bolts, Nuts, and Washers: Stainless steel.

**2.03 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. 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.
- D. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

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

## **2.04 FINISHES - STEEL**

- A. Stainless Steel Finish: No. 4 Bright Polished finish.

## **2.05 FINISHES - ALUMINUM**

- A. High Performance Organic Coating System: AAMA 2604 multiple coat, thermally cured fluoropolymer system; color as indicated.
  - 1. Manufacturers:
    - a. Sherwin-Williams Company; POLANE Solar Reflective 2K Urethane Enamel: [oem.sherwin-williams.com/#sle](http://oem.sherwin-williams.com/#sle).
    - b. Substitutions: See Section 01 60 00 - Product Requirements.

## **2.06 FABRICATION TOLERANCES**

- A. Squareness: 1/8 inch (3 mm) maximum difference in diagonal measurements.
- B. Maximum Offset Between Faces: 1/16 inch (1.5 mm).
- C. Maximum Misalignment of Adjacent Members: 1/16 inch (1.5 mm).
- D. Maximum Bow: 1/8 inch (3 mm) in 48 inches (1.2 m).
- E. Maximum Deviation From Plane: 1/16 inch (1.5 mm) in 48 inches (1.2 m).

## **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 and aluminum where site welding is required.

### **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. Obtain approval prior to site cutting or making adjustments not scheduled.

### **3.04 TOLERANCES**

- A. Maximum Variation From Plumb: 1/4 inch (6 mm) per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch (6 mm).
- C. Maximum Out-of-Position: 1/4 inch (6 mm).

**END OF SECTION**

**SECTION 06 10 00**  
**ROUGH CARPENTRY**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Nonstructural dimension lumber framing.
- B. Sheathing.
- C. Concealed wood blocking, nailers, and supports.

**1.02 RELATED REQUIREMENTS**

- A. Section 09 21 16 - Gypsum Board Assemblies: Gypsum-based sheathing.

**1.03 REFERENCE STANDARDS**

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- 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 C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing; 2003 (Reapproved 2017).
- D. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 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; 2019a.
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2020.
- G. AWWA U1 - Use Category System: User Specification for Treated Wood; 2018.
- H. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. PS 20 - American Softwood Lumber Standard; 2020.
- J. WWP A G-5 - Western Lumber Grading Rules; 2017.

**1.04 SUBMITTALS**

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

**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.

**1.06 WARRANTY**

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

**PART 2 PRODUCTS**

**2.01 GENERAL REQUIREMENTS**

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
  - 1. Species: Douglas Fir-Larch, unless otherwise indicated.
  - 2. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
  - 3. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at [www.alsc.org](http://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; WWP A G-5.
- B. Sizes: Nominal sizes as indicated on drawings, S4S.
- C. Moisture Content: S-dry or MC19.
- D. Stud Framing (2 by 2 through 2 by 6 (50 by 50 mm through 50 by 150 mm) ):
  - 1. Species: Douglas Fir-Larch.
  - 2. Grade: No. 2.
- E. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
  - 1. Lumber: S4S, No. 2 or Standard Grade.
  - 2. Boards: Standard or No. 3.

## **2.03 STRUCTURAL COMPOSITE LUMBER**

- A. At Contractor's option, structural composite lumber may be substituted for concealed dimension lumber and timbers.

## **2.04 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. Construction Adhesives: Adhesives complying with ASTM C557 or ASTM D3498.

## **2.05 FACTORY WOOD TREATMENT**

- A. Treated Lumber and Plywood: Comply with requirements of AWWA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.

# **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 (100 mm) 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 and AWC (WFCM) Wood Frame Construction Manual.
- E. 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.
- F. 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 authorities having jurisdiction may be used in lieu of solid wood blocking.
- C. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.
- D. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.
- E. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.
- F. Provide the following specific nonstructural framing and blocking:
  - 1. Cabinets and shelf supports.
  - 2. Wall brackets.
  - 3. Handrails.
  - 4. Grab bars.
  - 5. Towel and bath accessories.
  - 6. Wall-mounted door stops.
  - 7. Chalkboards and marker boards.
  - 8. Wall paneling and trim.
  - 9. Joints of rigid wall coverings that occur between studs.

#### **3.05 TOLERANCES**

- A. Framing Members: 1/4 inch (6 mm) from true position, maximum.
- B. Variation from Plane, Other than Floors: 1/4 inch in 10 feet (2 mm/m) maximum, and 1/4 inch in 30 feet (7 mm in 10 m) maximum.

#### **3.06 CLEANING**

- A. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill.
- B. 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.
- B. Wood casings and moldings.

**1.02 RELATED REQUIREMENTS**

- A. 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; 2020.
- B. AWI (QCP) - Quality Certification Program; Current Edition.
- C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).
- D. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 4.0; 2021.
- E. PS 1 - Structural Plywood; 2009 (Revised 2019).

**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.
  - 1. Provide information as required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).
  - 2. Include certification program label.
- C. Samples: Submit two samples of Side and/or Back Panels, one-quarter full size, illustrating one-quarter finish and construction.
- D. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

**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 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.

**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. 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 FASTENINGS**

- A. Adhesive for Purposes Other Than Laminate Installation: Suitable for the purpose; not containing formaldehyde or other volatile organic compounds.
- B. Fasteners: Of size and type to suit application. \_\_\_\_\_
- C. Concealed Joint Fasteners: Threaded steel.

## **2.04 ACCESSORIES**

- A. Adhesive: Type recommended by fabricator to suit application.
- B. Wood Filler: Solvent base, tinted to match surface finish color.

## **2.05 SITE FINISHING MATERIALS**

- A. Stain, Shellac, Varnish, and Finishing Materials: Comply with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

## **2.06 FABRICATION**

- A. Shop assemble work for delivery to site, permitting passage through building openings.
- B. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

## **2.07 SHOP FINISHING**

- A. Sand work smooth and set exposed nails and screws.
- B. Apply wood filler in exposed nail and screw indentations.
- C. On items to receive transparent finishes, use wood filler that matches surrounding surfaces and is of type recommended for the applicable finish.
- D. 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. Set and secure materials and components in place, plumb and level.
- C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch (0.79 mm). Do not use additional overlay trim to conceal larger gaps.

## **3.03 SITE APPLIED WOOD TREATMENT**

- A. Apply preservative treatment in accordance with manufacturer's instructions.
- B. Brush apply one coats of preservative treatment on wood in contact with cementitious materials. Treat site-sawn cuts.
- C. Allow preservative to dry prior to erecting members.

## **3.04 PREPARATION FOR SITE FINISHING**

- A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.

**3.05 TOLERANCES**

- A. Maximum Variation from True Position: 1/16 inch (1.6 mm).
- B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch (0.79 mm).

**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; 2020.
- 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 Firestop Systems; 2020a.
- E. ASTM E2393 - Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers; 2020a.
- F. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015 (Reapproved 2021)e1.
- G. ITS (DIR) - Directory of Listed Products; current edition.
- H. FM 4991 - Approval Standard for Firestop Contractors; 2013.
- I. FM (AG) - FM Approval Guide; current edition.
- J. SCAQMD 1168 - Adhesive and Sealant Applications; 1989 (Amended 2017).
- K. UL 1479 - Standard for Fire Tests of Penetration Firestops; Current Edition, Including All Revisions.
- L. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems; Current Edition, Including All Revisions.
- M. UL (DIR) - Online Certifications Directory; Current Edition.
- N. 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. Sustainable Design Submittal: Submit VOC content documentation for nonpreformed materials.
- E. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.
- F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- G. Manufacturer's qualification statement.
- H. 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.
  - 2. Verification of at least five satisfactorily completed projects of comparable size and type.

### **1.06 MOCK-UPS**

- A. Install one firestopping assembly representative of each fire rating design required on project.
  - 1. Where one design may be used for different penetrating items or in different wall constructions, install one assembly for each different combination.
- B. If accepted, mock-up will represent minimum standard for this work.
- C. If accepted, mock-up may remain as part of this work. Remove and replace mock-ups not accepted.

### **1.07 FIELD CONDITIONS**

- A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.
- B. Provide ventilation in areas where solvent-cured materials are being installed.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Firestopping Manufacturers:
  - 1. 3M Fire Protection Products: [www.3m.com/firestop/#sle](http://www.3m.com/firestop/#sle).
  - 2. Hilti, Inc: [www.us.hilti.com/#sle](http://www.us.hilti.com/#sle).
  - 3. HoldRite, a Brand of Reliance Worldwide Corporation: [www.holdrite.com/#sle](http://www.holdrite.com/#sle).
  - 4. Passive Fire Protection Partners; Firestop 3600EX: [www.firestop.com/#sle](http://www.firestop.com/#sle).
  - 5. Specified Technologies Inc: [www.stifirestop.com/#sle](http://www.stifirestop.com/#sle).
  - 6. Tremco Commercial Sealants & Waterproofing; TREMstop Acrylic: [www.tremcosealants.com/#sle](http://www.tremcosealants.com/#sle).
  - 7. 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. Mold and Mildew Resistance: Provide firestopping materials with mold and mildew resistance rating of zero(0) in accordance with ASTM G21.
- D. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.

### **2.03 FIRESTOPPING ASSEMBLY REQUIREMENTS**

- A. 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.
  - 1. Listing by FM (AG), ITS (DIR), UL (DIR), or UL (FRD) in their certification directories will be considered evidence of successful testing.

## **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.
- C. Install backing materials to prevent liquid material from leakage.

### **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 09 21 16**  
**GYPSUM BOARD ASSEMBLIES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Metal channel ceiling framing.
- B. Gypsum sheathing.
- C. Cementitious backing board.
- D. Gypsum wallboard.
- E. Joint treatment and accessories.
- F. 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. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2018.
- B. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 1999 (Reaffirmed 2016).
- 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 2020).
- E. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2020.
- F. 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; 2020.
- G. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2019.
- H. ASTM C1325 - Standard Specification for Fiber-Mat Reinforced Cementitious Backer Units; 2021.
- I. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.
- J. ASTM C1658/C1658M - Standard Specification for Glass Mat Gypsum Panels; 2019, with Editorial Revision (2020).
- K. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2016.
- L. GA-216 - Application and Finishing of Gypsum Panel Products; 2018.

**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.
- C. Product Data: Provide data on gypsum board, accessories, and joint finishing system.
- D. Samples: Submit two samples of gypsum board finished with proposed texture application, 12 by 12 inches (300 by 300 mm) in size, illustrating finish color and texture.
- E. Installer's Qualification Statement.

**1.05 QUALITY ASSURANCE**

- A. Installer Qualifications: Company specializing in performing gypsum board installation and finishing, with minimum 5 years of experience.

## **PART 2 PRODUCTS**

### **2.01 GYPSUM BOARD ASSEMBLIES**

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

### **2.02 BOARD MATERIALS**

- A. Manufacturers - Gypsum-Based Board:
1. American Gypsum Company: [www.americangypsum.com/#sle](http://www.americangypsum.com/#sle).
  2. CertainTeed Corporation: [www.certainteed.com/#sle](http://www.certainteed.com/#sle).
  3. Georgia-Pacific Gypsum: [www.gpgypsum.com/#sle](http://www.gpgypsum.com/#sle).
  4. USG Corporation: [www.usg.com/#sle](http://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](http://www.americangypsum.com/#sle).
    - b. American Gypsum Company; FireBloc Type X Gypsum Wallboard: [www.americangypsum.com/#sle](http://www.americangypsum.com/#sle).
    - c. CertainTeed Corporation; Type C Drywall: [www.certainteed.com/#sle](http://www.certainteed.com/#sle).
    - d. CertainTeed Corporation; Type X Drywall: [www.certainteed.com/#sle](http://www.certainteed.com/#sle).
    - e. Georgia-Pacific Gypsum; ToughRock: [www.gpgypsum.com/#sle](http://www.gpgypsum.com/#sle).
    - f. Georgia-Pacific Gypsum; ToughRock Fireguard X: [www.gpgypsum.com/#sle](http://www.gpgypsum.com/#sle).
    - g. USG Corporation; USG Sheetrock Brand EcoSmart Panels Firecode X: [www.usg.com/#sle](http://www.usg.com/#sle).
    - h. USG Corporation; USG Sheetrock Brand Firecode X Panels: [www.usg.com/#sle](http://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](http://www.americangypsum.com/#sle).
    - b. CertainTeed Corporation; M2Tech 5/8" Type C Moisture & Mold Resistant Drywall: [www.certainteed.com/#sle](http://www.certainteed.com/#sle).
    - c. Georgia-Pacific Gypsum; ToughRock Mold-Guard: [www.gpgypsum.com/#sle](http://www.gpgypsum.com/#sle).
    - d. USG Corporation; USG Sheetrock Brand EcoSmart Panels Mold Tough Firecode X: [www.usg.com/#sle](http://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. Backing Board For Wet Areas: One of the following products:
1. Application: Surfaces behind tile in wet areas including tub and shower surrounds, shower ceilings, and kitchens.
  2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
  3. ANSI Cement-Based Board: Non-gypsum-based; aggregated Portland cement panels with glass fiber mesh embedded in front and back surfaces complying with ANSI A118.9 or ASTM C1325.
    - a. Thickness: 1/2 inch (12.7 mm).
    - b. Products:
      - 1) USG Corporation: [www.usg.com/#sle](http://www.usg.com/#sle).
      - 2) Substitutions: See Section 01 60 00 - Product Requirements.

- D. 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 (13 mm).
  - 3. Edges: Tapered.
  - 4. Products:
    - a. CertainTeed Corporation; Interior Ceiling Drywall: [www.certainteed.com/#sle](http://www.certainteed.com/#sle).
    - b. Georgia-Pacific Gypsum; ToughRock Span 24 Ceiling Board: [www.gpgypsum.com/#sle](http://www.gpgypsum.com/#sle).
    - c. USG Corporation; 1/2 Inch Sheetrock Brand UltraLight Panels: [www.usg.com/#sle](http://www.usg.com/#sle).
    - d. Substitutions: See Section 01 60 00 - Product Requirements.

### **2.03 GYPSUM BOARD 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](http://www.certainteed.com/#sle).
      - 2) ClarkDietrich; Strait-Flex Big-Stick: [www.clarkdietrich.com/#sle](http://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. Decorative Metal Trim:
  - 1. Material: Extruded aluminum alloy 6063-T5 temper.
  - 2. Finish: Anodized, clear.
  - 3. Type: Profile as selected from manufacturer's standard range.
- C. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
- D. Finishing Compound: Surface coat and primer, takes the place of skim coating.
- E. Textured Finish Materials: Latex-based compound; plain.
- F. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches (0.84 mm) in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.
- G. Nails for Attachment to Wood Members: ASTM C514.
- H. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

## **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. Suspended Ceilings and Soffits: Space framing and furring members at 16 inches (400 mm) on center.
  - 1. Laterally brace entire suspension system.
- B. Studs: Space studs at 16 inches on center (at 406 mm on center).
  - 1. Extend partition framing to structure in all 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.

- C. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.
- D. 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. Exposed Gypsum Board in Interior Wet Areas: Seal joints, cut edges, and holes with water-resistant sealant.
- E. Cementitious Backing Board: Install over steel framing members and plywood substrate where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.
- F. 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 (10 meters) apart on walls and ceilings over 50 feet (16 meters) long.
  - 2. At exterior soffits, not more than 30 feet (10 meters) 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.

### **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 (0.8 mm).
- 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 51 00**  
**ACOUSTICAL CEILINGS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

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

**1.02 RELATED REQUIREMENTS**

- A. Section 09 51 53 - Direct-Applied Acoustical Ceilings.

**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; 2019.
- 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; 2020.
- E. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2019.

**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 (\_\_\_\_ mm) 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 (16 degrees C), 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](http://www.armstrongceilings.com/#sle).
  - 2. CertainTeed Corporation: [www.certainteed.com/#sle](http://www.certainteed.com/#sle).
  - 3. USG Corporation: [www.usg.com/ceilings/#sle](http://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 (610 by 1219 mm).
  - 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](http://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 (2 mm) 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 (19 mm) 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 (152 mm) 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 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.
  - 3. Mechanical and Electrical:
    - a. In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
- D. Do Not Paint or Finish the Following Items:
  - 1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
  - 2. Items indicated to receive other finishes.
  - 3. Items indicated to remain unfinished.
  - 4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
  - 5. Stainless steel, anodized aluminum, bronze, terne-coated stainless steel, and lead items.
  - 6. Marble, granite, slate, and other natural stones.
  - 7. Floors, unless specifically indicated.
  - 8. Ceramic and other tiles.
  - 9. Glass.
  - 10. Concealed pipes, ducts, and conduits.

**1.02 RELATED REQUIREMENTS**

- A. Section 05 50 00 - Metal Fabrications: Shop-primed items.

**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 (216 by 279 mm) 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 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 (4 L) 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. Locate where directed by Architect.

- B. 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 (7 degrees C) and a maximum of 90 degrees F (32 degrees C), 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 (3 degrees C) above the dew point, or to damp or wet surfaces.
- D. Minimum Application Temperatures for Paints: 50 degrees F (10 degrees C) 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. If 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.rodmapaint.com/#sle](http://www.rodmapaint.com/#sle).
  - 2. Sherwin-Williams Company: [www.sherwin-williams.com/#sle](http://www.sherwin-williams.com/#sle).
  - 3. Miller Paint: [www.millerpaint.com](http://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. Where MPI paint numbers are specified, provide products listed in Master Painters Institute Approved Product List, current edition available at [www.paintinfo.com](http://www.paintinfo.com), for specified MPI categories, except as otherwise indicated.
  - 2. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
  - 3. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
  - 4. Supply each paint material in quantity required to complete entire project's work from a single production run.
  - 5. 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 drawings.
1. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling under which they are mounted.

### **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 affect 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 is 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 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. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.



- B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- D. Apply each coat to uniform appearance in thicknesses specified by manufacturer.
- E. Sand wood and metal surfaces lightly between coats to achieve required finish.
- F. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- G. 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 22 05 17 - SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING**

### **PART 1 GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Pipe sleeves.

#### **1.2 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**

#### **2.1 PIPE SLEEVES**

- A. Vertical Piping:
  - 1. Sleeve Length: 1 inch above finished floor.
  - 2. Provide sealant for watertight joint.
  - 3. Blocked Out Floor Openings: Provide 1-1/2 inch angle set in silicon adhesive around opening.
  - 4. 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.
- C. Pipe Passing Through Below Grade Exterior Walls:
  - 1. Zinc coated or cast iron pipe.
  - 2. Provide watertight space with link rubber or modular seal between sleeve and pipe on both pipe ends.
- D. Clearances:
  - 1. Provide allowance for insulated piping.
  - 2. Wall, Floor, Partitions: 1 inch greater than external; pipe diameter.
  - 3. All Rated Openings: Caulked 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.

## **PART 3 EXECUTION**

### **3.1 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. Underground Piping: Caulk pipe sleeve watertight with lead and oakum or mechanically expandable chloroprene inserts with bitumen sealed metal components.
  - 2. 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.
- 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 19 - METERS AND GAUGES FOR PLUMBING PIPING**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Pressure Gauges:
  - 1. Bourdon tube for liquids and gases.
- B. Thermometers.
- C. Pressure-Temperature test plugs.

**1.2 REFERENCE STANDARDS**

- A. ASME B40.100 - Pressure Gauges and Gauge Attachments 2013.
- B. ASTM E1 - Standard Specification for ASTM Liquid-in-Glass Thermometers 2014 (Reapproved 2020).
- C. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers 2014 (Reapproved 2021).

**1.3 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide red-marked product data sheets for each furnished item with associated components and accessories.
- C. Project Record Documents: Record actual locations of components and instrumentation.

**PART 2 PRODUCTS**

**2.1 PRESSURE GAUGES**

- A. Bourdon Tube for Liquids and Gases:
  - 1. Dial Size and Cover: 4-1/2 inch diameter scale with polycarbonate window.
  - 2. Dial Text and Markings: Black color on white background with scaled psi units.
  - 3. Accuracy: ASME B40.100, adjustable commercial grade (D) with 5 percent of span.
  - 4. Process Connection: Lower-back, 1/4 inch NPT male except where noted.

**2.2 THERMOMETERS**

- A. General:
  - 1. Product Compliance: ASTM E1.
  - 2. Lens: Clear glass, except where stated.
  - 3. Accuracy: One percent, when tested in accordance with ASTM E77, except where stated.

4. Scale: Black markings depicting single scale in degrees F where expected process value falls half-span of standard temperature range.
- B. Thermometers - Adjustable Angle: 7 inch v-shape aluminum case with clear glass window scale, 6 inch NPT stem, red or blue organic non-toxic liquid filled glass tube, and adjustable joint with positive locking device allowing 360 degrees in horizontal plane or 180 degrees in vertical plane adjustments.

## **2.3 PRESSURE-TEMPERATURE TEST PLUGS:**

- A. Size: 500 psi capacity; 1/2 inch MPT brass fitting with gasket, cap, and retaining strap for 1/8 inch pressure gauge or temperature probe.
- B. Wetted Materials per Temperature Range:
  1. Up to 200 degrees F: Brass probe with neoprene core.

## **PART 3 EXECUTION**

### **3.1 INSTALLATION**

- A. Install pressure gauges as follows:
  1. At domestic water entrance: Upstream of main shut-off valves.
- B. Install thermometers as follows:
  1. Hot Water Heaters: Place upstream and downstream of heater.

## **END OF SECTION**

## **SECTION 22 05 29 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT**

### **PART 1 GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Support and attachment components.

#### **1.2 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 A181/A181M - Standard Specification for Carbon Steel Forgings, for General - Purpose Piping 2014 (Reapproved 2020).
- D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2019.
- E. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings 1999, with Editorial Revision (2018).
- F. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates 2018.
- G. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures 1999 (Reapproved 2018).
- H. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel 2019.
- I. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation 2018, with Amendment (2019).
- J. UL (DIR) - Online Certifications Directory Current Edition.

#### **1.3 QUALITY ASSURANCE**

- A. Comply with Oregon Plumbing Specialty Code and Oregon Structural Specialty Code.

### **PART 2 PRODUCTS**

#### **2.1 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. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
    - b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Pipe Supports:
1. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.
  2. Liquid Temperatures Up To 122 degrees F:
    - a. Overhead Support: MSS SP-58 Types 1, 3 through 12 clamps.
    - b. Support From Below: MSS SP-58 Types 35 through 38.
- C. Pipe Stanchions:
1. Material: Malleable iron, ASTM A47/A47M; or carbon steel, ASTM A36/A36M.
  2. Provide coated or plated saddles to isolate steel hangers from dissimilar metal tube or pipe.
- D. Riser Clamps:
1. MSS SP-58 type 1 or 8, carbon steel or steel with epoxy plated, plain, stainless steel, or zinc plated finish.
  2. UL (DIR) listed: Pipe sizes 1/2 to 8 inch.
- E. Offset Pipe Clamps: Double-leg design two-piece pipe clamp.
- F. Strut Clamps:
1. Pipe Clamp: Two-piece rigid, universal, or outer diameter type, carbon steel with epoxy copper or zinc finish.
- G. Pipe Hangers:
1. Hangers:
    - a. Provide hinged split ring and yoke roller hanger with epoxy copper or plain finish.
    - b. Material: ASTM A47/A47M malleable iron or ASTM A36/A36M carbon steel.

- c. Provide hanger rod and nuts of the same type and material for a given pipe run.
  - d. Provide coated or plated hangers to isolate steel hangers from dissimilar metal tube or pipe.
- H. Anchors and Fasteners:
- 1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
  - 2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
  - 3. Hollow Stud Walls: Use toggle bolts.
  - 4. Wood: Use wood screws.
  - 5. Plastic and lead anchors are not permitted.
  - 6. Hammer-driven anchors and fasteners are not permitted.

### **PART 3 EXECUTION**

#### **3.1 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 Engineer, do not provide support from suspended ceiling support system or ceiling grid.
- D. Do not penetrate or otherwise notch or cut structural members.
- E. Secure fasteners according to manufacturer's recommended torque settings.
- F. Remove temporary supports.

#### **END OF SECTION**



**SECTION 22 05 48 - VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Seismic control requirements.
- B. Seismic restraint systems.

**1.2 RELATED REQUIREMENTS**

- A. Section 01 45 33 - Code-Required Special Inspections and Procedures.
- B. Section 03 30 00 - Cast-in-Place Concrete.

**1.3 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.

**1.4 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. FEMA 412 - Installing Seismic Restraints for Mechanical Equipment 2014.
- C. FEMA 413 - Installing Seismic Restraints for Electrical Equipment 2004.
- D. FEMA 414 - Installing Seismic Restraints for Duct and Pipe 2004.
- E. FEMA E-74 - Reducing the Risks of Nonstructural Earthquake Damage 2012.
- F. ICC (IBC) - International Building Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems 2008.

**1.5 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 Engineer 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.

## **1.6 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 - 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.
- E. 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.

## **1.7 QUALITY ASSURANCE**

- A. Comply with applicable building code.
- B. Seismic Controls Designer Qualifications: Registered professional engineer licensed in the State of Oregon and with minimum five years experience designing seismic restraints for nonstructural components.
  - 1. Designer may be employed by the manufacturer of the seismic restraint products.

## **PART 2 PRODUCTS**

### **2.1 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: ICC (IBC).
- 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. Premanufactured Modular Plumbing Equipment: Where not otherwise seismically qualified, premanufactured modules 6 feet high and taller furnished under other sections to be designed in accordance with seismic provisions for nonbuilding structures.
- E. 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 ( $I_p$ ) 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 ( $I_p$ ) 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 ( $I_p$ ) 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 ( $I_p$ ) of 1.0 and nominal pipe size of 3 inch or less, or with component importance factor ( $I_p$ ) 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 ( $I_p$ ) 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 ( $I_p$ ) 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 ( $I_p$ ) 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 ( $I_p$ ) 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. FEMA 412.
    - b. FEMA 413.
    - c. FEMA 414.
    - d. FEMA E-74.
    - e. 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.

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.
- 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.

G. 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.
- H. 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.

## **PART 3 EXECUTION**

### **3.1 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.

### **3.2 CODE-REQUIRED SPECIAL INSPECTIONS**

- A. Arrange work to accommodate tests and/or inspections performed by Special Inspection Agency employed by Owner or Engineer 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.

- 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.

### **3.3 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.

### **END OF SECTION**



## **SECTION 22 05 53 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT**

### **PART 1 GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Nameplates.
- B. Tags.
- C. Pipe markers.

#### **1.2 REFERENCE STANDARDS**

- A. ASME A13.1 - Scheme for the Identification of Piping Systems 2020.

#### **1.3 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Valve Chart: Submit fully updated valve chart for that includes tags, function, and location of all plumbing isolation valves that are new and existing to remain in the building. Format and framing to match existing valve chart.
- C. Schedules:
  - 1. Submit plumbing component identification schedule listing equipment, piping, and valves.
  - 2. Detail proposed component identification data in terms of of wording, symbols, letter size, and color coding to be applied to corresponding product.
  - 3. Valve Data Format: Include id-number, location, function, and model number.

### **PART 2 PRODUCTS**

#### **2.1 PLUMBING COMPONENT IDENTIFICATION GUIDELINE**

- A. Nameplates:
  - 1. Water heaters.
  - 2. Pumps.
- B. Tags:
  - 1. Valves.
- C. Pipe Markers: 3/4 inch diameter and higher.

#### **2.2 NAMEPLATES**

- A. Description: Laminated piece with up to three lines of text.
  - 1. Letter Color: White.
  - 2. Letter Height: 1/4 inch.

## **2.3 TAGS**

- A. Metal: Brass, 19 gauge 1-1/2 inch in diameter with smooth edges, engraved, smooth edges, and corrosion-resistant ball chain. Up to three lines of text.
- B. Valve Tag Chart: Typewritten 12-point letter size list in anodized aluminum frame.

## **2.4 PIPE MARKERS**

- A. Flexible Marker: Factory fabricated, semi-rigid, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid conveyed.

# **PART 3 EXECUTION**

## **3.1 PREPARATION**

- A. Degrease and clean surfaces to receive identification products.

## **3.2 INSTALLATION**

- A. Install tags in clear view and align with axis of piping
- B. Install plastic pipe markers in accordance with manufacturer's instructions.
- C. Install plastic tape pipe marker around pipe in accordance with manufacturer's instructions.
- D. Apply ASME A13.1 Pipe Marking Rules:
  - 1. Place pipe marker adjacent to changes in direction.
  - 2. Place pipe marker adjacent each valve port and flange end.
  - 3. Place pipe marker at both sides of floor and wall penetrations.
  - 4. Place pipe marker every 25 to 50 feet interval of straight run.

## **END OF SECTION**

## **SECTION 22 07 19 - PLUMBING PIPING INSULATION**

### **PART 1 GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Flexible elastomeric cellular insulation.
- B. Glass fiber insulation.
- C. Jacketing and accessories.

#### **1.2 RELATED REQUIREMENTS**

- A. Section 07 84 00 - Firestopping.

#### **1.3 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 C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form 2020a.
- C. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation 2019.
- D. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel 2008 (Reapproved 2018).
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2021a.
- F. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials 2021.
- G. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

#### **1.4 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.

### **PART 2 PRODUCTS**

#### **2.1 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.

#### **2.2 GLASS FIBER INSULATION**

- A. 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.
- B. 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 inch.

## **2.3 FLEXIBLE ELASTOMERIC CELLULAR INSULATION**

- A. 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: 220 degrees F.
  3. Connection: Waterproof vapor barrier adhesive.

## **2.4 JACKETING AND ACCESSORIES**

- A. PVC Plastic.
1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
    - a. Minimum Service Temperature: 0 degrees F.
    - b. Maximum Service Temperature: 150 degrees F.
    - c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
    - d. Thickness: 10 mil, 0.010 inch.
    - e. Connections: Brush on welding adhesive.
  2. Covering Adhesive Mastic: Compatible with insulation.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

### **3.2 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. 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.
- C. 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.
- D. Inserts and Shields:
1. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
  2. Insert Location: Between support shield and piping and under the finish jacket.
  3. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
  4. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.
- E. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, see Section 07 84 00.
- F. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with PVC jacket and fitting covers.

**3.3 REFER TO DRAWINGS FOR PIPING INSULATION SCHEDULE**

**END OF SECTION**

## **SECTION 22 10 05 - PLUMBING PIPING**

### **PART 1 GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Domestic water piping, above grade.
- B. Pipe flanges, unions, and couplings.
- C. Pipe hangers and supports.
- D. Ball valves.
- E. Butterfly valves.
- F. Balancing valves.
- G. Flow-balancing valves.
- H. Pressure reducing valves.
- I. Pressure relief valves.
- J. Strainers.

#### **1.2 RELATED REQUIREMENTS**

- A. Section 08 31 00 - Access Doors and Panels.
- B. Section 22 05 53 - Identification for Plumbing Piping and Equipment.

#### **1.3 REFERENCE STANDARDS**

- A. ANSI Z21.22 - American National Standard for Relief Valves for Hot Water Supply Systems 2015 (Reaffirmed 2020).
- 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. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings 1999, with Editorial Revision (2018).
- E. ASTM B32 - Standard Specification for Solder Metal 2020.
- F. ASTM B88 - Standard Specification for Seamless Copper Water Tube 2020.
- G. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric) 2020.
- H. ASTM F876 - Standard Specification for Crosslinked Polyethylene (PEX) Tubing 2020b.
- I. 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 2021.

- J. AWWA C606 - Grooved and Shouldered Joints 2015.
- K. AWWA C651 - Disinfecting Water Mains 2014, with Addendum (2020).
- L. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation 2018, with Amendment (2019).
- M. MSS SP-67 - Butterfly Valves 2017, with Errata.
- N. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends 2010, with Errata .
- O. NSF 61 - Drinking Water System Components - Health Effects 2020.
- P. NSF 372 - Drinking Water System Components - Lead Content 2020.
- Q. PPI TR-4 - PPI HSB 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 2021.

## **PART 2 PRODUCTS**

### **2.1 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.

### **2.2 DOMESTIC WATER PIPING, ABOVE GRADE**

- A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), 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.
    - a. Manufacturers:
      - 1) Viega LLC.
- 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.
4. Joints: Lead free brass cold-expansion fittings.

## **2.3 PIPE FLANGES, UNIONS, AND COUPLINGS**

- A. Unions for Pipe Sizes 3 inch and Under:
  1. Copper Tube and Pipe: Class 150 bronze unions with soldered joints.
- B. Flanges for Pipe Sizes Over 1 inch:
  1. Copper Tube and Pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.
- C. Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.
  1. Dimensions and Testing: In accordance with AWWA C606.
  2. Housing Material: Provide ASTM A47/A47M malleable iron, ductile iron, or [\_\_\_\_], galvanized.
  3. Bolts and Nuts: Hot dipped galvanized or zinc-electroplated steel.
  4. When pipe is field grooved, provide coupling manufacturer's grooving tools.
- D. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

## **2.4 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 - Water:
  1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.
  2. Hangers for Cold Pipe Sizes 2 inch and Over: Carbon steel, adjustable, clevis.
  3. Wall Support for Pipe Sizes Up to 3 inch: Cast iron hook.



## **2.5 BALL VALVES**

- A. Construction, 4 inch 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, solder or threaded ends with union.

## **2.6 BUTTERFLY VALVES**

- A. Construction 1-1/2 inch and Larger: MSS SP-67, 200 psi CWP, cast or ductile iron body, nickel-plated ductile iron disc, resilient replaceable EPDM seat, wafer ends, extended neck, 10 position lever handle.
- B. Provide gear operators for valves 8 inches and larger, and chain-wheel operators for valves mounted over 8 feet above floor.

## **2.7 BALANCING VALVES**

- A. Manufacturers:
  - 1. ITT Bell & Gossett; [\_\_\_\_]: [www.bellgossett.com/#sle](http://www.bellgossett.com/#sle).
  - 2. Griswold Controls; [\_\_\_\_]: [www.griswoldcontrols.com/#sle](http://www.griswoldcontrols.com/#sle).
  - 3. Taco, Inc; [\_\_\_\_]: [www.taco-hvac.com/#sle](http://www.taco-hvac.com/#sle).
  - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Construction: Class 125, brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain.
- C. Manual Operated Y-Pattern Globe, Size 1/2 to 2 inch:
  - 1. Class 125, brass or bronze body, multi-turn handwheel, memory stop, variable orifice, soldered connections, dual PT (hot and cold pressure-temperature) test ports for 300 psi, minus 4 to 250 deg F WOG service.
- D. Calibration: Control flow within five percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi.

## **2.8 PRESSURE RELIEF VALVES**

- A. Manufacturers:
  - 1. Watts Regulator Company; [\_\_\_\_]: [www.wattsregulator.com/#sle](http://www.wattsregulator.com/#sle).
- B. ANSI Z21.22, AGA certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.

## **2.9 STRAINERS**

- A. Size 1/2 inch to 3 inch:
  - 1. Class 150, threaded forged bronze Y-pattern body, stainless steel perforated mesh screen with cap, and rated for 150 psi, 250 deg F WOG service.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

- A. Verify that excavations are to required grade, dry, and not over-excavated.

### **3.2 PREPARATION**

- A. Ream pipe and tube ends. Remove burrs.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

### **3.3 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- C. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- D. Group piping whenever practical at common elevations.
- E. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- F. Provide access where valves and fittings are not exposed.
  - 1. Coordinate size and location of access doors with Section 08 31 00.
- G. Install valves with stems upright or horizontal, not inverted. See Section 22 05 23.
- H. Sleeve pipes passing through partitions, walls, and floors.
- I. Pipe Hangers and Supports:
  - 1. Support horizontal piping as indicated.
  - 2. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
  - 3. Place hangers within 12 inches of each horizontal elbow.
  - 4. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
  - 5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
  - 6. Provide copper plated hangers and supports for copper piping.
- J. 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.

### 3.4 APPLICATION

- A. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.
- B. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- C. Provide spring-loaded check valves on discharge of water pumps that do not have integral checks.
- D. Provide flow controls in water recirculating systems where indicated.

### 3.5 TOLERANCES

- A. Water Piping: Slope at minimum of 1/32 inch per foot and arrange to drain at low points.

### 3.6 FIELD TESTS AND INSPECTIONS

- A. Verify and inspect systems according to requirements by the Authority Having Jurisdiction. In the absence of specific test and inspection procedures proceed as indicated below.
- B. Domestic Water Systems:
  - 1. **Potable water system lead testing:**
    - a. **BSD's approved third party environmental consultant will test potable plumbing systems for lead. If test results detect more than 1 ppb of lead, contractor shall be responsible to provide either mitigation and retesting until required results are achieved or flush draw tests showing the source of lead is outside the scope of the project.**
  - 2. Perform hydrostatic testing for leakage prior to system disinfection.
  - 3. Test Preparation: Close each fixture valve or disconnect and cap each connected fixture.
  - 4. General:
    - a. Fill the system with water and raise static head to 10 psi above service pressure. Minimum static head of 50 to 150 psi. As an exception, certain codes allow a maximum static pressure of 80 psi.
- C. Test Results: Document and certify successful results, otherwise repair, document, and retest.

### 3.7 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.

### **3.8 SCHEDULES**

#### **A. Pipe Hanger Spacing:**

##### **1. Metal Piping:**

- a. Pipe Size: 1/2 inch to 1-1/4 inch:
  - 1) Maximum Hanger Spacing: 6.5 ft.
  - 2) Hanger Rod Diameter: 3/8 inches.
- b. Pipe Size: 1-1/2 inch to 2 inch:
  - 1) Maximum Hanger Spacing: 10 ft.
  - 2) Hanger Rod Diameter: 3/8 inch.
- c. Pipe Size: 2-1/2 inch to 3 inch:
  - 1) Maximum Hanger Spacing: 10 ft.
  - 2) Hanger Rod Diameter: 1/2 inch.
- d. Pipe Size: 4 inch to 6 inch:
  - 1) Maximum Hanger Spacing: 10 ft.
  - 2) Hanger Rod Diameter: 5/8 inch.

##### **2. PEX Piping:**

- a. Pipe Size: 1 inch and smaller:
  - 1) Maximum Hanger Spacing: 32 inches.
  - 2) Hanger Rod Diameter: 3/8 inch.
- b. Pipe Size: 1 1/4 inch and larger:
  - 1) Maximum Hanger Spacing: 4 ft.
  - 2) Hanger Rod Diameter: 3/8 inch.

- c. PEX piping with continuous metal saddle support may be supported at the same intervals as metal piping.

**END OF SECTION**

## **SECTION 22 10 06 - PLUMBING PIPING SPECIALTIES**

### **PART 1 GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Water hammer arrestors.
- B. Mixing valves.

#### **1.2 REFERENCE STANDARDS**

- A. PDI-WH 201 - Water Hammer Arresters 2017.

### **PART 2 PRODUCTS**

#### **2.1 WATER HAMMER ARRESTORS**

- A. Water Hammer Arrestors:
  - 1. Stainless steel construction, bellows type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range minus 100 to 300 degrees F and maximum 250 psi working pressure.

#### **2.2 MIXING VALVES**

- A. Thermostatic Mixing Valves:
  - 1. Valve: Chrome-plated cast brass body, stainless steel or copper alloy bellows, integral temperature adjustment.

### **PART 3 EXECUTION**

#### **3.1 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatory sinks or water closets.

### **END OF SECTION**

## **SECTION 22 30 00 - PLUMBING EQUIPMENT**

### **PART 1 GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Tankless gas-fired water heaters.
- B. Commercial gas-fired water heaters.
- C. Commercial electric water heaters.
- D. Diaphragm-type compression tanks.
- E. In-line circulator pumps.

#### **1.2 REFERENCE STANDARDS**

- A. AHRI Directory of Certified Product Performance - Air-Conditioning, Heating, and Refrigeration Institute (AHRI) Current Edition.
- B. ANSI Z21.10.1 - Gas Water Heaters, Volume I, Storage Water Heaters with Input Ratings of 75,000 Btu Per Hour or Less 2019, with Errata (2020).
- C. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1: Rules for Construction of Pressure Vessels 2021.
- E. UL 174 - Standard for Household Electric Storage Tank Water Heaters Current Edition, Including All Revisions.

#### **1.3 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements for submittals procedures.
- B. Product Data:
  - 1. Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.
  - 2. Indicate pump type, capacity, power requirements.
  - 3. Provide certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.
  - 4. Provide electrical characteristics and connection requirements.
- C. Project Record Documents: Record actual locations of components.
- D. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

- E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

#### **1.4 QUALITY ASSURANCE**

- A. Certifications:
  - 1. Water Heaters: NSF approved.
  - 2. Gas Water Heaters: AHRI Directory of Certified Product Performance.
  - 3. Electric Water Heaters: UL listed and labeled to UL 174.
  - 4. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.
- B. Identification: Provide pumps with manufacturer's name, model number, and rating/capacity identified by permanently attached label.

#### **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

#### **1.6 WARRANTY**

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Provide five year manufacturer warranty for domestic water heaters.

### **PART 2 PRODUCTS**

#### **2.1 WATER HEATERS**

- A. Manufacturers:
  - 1. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Tankless Gas-Fired Water Heaters:
  - 1. Manufacturers:
    - a. Bosch Thermotechnology.
    - b. Rinnai.
    - c. A.O. Smith Water Products Co..
    - d. Substitutions: See Section 01 60 00 - Product Requirements.
  - 2. Minimum Efficiency Required: ASHRAE Std 90.1 I-P.
  - 3. Water Inlet Pressure: From 30 psi to 150 psi.
  - 4. Supply Gas Type: Natural gas.



5. Heater Type: Self-contained, wall-mounted unit capable of handling listed capacity, air intake valve, condensate solenoid drain valve, water-inlet strainer, removable thermally-insulated front panel, blower access cover, and threaded water, gas, and condensate pipe-end connections.
  6. Burner-Heat Exchanger: Stainless steel assembly with single flue passage, flue baffle, and draft hood; thermally insulated and encased in corrosion-resistant steel jacket; baked-on enamel finish.
  7. Safeties: Provide internal safeties for vent side, water flow, flame detection, fan speed, electrical load, and thermal load.
  8. Accessories: Provide cold water inlet expansion tank, hot water recirculation pump, inlet ball valve, outlet ball valve, outlet ASME-rated temperature-pressure relief valve, and pipe-mounted thermometers.
  9. Electrical Load: 120 VAC, single phase.
- C. Commercial Gas-Fired Water Heaters:
1. Manufacturers:
    - a. Bradford White Corporation.
    - b. A.O. Smith Water Products Co..
  2. Type: Automatic, natural gas-fired, vertical storage.
  3. Minimum Efficiency Required: ASHRAE Std 90.1 I-P.
  4. Performance:
  5. Tank: Glass lined welded steel ASME labeled; multiple flue passages, 4 inch diameter inspection port, thermally insulated with minimum 2 inches glass fiber, encased in corrosion-resistant steel jacket; baked-on enamel finish; floor shield and legs.
  6. Accessories:
    - a. Water Connections: Brass.
    - b. Dip Tube: Brass.
    - c. Drain valve.
    - d. Anode: Magnesium.
  7. Applications:
    - a. Automatic storage water heater.
  8. Controls: Automatic water thermostat with temperature range adjustable from 120 to 180 degrees F, automatic reset high temperature limiting thermostat factory set at 195 degrees F, gas pressure regulator, multi-ribbon or tubular burner, 100 percent safety shut-off pilot and thermocouple, flue baffle and draft hood.

D. Commercial Electric Water Heaters:

1. Manufacturers:
  - a. Bradford White Corporation.
  - b. A.O. Smith Water Products Co..
2. Type: Factory-assembled and wired, electric, vertical storage.
3. Minimum Efficiency Required: ASHRAE Std 90.1 I-P.
4. Performance: As indicated on drawings.
5. Electrical Characteristics: As indicated on drawings.
6. Tank: Glass lined welded steel; 4 inch diameter inspection port, thermally insulated with minimum 2 inches glass fiber encased in corrosion-resistant steel jacket; baked-on enamel finish.
7. Controls: Automatic immersion water thermostat; externally adjustable temperature range from 60 to 180 degrees F, flanged or screw-in nichrome elements, high temperature limit thermostat.
8. Accessories:
  - a. Water Connections: Brass.
  - b. Dip Tube: Brass.
  - c. Temperature and Pressure Relief Valve: ASME labeled.
9. Heating Elements: Flange-mounted immersion elements; individual elements sheathed with Incoloy corrosion-resistant metal alloy, rated less than 75 W/sq in.

**2.2 DIAPHRAGM-TYPE COMPRESSION TANKS**

- A. Manufacturers:
1. Amtrol Inc.
  2. Bell & Gossett, a brand of Xylem, Inc.
  3. Taco, Inc.
- B. Construction: Welded steel, tested and stamped in accordance with ASME BPVC-VIII-1; supplied with National Board Form U-1, rated for working pressure of 125 psig, with flexible EPDM diaphragm sealed into tank, and steel legs or saddles.
- C. Accessories: Pressure gauge and air-charging fitting, tank drain; precharge to 12 psig.

**2.3 IN-LINE CIRCULATOR PUMPS**

- A. Manufacturers:

1. Armstrong Fluid Technology.
  2. Bell & Gossett, a brand of Xylem, Inc.
  3. Taco.
  4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Casing: Bronze, rated for 125 psig working pressure, with stainless steel rotor assembly.
- C. Impeller: Bronze.
- D. Shaft: Alloy steel with integral thrust collar and two oil lubricated bronze sleeve bearings.
- E. Seal: Carbon rotating against a stationary ceramic seat.
- F. Drive: Flexible coupling.

### **PART 3 EXECUTION**

#### **3.1 INSTALLATION**

- A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions of certification, if any.
- B. Coordinate with plumbing piping and related fuel piping work to achieve operating system.
- C. Pumps:
1. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

### **END OF SECTION**

## **SECTION 22 40 00 - PLUMBING FIXTURES**

### **PART 1 GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Sinks.

#### **1.2 REFERENCE STANDARDS**

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.
- B. ASME A112.18.1 - Plumbing Supply Fittings 2018, with Errata.
- C. NSF 61 - Drinking Water System Components - Health Effects 2020.
- D. NSF 372 - Drinking Water System Components - Lead Content 2020.

#### **1.3 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.

#### **1.4 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**

#### **2.1 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.
- B. Maximum Fixture or Faucet Supply Pressure: 60 psi unless stated otherwise.

#### **2.2 REGULATORY REQUIREMENTS**

- A. Comply with applicable codes for installation of plumbing systems.

#### **2.3 SINKS**

- A. Faucets:
  - 1. Two Handle Faucet:
    - a. Type: Deck-mount, lever operated faucet with mounting plate.
    - b. ASME A112.18.1, ADA Standards, and NSF 61 compliant assembly.

- B.     Bubbler for Classroom Sinks:

### **PART 3 EXECUTION**

#### **3.1       INSTALLATION**

- A.     Install components level and plumb.

**END OF SECTION**

## **SECTION 22 45 00 - EMERGENCY PLUMBING FIXTURES**

### **PART 1 GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Eye/face wash equipment.

#### **1.2 REFERENCE STANDARDS**

- A. ANSI Z358.1 - American National Standard for Emergency Eyewash and Shower Equipment 2014.
- B. ASSE 1070 - Performance Requirements for Water Temperature Limiting Devices 2020.

### **PART 2 PRODUCTS**

#### **2.1 EYE/FACE WASH EQUIPMENT**

- A. Manufacturers:
  - 1. Haws Corporation.
- B. Deck mounted eye/face wash, pull-out type with hose.
- C. Tepad Supply Water Temperature: Set to 85 degrees F.
- D. Valve: Full flow, self closing, quick to open thru wide-handle manual hand operator.
- E. Thermostatic Mixing Valve:
  - 1. ASSE 1070 listed with combination stop, strainer, check valve, and flexible stainless steel connectors.

### **PART 3 EXECUTION**

#### **3.1 EXAMINATION**

- A. Verify that fixtures and accessories are of the correct type and size prior to installation.
- B. Verify that deck, wall and floor finishes are prepared and ready for fixture installation.

#### **3.2 INSTALLATION**

- A. Install fixtures and fittings in accordance with the manufacturer's instructions.
- B. Adjust water flow rates to comply with manufacturer's rating of the fixture.

### **END OF SECTION**

## **SECTION 26 05 05 - SELECTIVE DEMOLITION FOR ELECTRICAL**

### **PART 1 GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Electrical demolition.

### **PART 2 PRODUCTS**

#### **2.1 MATERIALS AND EQUIPMENT**

- A. Materials and equipment for patching and extending work: As specified in individual sections.

### **PART 3 EXECUTION**

#### **3.1 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 Engineer before disturbing existing installation.
- D. Beginning of demolition means installer accepts existing conditions.

#### **3.2 PREPARATION**

- A. Disconnect electrical systems in walls, floors, and ceilings to be removed.
- B. 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.

#### **3.3 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. Repair adjacent construction and finishes damaged during demolition and extension work.
- F. 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**

#### **1.1 SECTION INCLUDES**

- A. Single conductor building wire.
- B. Metal-clad cable.
- C. Wiring connectors.
- D. Electrical tape.

#### **1.2 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 104 - Standard for Installing Aluminum Building Wire and Cable 2012.
- G. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy 2021.
- 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 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape Current Edition, Including All Revisions.

#### **1.3 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.



## **PART 2 PRODUCTS**

### **2.1 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.
      - 1) Maximum Length: 6 feet.

### **2.2 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.
  - 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 to match existing installations unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.

## **2.3 SINGLE CONDUCTOR BUILDING WIRE**

- A. Description: Single conductor insulated wire.
- B. Conductor Stranding:
  1. Feeders and Branch Circuits:
    - a. Size 10 AWG and Smaller: Solid.
- C. Insulation Voltage Rating: 600 V.
- D. Insulation:
  1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2.

## **2.4 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.

## **2.5 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. 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. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.

# **PART 3 EXECUTION**

## **3.1 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.

- B. Install products in accordance with manufacturer's instructions.
- C. Perform work in accordance with NECA 1 (general workmanship).
- D. Install aluminum conductors in accordance with NECA 104.
- E. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
- F. 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. Connections for Aluminum Conductors: Fill connectors with oxide inhibiting compound where not pre-filled by manufacturer.
- G. 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.
- H. Insulate ends of spare conductors using vinyl insulating electrical tape.
- I. 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**

#### **1.1 SECTION INCLUDES**

- A. Grounding and bonding requirements.
- B. Conductors for grounding and bonding.
- C. Connectors for grounding and bonding.

#### **1.2 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

### **PART 2 PRODUCTS**

#### **2.1 GROUNDING AND BONDING REQUIREMENTS**

- A. Do not use products for applications other than as permitted by NFPA 70 and product listing.
- B. 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.
- C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- D. 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. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
  - 4. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
  - 5. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
  - 6. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:

- a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.
- b. Metal gas piping.

## **2.2 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.
  - 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) Tinned 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.
- 3. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- 4. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

## **PART 3 EXECUTION**

### **3.1 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. 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.
- D. Grounding and Bonding for Piping:
  - 1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
- 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. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
    - a. Applications:
      - 1) Underground connections(except at test wells and as otherwise indicated.
      - 2) Connections to structural steel.
  - 4. 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.

**3.2 EQUIPMENT GROUNDING:**

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.

**END OF SECTION**

## **SECTION 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS**

### **PART 1 GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.
- B. Construction requirements for concrete bases

### **PART 2 PRODUCTS**

#### **2.1 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. Concrete: Use preset concrete inserts.
  - 3. Solid or Grout-Filled Masonry: Use expansion anchors.
  - 4. Hollow Masonry: Use toggle bolts.
  - 5. Hollow Stud Walls: Use toggle bolts.
  - 6. Steel: Use beam clamps complying with MSS SP-96.
  - 7. Sheet Metal: Use sheet metal screws.
  - 8. Wood: Use Fasten with lag screws or through bolts.

### **PART 3 EXECUTION**

#### **3.1 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 Engineer, do not provide support from suspended ceiling support system or ceiling grid.
- E. Unless specifically indicated or approved by Engineer, 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. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
  - 4. Use slotted-channel racks attached to substrate to support equipment surface-mounted on hollow stud walls and nonstructural building surfaces.

5. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
  6. 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**

**1.1 SECTION INCLUDES**

- A. Intermediate metal conduit (IMC).
- B. Flexible metal conduit (FMC).
- C. Liquidtight flexible metal conduit (LFMC).
- D. Electrical metallic tubing (EMT).
- E. Rigid polyvinyl chloride (PVC) conduit.
- F. Conduit fittings.
- G. Accessories.

**1.2 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.

**1.3 REFERENCE STANDARDS**

- A. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S) 2020.
- B. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit 2018.
- 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. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit 2020.
- G. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL 514B - Conduit, Tubing, and Cable Fittings Current Edition, Including All Revisions.
- I. UL 797 - Electrical Metallic Tubing-Steel Current Edition, Including All Revisions.
- J. UL 1242 - Electrical Intermediate Metal Conduit-Steel Current Edition, Including All Revisions.

## **PART 2 PRODUCTS**

### **2.1 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 Above Accessible Ceilings: Use electrical metallic tubing (EMT).
- D. Interior, Damp or Wet Locations: Use intermediate metal conduit (IMC).
- E. Exposed, Interior, Not Subject to Physical Damage, Located within unfinished spaces(mechanical rooms/storage rooms): Use electrical metallic tubing (EMT).
- F. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).
- G. Connections to Vibrating 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. Motors.

### **2.2 CONDUIT REQUIREMENTS**

- A. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.

- C. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

## **2.3 INTERMEDIATE METAL CONDUIT (IMC)**

- A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.
- B. Fittings:
  - 1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  - 2. Material: Use steel.
  - 3. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

## **2.4 FLEXIBLE METAL CONDUIT (FMC)**

- A. 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.
- B. Fittings:
  - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  - 2. Material: Use steel.

## **2.5 ELECTRICAL METALLIC TUBING (EMT)**

- A. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
- B. Fittings:
  - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  - 2. Material: Use steel.
  - 3. Connectors and Couplings: Use compression (gland) or set-screw type.
    - a. Do not use indenter type connectors and couplings.

# **PART 3 EXECUTION**

## **3.1 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Install intermediate metal conduit (IMC) in accordance with NECA 101.

- D. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.
- E. 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. Conduits installed underground or embedded in concrete may be routed in the shortest possible manner unless otherwise indicated. Route all other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
  - 8. Arrange conduit to maintain adequate headroom, clearances, and access.
  - 9. Arrange conduit to provide no more than the equivalent of three 90 degree bends between pull points.
  - 10. Arrange conduit to provide no more than 150 feet between pull points.
  - 11. Maintain minimum clearance of 6 inches between conduits and piping for other systems.
  - 12. 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.
  - 13. arrange stub-ups so curved portions of bends are not visible above finished slab.

F. 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. Support conduits within 12 inches of connected enclosure.

G. 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. Terminate threaded conduits in boxes and enclosures using threaded hubs for dry locations and raintight hubs for wet locations.
5. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
6. Secure joints and connections to provide maximum mechanical strength and electrical continuity.
7. 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.

**END OF SECTION**

**SECTION 26 05 33.16 - BOXES FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.

**PART 2 PRODUCTS**

**2.1 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 suitable concrete type boxes where flush-mounted in concrete.
  - 4. Use suitable masonry type boxes where flush-mounted in masonry walls.
  - 5. Use raised covers suitable for the type of wall construction and device configuration where required.
  - 6. Use shallow boxes where required by the type of wall construction.
  - 7. Do not use "through-wall" boxes designed for access from both sides of wall.
  - 8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
  - 9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.



10. 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.
11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
12. Minimum Box Size, Unless Otherwise Indicated:
  - a. 4 inch square by 1-1/2 inch deep (100 by 38 mm) trade size

## **PART 3 EXECUTION**

### **3.1 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. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.
- E. 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 required where 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.
- F. 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 boxes by conduit alone.
- G. Install boxes plumb and level.
- H. Install boxes as required to preserve insulation integrity.
- I. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.
- J. Close unused box openings.
- K. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

**END OF SECTION**

## **SECTION 26 28 16.16 - ENCLOSED SWITCHES**

### **PART 1 GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Enclosed safety switches.

#### **1.2 REFERENCE STANDARDS**

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.
- C. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum) 2013.
- D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems 2017.
- E. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations Current Edition, Including All Revisions.
- G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations Current Edition, Including All Revisions.
- H. UL 98 - Enclosed and Dead-Front Switches Current Edition, Including All Revisions.
- I. UL 869A - Reference Standard for Service Equipment Current Edition, Including All Revisions.

#### **1.3 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
  - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
  - 3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.

#### **1.4 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 enclosed switches and other installed components and accessories.
- C. Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and

installed features and accessories.

1. Include dimensioned plan and elevation views of enclosed switches and adjacent equipment with all required clearances indicated.
2. Include wiring diagrams showing all factory and field connections.

D. Closeout Submittals:

1. Field Quality Control Test Reports.
2. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.
3. Project Record Documents: Record actual locations of enclosed switches.
4. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.
5. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - a. See Section 01 60 00 - Product Requirements, for additional provisions.

## 1.5 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. ABB/GE: [www.geindustrial.com/#sle](http://www.geindustrial.com/#sle).
- B. Eaton Corporation: [www.eaton.com/#sle](http://www.eaton.com/#sle).
- C. Schneider Electric; Square D Products: [www.schneider-electric.us/#sle](http://www.schneider-electric.us/#sle).
- D. Siemens Industry, Inc: [www.usa.siemens.com/#sle](http://www.usa.siemens.com/#sle).
- E. Substitutions: See Section 01 60 00 - Product Requirements.
- F. Source Limitations: Furnish enclosed switches and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

### 2.2 ENCLOSED SAFETY SWITCHES

- A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.

- C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
  - 1. Altitude: Less than 6,600 feet.
  - 2. Ambient Temperature: Between -22 degrees F and 104 degrees F.
- D. Horsepower Rating: Suitable for connected load.
- E. Voltage Rating: Suitable for circuit voltage.
- F. Short Circuit Current Rating:
  - 1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
- G. Provide with switch blade contact position that is visible when the cover is open.
- H. Fuse Clips for Fusible Switches: As required to accept fuses indicated.
- I. Conductor Terminations: Suitable for use with the conductors to be installed.
- J. Provide insulated, groundable fully rated solid neutral assembly where a neutral connection is required, with a suitable lug for terminating each neutral conductor.
- K. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.
- L. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
  - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
    - a. Indoor Clean, Dry Locations: Type 1.
    - b. Outdoor Locations: Type 3R.
  - 2. Finish for Painted Steel Enclosures: Manufacturer's standard, factory applied grey unless otherwise indicated.
- M. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.
- N. Heavy Duty Switches:
  - 1. Comply with NEMA KS 1.
  - 2. Conductor Terminations:
    - a. Provide mechanical lugs unless otherwise indicated.
    - b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.

### **PART 3 EXECUTION**

#### **3.1 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive enclosed safety switches.
- D. Verify that conditions are satisfactory for installation prior to starting work.

#### **3.2 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide required support and attachment in accordance with Section 26 05 29.
- E. Install enclosed switches plumb.
- F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.
- G. Provide grounding and bonding in accordance with Section 26 05 26.
- H. Provide fuses complying with Section 26 28 13 for fusible switches as indicated or as required by equipment manufacturer's recommendations.
- I. Identify enclosed switches in accordance with Section 26 05 53.

#### **3.3 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.
- D. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

#### **3.4 ADJUSTING**

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

**3.5 CLEANING**

- A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

**END OF SECTION**

## SECTION 31 10 00 – SITE CLEARING

### PART 1 GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections:
  - 1. Section 31 25 00 "Erosion and Sediment Control" for temporary erosion and sedimentation control measures.

#### 1.2 SUMMARY

- C. Section Includes:
  - 1. Protecting existing vegetation to remain.
  - 2. Removing existing vegetation.
  - 3. Clearing and grubbing.
  - 4. Stripping and stockpiling topsoil.
  - 5. Stripping and stockpiling rock.
  - 6. Removing above and below grade site improvements.
  - 7. Disconnecting, capping or sealing, removing site utilities, and abandoning site utilities in place.

#### 1.3 DEFINITIONS

- A. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.
- B. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil," but in disturbed areas such as urban environments, the surface soil can be subsoil.
- C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects larger than 2 inches in diameter; and free of weeds, roots, toxic materials.
- D. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.
- E. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and indicated on Drawings.
- F. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.



#### **1.4 PREINSTALLATION MEETINGS**

- A. Pre-installation Conference: Conduct conference at Project Site or location identified by the Engineer.

#### **1.5 MATERIAL OWNERSHIP**

- A. Except for materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

#### **1.6 INFORMATIONAL SUBMITTALS**

- A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.
  - 1. Use sufficiently detailed photographs or video recordings.
  - 2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plant designated to remain.
- B. Topsoil stripping and stockpiling program.
- C. Rock stockpiling program.
- D. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

#### **1.7 QUALITY ASSURANCE**

- A. Topsoil Stripping and Stockpiling Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work. Include dimensioned diagrams for placement and protection of stockpiles.
- B. Rock Stockpiling Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work. Include dimensioned diagrams for placement and protection of stockpiles.

#### **1.8 FIELD CONDITIONS**

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
  - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
  - 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

- B. Improvements on Adjoining Property: Authority for performing site clearing indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
  - 1. Do not proceed with work on adjoining property until directed by the Engineer.
- C. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.
- D. Utility Locator Service: Notify One Call for area where Project is located before site clearing.
- E. Do not commence site clearing operations until temporary erosion and sedimentation control and tree-protection measures are in place.
- F. Tree and Plant Protection Zones: Protect according to Washington County requirements and as noted on the drawings.
- G. Soil Stripping, Handling, and Stockpiling: Perform only when the soil is dry or slightly moist.

## **PART 2 PRODUCTS**

### **2.1 MATERIALS**

- A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 31 20 00 "Earth Moving."
  - 1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

## **PART 3 EXECUTION**

### **3.1 PREPARATION**

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Verify that trees, shrubs, and other vegetation to remain or to be relocated have been flagged and that protection zones have been identified and enclosed.
- C. Protect existing site improvements to remain from damage during construction.
  - 1. Restore damaged improvements to their original condition, as acceptable to Owner.

### **3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL**

- A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion and sedimentation control 1200C Drawings and requirements of authorities having jurisdiction.
- B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

- C. Inspect, maintain, and repair erosion and sedimentation control measures during construction until permanent vegetation has been established.
- D. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.

### **3.3 TREE AND PLANT PROTECTION**

- A. Protect trees and plants remaining on-site according to the Drawings.
- B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations.

### **3.4 EXISTING UTILITIES**

- A. Contractor to locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.
  - 1. Arrange with utility companies to shut off indicated utilities.
- B. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others, unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
  - 1. Notify Engineer not less than two days in advance of proposed utility interruptions.
  - 2. Do not proceed with utility interruptions without Engineer's written permission.
- C. Excavate for, remove, and backfill underground utilities indicated to be removed.

### **3.5 CLEARING AND GRUBBING**

- A. Clear and grub per Beaverton School District Technical Standards.

### **3.6 STOCKPILING ROCK**

- A. Remove from construction area naturally formed rocks that measure more than 1 foot across in least dimension. Do not include excavated or crushed rock.
  - 1. Separate or wash off non-rock materials from rocks, including soil, clay lumps, gravel, and other objects larger than 2 inches in diameter; trash, debris, weeds, roots, and other waste materials.
- B. Stockpile rock without intermixing with other materials. Cover to prevent windblown debris from accumulating among rocks.
  - 1. Do not stockpile rock within protection zones.
  - 2. Dispose of surplus rock. Surplus rock is that which exceeds quantity indicated to be stockpiled or reused.

### **3.7 SITE IMPROVEMENTS**

- A. Remove existing above and below grade improvements as indicated and necessary to facilitate new construction.

- B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.
  - 1. Unless existing full-depth joints coincide with line of demolition, neatly sawcut along line of existing pavement to remain before removing adjacent existing pavement. Sawcut faces vertically.
  - 2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.

### **3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS**

- A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.
- B. Separate recyclable materials produced during site clearing from other non-recyclable materials. Store or stockpile without intermixing with other materials, and transport them to recycling facilities. Do not interfere with other Project work.

**END OF SECTION**

## **SECTION 31 20 00 – EARTH MOVING**

### **PART 1 GENERAL**

#### **1.1. RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections:
  - 1. Section 31 10 00 "Site Clearing" for site stripping, grubbing, stripping, and stockpiling topsoil, and removal of above and below ground improvements and utilities.

#### **1.2. SUMMARY**

- A. Section Includes:
  - 1. Excavating and filling for rough grading the Site.
  - 2. Preparing subgrades for slabs on grade, walks, pavements, turf and grasses and landscape areas.
  - 3. Excavating and backfilling for buildings and structures.
  - 4. Drainage course for concrete slabs-on-grade.
  - 5. Subbase course for concrete walks and pavements.
  - 6. Subbase course for asphalt paving.
  - 7. Subsurface drainage backfill for walls and trenches.
  - 8. Excavating and backfilling trenches for utilities and pits for buried utility structures.

#### **1.3. DEFINITIONS**

- A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
  - 1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
  - 2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.
- C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.
- D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

- E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.
- F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
  - 1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by the Engineer. Authorized additional excavation and replacement material will be paid for according to Contract.
  - 2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by the Engineer. Unauthorized excavation, as well as remedial work directed by the Engineer, shall be without additional compensation.
- G. Fill: Soil materials used to raise existing grades.
- H. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1 cu. yd. for bulk excavation or 1 cu. yd. for footing, trench, and pit excavation that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering or ripping.
- I. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- J. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.
- K. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.
- L. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

#### **1.4. PREINSTALLATION MEETINGS**

- A. Pre- installation Conference: Conduct pre-excavation conference at Project site or location identified by the Engineer.
  - 1. Review methods and procedures related to earthmoving, including, but not limited to, the following:
    - a. Personnel and equipment needed to make progress and avoid delays.
    - b. Coordination of Work with utility locator service.
    - c. Coordination of Work and equipment movement with the locations of tree and plant protection zones.
    - d. Extent of trenching by hand or with air spade.
    - e. Field quality control.

### **1.5. INFORMATIONAL SUBMITTALS**

- A. Qualification Data: For qualified testing agency.
- B. Material Test Reports: For each soil material proposed for fill and backfill as follows:
  - 1. Classification according to ASTM D 2487.
  - 2. Laboratory compaction curve according to ASTM D 698 or ASTM D 1557.
  - 3. Any additional submittals required by the Beaverton School District Technical Standards.
- C. Preexcavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth-moving operations. Submit before earth moving begins.

### **1.6. QUALITY ASSURANCE**

- A. Blasting is not allowed.
- B. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E 329 and ASTM D 3740 for testing indicated.

### **1.7. FIELD CONDITIONS**

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving operations.
  - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
  - 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- B. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
  - 1. Do not proceed with work on adjoining property until directed by the Engineer.
- C. Utility Locator Service: Notify One Call for area where Project is located before beginning earth moving operations.
- D. Do not commence earth moving operations until temporary site fencing and erosion and sediment control measures specified in Section 312500 "Erosion and Sediment Control" and tree protection are in place.
- E. The following practices are prohibited within protection zones:
  - 1. Storage of construction materials, debris, or excavated material.
  - 2. Parking vehicles or equipment.
  - 3. Foot traffic.

4. Erection of sheds or structures.
  5. Impoundment of water.
  6. Excavation or other digging unless otherwise indicated.
  7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
- F. Do not direct vehicle or equipment exhaust towards protection zones.
- G. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

## **PART 2 PRODUCTS**

### **2.1. SOIL MATERIALS**

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory materials per recommendations of the Beaverton School District Technical Standards.

### **2.2. GEOTEXTILES**

- A. Subgrade Geotextile
1. Subgrade geotextile should conform to Oregon Standard Specifications for Construction Table 02320-1 (Geotextile Property Values for Drainage Geotextile) and Oregon Standard Specifications for Construction 00350 (Geosynthetic Installation). The geotextile should have a Level "B" certification. A minimum initial aggregate base lift of 6 inches is required over geotextiles.
- B. Drainage Geotextile
1. Drainage geotextile should conform to Type 2 material of Oregon Standard Specifications for Construction Table 02320-1 (Geotextile Property Values for Drainage Geotextile) and Oregon Standard Specifications for Construction 00350 (Geosynthetic Installation). The geotextile should have a Level "B" certification. A minimum initial aggregate base lift of 6 inches is required over geotextiles.

## **PART 3 EXECUTION**

### **3.1. PREPARATION**

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.
- B. Protect and maintain erosion and sedimentation controls during earth moving operations.
- C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.



### **3.2. DEWATERING**

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
  - 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

### **3.3. EXPLOSIVES**

- A. Explosives: Do not use explosives.

### **3.4. EXCAVATION, GENERAL**

- A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
  - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
  - 2. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:
    - a. 24 inches outside of concrete forms other than at footings.
    - b. 12 inches outside of concrete forms at footings.
    - c. 6 inches outside of minimum required dimensions of concrete cast against grade.
    - d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
    - e. 6 inches beneath bottom of concrete slabs on grade.
    - f. 6 inches beneath pipe in trenches and the greater of 24 inches wider than pipe or trench.
- B. Classified Excavation: Excavate to subgrade elevations. Material to be excavated will be classified as earth and rock. Do not excavate rock until it has been classified and cross sectioned by the Engineer. The Contract Sum will be adjusted for rock excavation according to unit prices included in the Contract Documents. Changes in the Contract Time may be authorized for rock excavation.
  - 1. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; and soil, boulders, and other materials not classified as rock or unauthorized excavation.

- a. Intermittent drilling; blasting, if permitted; ram hammering; or ripping of material not classified as rock excavation is earth excavation.
2. Rock excavation includes removal and disposal of rock. Remove rock to lines and subgrade elevations indicated to permit installation of permanent construction without exceeding the following dimensions:
  - a. 24 inches outside of concrete forms other than at footings.
  - b. 12 inches outside of concrete forms at footings.
  - c. 6 inches outside of minimum required dimensions of concrete cast against grade.
  - d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
  - e. 6 inches beneath bottom of concrete slabs on grade.
  - f. 6 inches beneath pipe in trenches and the greater of 24 inches wider than pipe or trench.

### **3.5. EXCAVATION FOR STRUCTURES**

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
  1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
- B. Excavations at Edges of Tree- and Plant-Protection Zones:
  1. Excavate by hand or with an air spade to indicated lines, cross sections, elevations, and subgrades. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.

### **3.6. EXCAVATION FOR WALKS AND PAVEMENTS**

- A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

### **3.7. EXCAVATION FOR UTILITY TRENCHES**

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
  1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.

- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
  - 1. For pipes and conduit less than 6 inches in nominal diameter, hand excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
  - 2. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe or conduit circumference. Fill depressions with tamped sand backfill.
  - 3. For flat-bottomed, multiple-duct conduit units, hand excavate trench bottoms and support conduit on an undisturbed subgrade.
  - 4. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.
- D. Trenches in Tree and Plant Protection Zones:
  - 1. Hand excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
  - 2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.

### **3.8. SUBGRADE INSPECTION**

- A. Notify the Engineer when excavations have reached required subgrade.
- B. If the Engineer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
- C. Proof roll subgrade to identify soft pockets and areas of excess yielding. Do not proof roll wet or saturated subgrades.
  - 1. Completely proof roll subgrade in one direction. Limit vehicle speed to 3 mph.
  - 2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by the Engineer, and replace with compacted backfill or fill as directed.
- D. Authorized additional excavation and replacement material will be paid for according to Contract provisions.
- E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by the Engineer, without additional compensation.

### **3.9. UNAUTHORIZED EXCAVATION**

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top

elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by the Engineer.

1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by the Engineer.

### **3.10. STORAGE OF SOIL MATERIALS**

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

### **3.11. BACKFILL**

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring, bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

### **3.12. UTILITY TRENCH BACKFILL**

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Backfill voids with satisfactory soil while removing shoring and bracing.

D. Initial Backfill:

1. Place and compact initial backfill of trench backfill, to a height of 12 inches over the pipe.
  - a. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to

avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing

- E. Final Backfill:
  - 1. Soil Backfill: Place and compact final backfill of satisfactory soil to final subgrade elevation.
  - 2. Rock Backfill: Place and compact final backfill of satisfactory trench rock per the Drawings.

### **3.13. SOIL FILL**

- A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- B. Place and compact fill material in layers to required elevations as follows:
  - 1. Under grass and planted areas, use satisfactory soil material.
  - 2. Under walks and pavements, use engineered fill.
  - 3. Under steps and ramps, use engineered fill.
  - 4. Under building slabs, use engineered fill.
  - 5. Under footings and foundations, use engineered fill.
- C. Place soil fill on subgrades free of mud, frost, snow, or ice.

### **3.14. SOIL MOISTURE CONTROL**

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
  - 1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
  - 2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

### **3.15. COMPACTION OF SOIL BACKFILLS AND FILLS**

- A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment and not more than 4 inches in loose depth for material compacted by hand operated tampers.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.

### **3.16. GRADING**

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
  2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- C. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:
1. Turf or Unpaved Areas: Plus or minus 1 inch.
  2. Walks: Plus or minus 1/2 inch.
  3. Pavements: Plus or minus 1/2 inch.
- C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

### **3.17. BASE COURSES UNDER PAVEMENTS AND WALKS**

- A. Place base course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place base course under pavements and walks as follows:
1. Install separation geotextile, where noted on Drawings, on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
  2. Place base course material over subbase course under hot-mix asphalt pavement.
  3. Shape base course to required crown elevations and cross slope grades.
  4. Place base course 6 inches or less in compacted thickness in a single layer.
  5. Place base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
  6. Compact base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

### **3.18. DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE**

- A. Place drainage course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:
1. Install subdrainage geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
  2. Place drainage course 6 inches or less in compacted thickness in a single layer.

3. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
4. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

### **3.19. FIELD QUALITY CONTROL**

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
  1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
  2. Determine that fill material classification and maximum lift thickness comply with requirements.
  3. Determine, during placement and compaction that in-place density of compacted fill complies with requirements.
- B. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.
- C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.
- D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Engineer.
- E. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2937, and ASTM D 6938, as applicable. Tests will be performed at the following locations and frequencies:
  1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of paved area or building slab but in no case fewer than three tests.
  2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 100 feet or less of wall length but no fewer than two tests.
  3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet or less of trench length but no fewer than two tests.
- F. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

### **3.20. PROTECTION**

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
  - 1. Scarify or remove and replace soil material to depth as directed by the Engineer; reshape and recompact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
  - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

### **3.21. DISPOSAL OF SURPLUS AND WASTE MATERIALS**

- A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.
- B. Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by the Engineer.
  - 1. Remove waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

**END OF SECTION**



## **SECTION 31 23 17 - TRENCHING**

### **PART 1 GENERAL**

#### **1.1. RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections:
  - 1. Section 31 20 00 "Earth Moving"
  - 2. Section 31 25 00 "Erosion and Sedimentation Control" for temporary erosion and sedimentation control measures.

#### **1.2. SUMMARY**

- A. Trench excavation consists of excavation, bedding, backfill and removal or disposal of material as necessary in the installation of water lines, sanitary sewer and storm sewer lines and appurtenances, conduits, conductors, culverts, and any other installation requiring trenching.
  - 1. This work includes, but is not limited to, sheeting, bracing, dewatering, disposal of unsuitable materials, and importing approved bedding or backfill material.
  - 2. All work shall be done in accordance with these Specifications and shown on the Drawings in conformity with the lines, grades, and dimensions.
  - 3. Public Right of Way or Easements: All public work construction in the public right of way or easements shall be in accordance with the applicable requirements of the latest edition of the Washington County Design and Construction Standards.

#### **1.3. SITE CONDITIONS**

- A. Existing Utility Systems: The existing utility systems shown are based on record drawings supplied by the Owner, and "surface" field survey. Prior to constructing any of the utility systems, the Contractor shall "pot-hole" all connection points and utility crossings to verify inverts, sizes, locations, and potential conflicts. Any discrepancies shall be reported to the Engineer for resolution or redesign.

### **PART 2 PRODUCTS**

#### **2.1. MATERIALS**

- A. Bedding: The bedding of pipes, conduits, cables and structures shall be as shown on the Drawings or as directed by the Engineer. The bedding material shall be placed and thoroughly compacted over the full width of the trench. Upon request, samples of the proposed materials shall be submitted to the Engineer for approval.
- B. Backfill: The backfill for pipes, conduits, cables and structures shall be as shown on the Drawings or as directed by the Engineer. The backfill material shall be placed in maximum eight-inch lifts and thoroughly compacted over the full width of the trench. Upon request, samples of the proposed materials shall be submitted to the Engineer for approval.

1. Granular backfill shall be used in all other locations where native backfill is not designated. Unclassified excavated material used as native backfill shall be earth, sand, gravel, rock or combinations thereof, free of humus, organic matter, vegetable matter, frozen material, clods, sticks, and debris and containing no stones having a dimension greater than three inches. The materials shall predominate in the finer sizes and, in place, shall present no voids and no isolated points or areas of larger stones which would cause fracture or denting of the utility or structure or subject it to undue stress. Use of the native backfill shall be approved by the Engineer.
2. Granular backfill shall be used under paved areas, in trenches in streets, in trenches in public right-of-ways and easements, and other areas subject to wheel traffic, and at structures or as designated on the plans. Granular backfill material shall conform to section 32 11 32 "Aggregate Base Courses". Top of rock elevation shall be held down at the specified depth in areas designated to receive asphalt paving. All granular backfill shall be placed and compacted per section 32 11 32 "Aggregate Base Courses"

### **PART 3 EXECUTION**

#### **3.1. CONTRACTOR'S RESPONSIBILITY FOR UTILITY PROPERTIES AND SERVICES**

- A. The Contractor shall comply with ORS 757.541 through 757.571 and shall notify all utility companies for line locations 72 hours (minimum) prior to start of work.
- B. At points where the Contractor's operation could cause damage or interference to railway, telegraph, telephone, television, power, oil, gas, water, irrigation, or other private, public or municipal utilities, the Contractor shall suspend work until all arrangements necessary for the protection thereof have been made by the Contractor.
- C. The Contractor shall notify all utility offices which are affected by the construction operation at least 72 hours in advance of excavation. Under no circumstances shall the Contractor expose or interrupt any utility without first requesting permission and being granted to do so from the affected agency.
  1. It shall be the Contractor's responsibility, once permission from the utility has been granted, to locate, if necessary, and expose all of the existing underground utilities in advance of the trenching operation.
- D. The Contractor shall be solely and directly responsible to the Owner and utility companies for any damage, expense, or claims of any kind brought because of injuries, damages or delay which may result from the carrying out of the work to be done under the Contract.
- E. In the event of interruption to domestic water or to other utility services as a result of accidental breakage, or as a result of being exposed, unsupported, or a lack of coordination, the Contractor shall promptly notify the Engineer and the agency involved. The Contractor shall cooperate with the said authority in restoration of service as promptly as possible and shall bear any and all costs of repair.
  1. In no case shall interruption of any water or utility service be allowed to exist outside working hours unless prior approval of the Engineer or agency involved is granted.

- F. Neither the Owner nor its officers or agents shall be responsible to the Contractor for damages as a result of the location of the underground utilities being other than that shown on the plans or for the existence of underground utilities not shown the plans.

### **3.2. FIELD RELOCATION**

- A. During construction, minor relocations of the line may be necessary. Such relocations shall be made only with approval from the Engineer. Unforeseen obstructions encountered as a result of such relocations will not become subject to claims for additional compensation by the Contractor to any greater extent that the original lump sum of the contract or unit price of the utility being installed.

### **3.3. OPEN TRENCHES**

- A. The Contractor shall not begin the trench excavation until the necessary material is on hand to complete the work involved.
1. The trenches shall be opened in accordance with the lines and grades given for the work, at such times and as far in advance of the work as may be required by the Engineer.
  2. Not more than a total of 100 feet of trench shall be opened in advance of the completed utility unless authorized by the Engineer. Related structures must be completed and backfilled at the time of line installation.

### **3.4. BARRICADES, GUARDS AND SAFETY PROVISIONS**

- A. To protect persons from injury and to avoid property damage, adequate barricades, construction signs, warning lights, and guards as required shall be placed and maintained during the progress of the work and until it is safe for public use.
1. Watchmen or flag personnel shall be provided as necessary.
  2. Rules and regulations of all local and Federal authorities regarding safety provisions shall be observed. The Contractor will be solely responsible for accidents caused by inadequate or insufficient safety provisions.

### **3.5. PAVEMENT REMOVAL**

- A. All bituminous and concrete pavements, regardless of the thickness shall be sawcut prior to excavation. Width of the pavement cut shall be equal to the prescribed width of the trench at the ground surface or as shown on the plans.
1. Pavement removed during excavation shall be piled separately from other excavation materials and removed from the site. Pavement shall not be used as backfill material. Uneven pavement edges shall be sawcut before patching the pavement.

### **3.6. OBSTRUCTIONS**

- A. This item refers to obstructions which may be encountered and do not require replacement.
1. Obstructions to the construction of the trench such as tree roots, stumps, abandoned piling, buildings and concrete structures, logs, rubbish, and debris of all types shall be removed without additional compensation from the Owner.

2. The Engineer may, if requested, make changes in the trench alignment to avoid major obstructions, if such alignment changes can be made within the perpetual easement and right-of-way and without adversely affecting the intended function of the facility or increase costs to the Owner. Sewer and water trenches must be maintained at a minimum specified separation, however.

### **3.7. INTERFERING STRUCTURES OR ROADWAYS**

- A. The Contractor shall remove, replace and/or repair any damage done by the Contractor during construction to fences, buildings, cultivated fields, drainage crossings, and any other properties at his own expense without additional compensation from the Owner.
  1. The Contractor shall replace or repair these structures to a condition as good as or better than their original condition prior to commencing work in the area.
- B. Where paved roadways are cut, granular backfill shall be used as defined in "Materials" above. New pavement shall be as specified on the plans and shall not deviate by more than one-quarter inch from the existing finish elevation.
- C. If the Contractor encounters existing structures that will prevent construction and are not adequately shown on the plans, he shall notify the Engineer before continuing with the work in order that the Engineer may make such field revisions as necessary to avoid conflict with the existing conditions.
  1. The cost of waiting or "downtime" during such field revisions shall be borne by the Contractor without additional cost to the Owner or liability to the Architect.
  2. If the Contractor fails to so notify the Architect when a conflict of this nature is encountered, but proceed with construction despite this interference, he shall do so at his own risk with no additional payment.

### **3.8. EASEMENTS**

- A. Any damage to private property, either inside or outside the limits of the easements provided by the Owner, shall be the responsibility of the Contractor.
  1. Before final payment will be authorized by the Engineer, the Contractor will be required to furnish the Owner with written releases from property owners where special agreements or easements have been obtained by the Contractor or where the Contractor's operations for any reason, have not been kept within the construction right of way obtained by the Owner.
  2. Any such special agreements must be in written form and shall not involve the Owner or Engineer as to liabilities in any way.

### **3.9. GRADES**

- A. The bottom of the trench shall be excavated to the lines and grades shown on the plans or established by the Engineer with proper allowance for pipe thickness and required bedding. Any trench excavated below grade shall be returned to grade at the Contractor's expense, with fine bedding material.
  1. The bedding shall be placed over the full width of the trench in thoroughly compacted layers as previously specified herein. Grades shall be smooth without humps or sags.

- B. The Engineer shall be notified with reasonable notice in advance when a section has been excavated and is ready for installation of the utility line or structure. The Engineer at that time will make a determination as to the suitability of the excavation foundation and will give notice to the Contractor to proceed or remove unstable material as covered in "Foundation Stabilization".

### **3.10. WIDTH OF TRENCH**

- A. Trenches shall be excavated to a sufficient width to permit proper installation of piping, conduits or related improvements as shown on the plans or required by local standards and specifications.
  - 1. For the installation of utilities or conduits, the minimum width of trenches shall be 18 inches plus the outside diameter of the pipe.
- B. In cases where excessive width of excavation would cause damage to adjacent structure, the trench shall not be excavated in excess of the minimum width as specified herein or detailed on the drawings.

### **3.11. BORING**

- A. Boring may be used as an approved method in lieu of open trench excavation if approved by the Engineer. The Contractor shall first show just cause and furnish the Engineer with a detailed construction schedule outlining methods, time schedule and proposed safety measures to be incorporated in construction.
  - 1. Upon receiving approval, the Contractor will not deviate from his proposed schedule without first obtaining approval of the Engineer and other respective agencies involved in that portion of the work.

### **3.12. DE-WATERING**

- A. Whenever water is encountered in the trench or excavation area, the Contractor shall pump or otherwise dry the bottom of the trench or excavated area before the pipe or conduit installation is commenced. Complete de-watering per Washington County Design and Construction Standards.
  - 1. The Contractor shall not allow water encountered in the trench or excavated area to escape down any pipe or conduit in place unless he first obtains written approval from the Engineer for this method of de-watering.
  - 2. The Contractor will be responsible for cleaning and/or flushing as required, the complete pipe, conduit, or structure. Any soil, aggregate or other foreign matter in the utility prior to acceptance must be removed at the Contractor's expense prior to final acceptance of the work.

### **3.13. SHORING AND SHEATHING**

- A. The Contractor shall use whatever means necessary to maintain safe working conditions and protect adjacent property and structures from damage due to excavation. The Contractor shall conform to all federal, state, and local regulations governing shoring, sheathing and excavation.

1. When shoring or sheathing is installed, the trench width shall be increased accordingly. The shoring or sheathing shall remain in place until the utility or structure is backfilled to a point where caving could not damage the installation.
2. No payment will be made for shoring or sheathing. All costs involved in placement and removal of shoring and sheathing shall be considered incidental to the work.

#### **3.14. LOCATION OF EXCAVATED MATERIALS**

- A. During excavation the Contractor shall locate excavated material so as not to block any public right of way, traveled roadways, public or private; and unless otherwise approved by the Engineer, roadways shall be kept open to at least one lane of traffic.
  1. The Contractor shall store or waste excavated materials only in designated areas unless otherwise approved by the Engineer. Utmost care shall be taken to prevent spillage or damage to property adjacent to the project.
- B. Excavated materials unsuitable for backfill as described herein or not required to meet original or specified grades shall be removed as soon as possible or at least by completion of backfill.
  1. No utilities will be considered for payment until these surplus materials have been removed and backfill completed as specified above or as otherwise directed by the Engineer. No additional payment will be made to the contractor for disposal of excess materials.

#### **3.15. FOUNDATION STABILIZATION**

- A. When in the opinion of the Geotechnical Engineer, the existing material in the bottom of the trench or excavated area is unsuitable for supporting the pipe, conduit or structure or related appurtenances, excavation below the flowline of the pipe or base of other structure shall be executed to a suitable depth as directed by the Geotechnical Engineer.

#### **3.16. MAINTENANCE OF BACKFILL**

- A. Notwithstanding the type of backfill placement, the backfilled trench or excavation surface shall be maintained until all construction has been completed and accepted by the Owner and Engineer. This maintenance shall include but not be limited to the addition of backfill in settled areas and surface rock or pavement in roadways to keep the trench reasonably smooth and free from excessive ruts and potholes.

#### **END OF SECTION**

## **SECTION 31 25 00 – EROSION AND SEDIMENT CONTROL**

### **PART 1 GENERAL**

#### **1.1. RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Section:
  - 1. Section 31 10 00 "Site Clearing" for site stripping, grubbing, stripping, and stockpiling topsoil, and removal of above and below ground improvements and utilities.
  - 2. Section 31 20 00 "Earth Moving"
  - 3. Section 31 23 17 "Trenching"
- C. Public Right-of-Way: All public work construction in the public right-of-way shall be in accordance with the applicable requirements of the Washington County Construction Standards.

#### **1.2. SUMMARY**

- A. Erosion/Sedimentation Control (ESC) is required on this project. Construction of all erosion control measures shall be in accordance with the Washington County requirements. Compost based BMP's shall be constructed in accordance with Oregon Department of Transportation Section 00280 – Erosion and Sediment Control specifications and details. All work shall comply with US Army Corps of Engineers and Oregon Department of State Lands Joint Permit and Sections 404 and 401 permit conditions and requirements.
- B. This section describes temporary measures and monitoring to control water pollution, soil erosion, and siltation. Erosion, sediment, and pollutant control (EPSC) devices or methods include the use of construction entrances, tree protection fences, diversion dikes, check dams, sediment basins and traps, compost filter sock sediment barriers, compost blanket mulch, gravel, mulches, sediment barriers, grasses, slope drains, and other techniques.
- C. The boundaries of the clearing limits and limits of grading shown on this plan shall be clearly flagged in the field prior to construction. During the construction period, no disturbance beyond the flagged clearing area shall be permitted. The flagging shall be maintained by the Contractor for the duration of the construction.
- D. The ESC facilities shown on this plan and/or details must be constructed in conjunction with all mass grading and site utility construction, in such a manner as to ensure that sediment and sediment laden water does not enter the drainage system, roadways, or violate applicable water standards.

#### **1.3. SUBMITTALS**

- A. At the pre-construction meeting, submit the following supplemental EPSC information:
  - 1. Construction start and completion dates.

2. Date when EPSC measures will be in place.
3. Projected date of removal of erosion control structures (after soil is stabilized by vegetation or pavement).
4. Description of control procedures to prevent the discharge of all wash water from concrete trucks into the storm sewer system.
5. Description of procedures for prompt maintenance or repair of EPSC measures utilized on-site.
6. Description of best management practices that will be used to prevent or minimize storm water from being exposed to pollutants from spills, cleaning and maintenance activities, and waste handling activities. These pollutants include fuel, hydraulic fluid, and other oils from vehicles and machinery as well as debris, leftover paints, solvents, and glues from construction operations.

#### **1.4. QUALITY ASSURANCE**

- A. The Contractor is to comply with all applicable local, State, and Federal ordinances, rules, and regulations concerning erosion and sedimentation control and stormwater runoff.
- B. In case of conflict between the above codes, regulations, references, and standards and these specifications, the more stringent requirements shall govern.
- C. Conduct a Preconstruction Meeting onsite as directed by the Owner or Owner's Representative prior to the start of construction.

#### **1.5. PROJECT SITE CONDITIONS**

- A. The Contractor to visit the site and verify all existing conditions affecting the work of this section prior to submitting bids or proposals. Additional compensation will not be allowed for revisions or modification of work resulting from failure to verify existing conditions.

### **PART 2 PRODUCTS**

#### **2.1. GENERAL**

- A. All products shall conform to the applicable requirements of Washington County requirements and Oregon Department of Transportation specifications Section 00280 – Erosion and Sediment Control.

### **PART 3 EXECUTION**

#### **3.1. GENERAL**

- A. The implementation of the EPSC measures and the construction, performance monitoring, maintenance, replacement, and upgrading of the EPSC measures are the responsibility of the Contractor until all construction is completed and accepted and vegetation/landscaping and paving is established.
- B. The EPSC measures shown on the drawings shall be constructed in conjunction with all clearing, grading, trenching, and earthwork activities and in a manner that ensures that



sediment and sediment-laden water do not enter the drainage system, roadways, or violate applicable water quality standards.

- C. The EPSC measures shown on the drawings are the minimum requirements for anticipated site conditions and Contractor methods and sequences. During the construction period, the EPSC measures shall be upgraded as needed for unexpected conditions, storm events, or Contractor methods or sequences and to ensure that sediment and sediment-laden water do not leave the site.
- D. The Contractor shall be responsible for implementing temporary erosion control measures during construction to correct unforeseen conditions. The Contractor shall be responsible for additional erosion control due to the Contractor's negligence, carelessness, or failure to install planned controls as a part of the work.
- E. Implementation, construction, and maintenance of EPSC measures shall be in accordance with the Washington County requirements.
- F. Do not begin soil disturbance activities until perimeter EPSC measures are in place.
- G. The erosion control drawings, together with the specifications and 1200-C documents (if applicable) constitute the EPSC plan. A copy of the EPSC plan shall be retained on site and made available to the Washington County staff upon request.

### **3.2. CONSTRUCTION DETAILS**

- A. Install and maintain all site public notification signs as shown on the drawings and keep signs easily readable from the public right-of-way throughout the duration of the ground-disturbing activities. Remove and dispose of signs upon completion of work.
- B. No visible or measurable erosion material or pollutant shall exit the construction site. Visible or measurable is defined as:
  - 1. Deposits of mud, dirt, sediment, or similar material exceeding 1/2 cubic foot in volume in any area of 100 square feet or less on public or private streets, adjacent property, or into the storm and surface water system, either by direct deposit, dripping, discharge, or as a result of the action of erosion.
  - 2. Evidence of concentrated flows of water over bare soils; turbid or sediment laden flows; or evidence of on-site erosion such as rivulets on bare soil slopes, where the flow of water is not filtered or captured on the site.
  - 3. Earth slides, mud flows, earth sloughing, or other earth movement which leaves the property.
- C. Employ all reasonable means and methods to control or divert upslope stormwater runoff away from cleared and grubbed areas, stockpiled materials, and other disturbed areas that will be open or stockpiled for periods longer than two-weeks.
- D. Construction entrances, exits, and parking areas shall be graveled or paved to reduce the tracking of sediment onto public or private roads. Maintain for the duration of the project.
- E. Unpaved roads on the site shall be graveled or under other effective erosion and sediment control measures, either on the road or down gradient, to prevent sediment and sediment-laden water from leaving the site.

- F. Preserve existing vegetation where practicable and revegetate open areas after grading or construction.
- G. Continuously secure or protect soil stockpiles from runoff and erosion throughout the project with temporary soil stabilization measures or protective cover.
- H. Provide ongoing maintenance, repair, and restoration of EPSC measures to keep them continually functional.
  - 1. The following maintenance activities shall be included:
    - a. Visual or measurable amounts of sediment and pollutants that leave the site shall be cleaned up immediately and placed back on the site or properly disposed. Under no conditions shall sediment be intentionally washed into storm sewers or drainage ways.
    - b. Clean catch basin protection when design capacity has been reduced by 50 percent.
    - c. Remove sediment trapped by sediment barriers before it reaches one third of the above-ground barrier height.
    - d. Remove trapped sediments from sediment basins and traps when design capacity has been reduced by 50 percent.
- I. If fertilizers are used to establish vegetation, the application rates shall follow manufacturer's guidelines and the application shall be done in a way that minimizes nutrient-laden runoff to receiving waters.
- J. If construction activities cease for 30 days or more, the entire site shall be stabilized using vegetation or a heavy mulch layer, temporary seeding, or another method that does not require germination to control erosion.
- K. Any use of toxic or other hazardous materials shall include proper storage, application, and disposal.
- L. When trucking saturated soils from the site, either watertight trucks shall be used, or loads shall be drained on-site until dripping has been reduced to minimize spillage on roads and streets.
- M. Clean all catch basins and inlets protected from sediment prior to paving and final acceptance. The cleaning operation shall not flush sediment laden water into the downstream system.
- N. EPSC measures installed during construction shall be removed when construction and site disturbance activity are complete and permanent soil stabilization is in place.
- O. Remove and dispose of waste and unused building material.

### **3.3. WET WEATHER CONSTRUCTION**

- A. The Contractor is responsible for all additional measures required during wet weather construction between October 1st and May 30th.

### **3.4. PROTECTION OF ADJACENT PROPERTY**

- A. Protect adjacent properties from land disturbance, erosion, and sedimentation.

**3.5. PROTECTION OF JURISDICTIONAL WETLANDS**

- A. No work or land disturbance shall occur in jurisdictional wetlands and vegetated corridors prior to issuance of US Army Corps of Engineers and Oregon Department of State Lands Joint Permit.
- B. Work shall be completed in compliance with US Army Corps of Engineers and Oregon Department of State Lands Joint Permit and conditions.

**3.6. DISPOSITION OF TEMPORARY MEASURES**

- A. All temporary erosion and sediment control measures shall be disposed of within thirty (30) days after final site stabilization and the establishment of paving and final landscaping.
- B. Trapped sediment and other disturbed soil areas resulting from the disposition of temporary measures shall be permanently stabilized to prevent further erosion.

**END OF SECTION**

## **SECTION 32 11 32 – AGGREGATE BASE COURSES**

### **PART 1 GENERAL**

#### **1.1. RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related sections:
  - 1. Section 31 10 00 "Site Clearing" for site stripping, grubbing, stripping, and stockpiling topsoil, and removal of above and below ground improvements and utilities.
  - 2. Section 31 25 00 "Erosion and Sediment Control" for temporary erosion and sedimentation control measures.
- D. The referenced specification for this Section is the "Oregon Standard Specifications for Construction" latest edition as prepared by the Oregon Department of Transportation and the Oregon Chapter of the American Public Works Association, and its revisions and supplements.
- E. Public Right-of-Way: All public work construction in the public right-of-way shall be in accordance with the applicable requirements of the Washington County Design and Construction Standards.

#### **1.2. SUMMARY**

- A. This section specifies requirements for furnishing and placing base course material composed of crushed aggregate.

#### **1.3. SUBMITTALS**

- A. See section 01 33 00 – Submittals, for submittal procedures.
- B. Materials Sources: Submit name of imported materials source.
- C. Aggregate Composition Test Reports: Results of laboratory test on proposed and actual materials used.
- D. Compaction Density Test Reports.

### **PART 2 PRODUCTS**

#### **2.1. MATERIALS**

- A. Aggregate Base Rock
  - 1. Aggregate base rock below asphalt concrete pavements should be clean, crushed rock or crushed gravel. The base aggregate should contain no deleterious materials, meet specifications provided in ODOT SS 02630.10 – Dense-Graded Aggregate, and have less than 5 percent by weight passing the U.S. Standard No. 200 Sieve.

2. Base aggregate material shall conform to the requirements of the Standard Specification in areas outside of the public right of way, and Washington County Standards for work in the public right-of-way. Refer to the Structural Contract Drawings for additional requirements for aggregate bases under the building.
- B. Certification of Aggregate: Prior to the placing of the aggregate base course material, the Contractor shall produce test results from a certified testing laboratory indicating the suitability of the material.

### **PART 3 EXECUTION**

#### **3.1. CONSTRUCTION REQUIREMENTS**

- A. Aggregate bases shall be placed per the requirements of the Washington County Design and Construction Standards.
- B. Compact aggregate base course thoroughly and uniformly to at least 95% of the maximum density as determined by ASTM D1557.

#### **3.2. EQUIPMENT**

- A. All equipment necessary for the proper construction of this work shall be in first-class working condition before construction is permitted to start, and all other equipment must be able to produce a product meeting the specifications.

#### **3.3. MAINTENANCE**

- A. Following the completion of the base course, the Contractor shall perform all maintenance work necessary to keep the base course in a condition satisfactory for paving.

### **END OF SECTION**

## **SECTION 32 12 16 – ASPHALT PAVING**

### **PART 1 GENERAL**

#### **1.1. RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections
  - 1. Section 31 20 00 "Earthwork".

#### **1.2. SUMMARY**

- A. Work of this Section consists of furnishing and applying asphalt mixes, tack coats, and placing asphalt concrete pavement in accordance with the applicable requirements of the standards listed below.
  - 1. The asphalt concrete shall be constructed on a prepared underlying course in accordance with these specifications and shall conform to the dimensions and typical cross and with the lines and grades section shown on the plans.
  - 2. The referenced specification for this Section is the "Oregon Standard Specifications for Construction" latest edition as prepared by the Oregon Department of Transportation and the Oregon Chapter of the American Public Works Association, and its revisions and supplements.
  - 3. Public Right-of-Way: All public work construction in the public right-of-way shall be in accordance with the applicable requirements of the Washington County Design and Construction Standards.

### **PART 2 PRODUCTS**

#### **2.1. ASPHALT MATERIALS**

- A. Asphalt Mix Design
  - 1. Provide mix design for ½" Dense, Level 2 ACP as specified on the plans in accordance with the Standard Specifications, and the applicable requirements of the Washington County Design and Construction Standards.
  - 2. Asphalt binder should be performance graded and conform to PG 64-22 or better.
- B. Tack Coat
  - 1. Tack coat material shall be CSS-1 or CSS1h in accordance with the Standard Specifications, and the applicable requirements of Washington County Design and Construction Standards.

### **PART 3 EXECUTION**

#### **3.1. PLACEMENT**

- A. Tack Coat: Per the Standard Specifications

1. All curbs, longitudinal and transverse joints shall be coated with a sufficient amount of tack coat material prior to placing the adjacent panel. This may be accomplished with hand distribution equipment.
2. Contractor shall be responsible for removing any tack applied to exposed curb faces or other finish surfaces. Tack all surfaces between layers.

**B. Asphalt Concrete Paving Surface Course**

1. Meet requirements of the Standard Specifications, the applicable requirements of Washington County.
2. Obtain approval for aggregate base course before placing paving surface course.
3. In Oregon, the AC surface temperature during paving should be at least 40 degrees Fahrenheit for lift thickness greater than 2.5 inches and at least 50 degrees Fahrenheit for lift thickness between 2.0 and 2.5 inches.
4. Place asphalt materials at temperatures between 200- and 250-degrees F.
5. Compact asphalt surface course thoroughly and uniformly to at least 91% of maximum specific gravity as determined by AASHTO T209.
6. Meet minimum and maximum lift thickness of 1.5 and 3.0 inches, respectively.

**3.2. TESTING AND INSPECTION**

- A. Asphalt density tests may be conducted on placed asphalt at the frequency determined by the Engineer. All tests, initiated by the Engineer, will be at the Owner's expense. The Owner will designate an independent testing laboratory and the contractor shall notify the laboratory 48 hours prior to paving so that tests can be scheduled and performed.

**END OF SECTION**

## **SECTION 32 13 13 – CONCRETE PAVING**

### **PART 1 GENERAL**

#### **1.1. RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections:
  - 1. Section 32 11 32 "Aggregate Base Courses"
  - 2. Section 32 13 73 "Concrete Paving Joint Sealants" for joint sealants in expansion and construction joints within concrete paving and in joints between concrete paving and asphalt paving or adjacent construction.

#### **1.2. SUMMARY**

- A. This Work consists of the construction of Portland cement concrete sidewalks, curbs and gutters, and driveways.
  - 1. The Portland cement concrete shall be constructed on a prepared underlying course in accordance with these Specifications and shall conform to the dimensions and typical cross section and with the lines and grades shown on the plans.
  - 2. The referenced specification for this Section is the "Oregon Standard Specifications for Construction" latest edition as prepared by the Oregon Department of Transportation and the Oregon Chapter of the American Public Works Association, and its revisions and supplements.
  - 3. Public Right-of-Way: All public work construction in the public right-of-way shall be in accordance with the applicable requirements of the Washington County Design and Construction Standards.
  - 4. All sidewalks and ramps shall be constructed to American's with Disabilities Act (ADA) standards.
- B. Roadways, sidewalks, curbs, and driveways shall be constructed in accordance with this Specification and related Sections, at the respective locations shown on the plans to the lines, grades, dimensions, and designs shown on the plans or established by the Engineer.

#### **1.3. SUBMITTALS**

- A. Concrete Mix Design.

#### **1.4. FIELD CONDITIONS**

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.
- B. Cold-Weather Concrete Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:



1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
  2. Do not use frozen materials or materials containing ice or snow.
  3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.
- C. Hot-Weather Concrete Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:
1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
  2. Cover steel reinforcement with water-soaked burlap, so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
  3. Fog-spray forms, steel reinforcement and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

## **PART 2 PRODUCTS**

### **2.1. CONCRETE**

- A. Concrete Mix Design Constituents shall be per the Washington County Design and Construction Standards.

### **2.2. REINFORCEMENT**

- A. Reinforcement shall be per the details shown on the plans.

### **2.3. TRUNCATED DOMES**

- A. Place pre-cast truncated dome detectable warning tile in the lower 2 feet of all pedestrian ramp throats per plans and details. The truncated dome detectable warning surface must be installed during the concrete pouring. Once the concrete is graded, smoothed, and finished, place the detectable warning tile in the lower 2 feet of the pedestrian ramp, per manufactures recommendations.
1. Detectable warning tile shall be compliant with ADA Standards for Accessible Design, Washington County, and Oregon Transportation Commission Standards for Accessible Parking Places.

## **PART 3 EXECUTION**

### **3.1. GENERAL**

- A. All Work shall comply the requirements of the Washington County Design and Construction Standards.

- B. Concrete within pedestrian areas to have a light broom finish for anti-slip.
- C. Private sidewalks to be minimum 3500 psi strength concrete, 4" thickness over minimum 4" of ¾" minus aggregate base.
- D. Expansion joints are required for concrete every 30 feet for curbs and sidewalks; continuous along the perimeter adjoining buildings and every 20 feet in each direction for patios, plazas, courtyards, etc. Control joints shall be a maximum of 5' for sidewalks.

### **3.2. PREPARATION FOR HANDLING AND PLACEMENT OF CONCRETE**

- A. In preparation for placing of concrete, all sawdust, chips and other construction debris or extraneous matter shall be removed from the interior of the forms or base. Any standing water shall be removed and a firm, stable base verified.
- B. Struts, stays and braces serving temporarily to hold the forms in the correct shape and alignment prior to the placing of concrete shall be removed when the concrete placing has reached the elevation rendering their service unnecessary. These temporary members shall be entirely removed from the forms and not buried in the concrete.

### **3.3. PREPARATION OF BASE**

- A. Areas on which sidewalks, curbs, and driveways are to be constructed shall be brought to proper lines and grade and compaction specified on the Drawings. The base shall be moistened before Portland cement is placed thereon and shall also be moist and firm at the time the concrete is placed.

### **3.4. TESTING AND INSPECTION**

- A. Slump tests, air entrainment, and cylinder tests may be conducted on poured in place concrete at the frequency determined by the Engineer. All tests, initiated by the Engineer, will be at the Owner's expense. The Owner will designate an independent testing laboratory and the contractor shall notify the laboratory 48 hours prior to all pours so that tests can be scheduled and performed.

### **3.5. CONCRETE CONSOLIDATION**

- A. Concrete, during and immediately after depositing, shall be thoroughly consolidated. The consolidation shall be done by mechanical means, such as spading, or high frequency vibrators, and shall ensure smooth surfaces and dense concrete along form surfaces or in corners, etc.

### **3.6. PROTECTION**

- A. The completed concrete surface shall be protected from damage until the project is accepted. The contractor shall be responsible to protect concrete from damage and/or vandalism for the first 24 hours following a pour. The Contractor shall repair damaged concrete and clean concrete discolored during construction. Surfaces that are damaged shall be removed and reconstructed for the entire length between regularly scheduled joints. Refinishing the damaged portion will not be acceptable. Removed portions shall be disposed of off the project site by the Contractor at no additional cost to the Owner.

### **END OF SECTION**

## **SECTION 329113 – SOIL PREPARATION**

### **PART 1 GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### **1.2 SUMMARY**

- A. This Section includes the following
  1. The work covered in this section consists of furnishing all labor, materials and equipment for testing, preparation, and placement of topsoil, water quality media and compost as indicated by the drawings and as specified.
  2. Coordinate placement of topsoil or water quality media and required soil amendments with the establishment of rough grades.
  3. Coordinate depths of soil amendments and topsoil with grading specifications for rough and finish grades.
  4. All rough grading operations shall be completed as required by these specifications. Topsoil placement or backfilling in areas to be landscaped shall not occur until the Owner's Representative has issued written approval of the rough grade and topsoil.
- B. Related Sections include the following:
  1. Section 312200; Grading.
  2. Section 329219; Seeding.

#### **1.3 DEFINITIONS**

- A. Soil classifications standards used herein for existing and imported soils include but are not limited to the following.
  1. ASTM Soil Quality Standards.
  2. Classification: ASTM D 2487-00.
  3. Gradation of Soils: ASTM D 422-63 (1998).
  4. Liquid Limit and Plasticity Index: ASTM D 4318-94(2001).
  5. Moisture-Density Relations: ASTM D 1557-00.
  6. Permeability of Soils: ASTM D 2434-68(2000),

- B. Finish Grade: Elevation of finished surface of planting soil.
- C. Water Quality Mix: Free draining soil mix produced off-site by blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- D. Planting Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.
- E. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill immediately beneath planting soil.
- F. Subgrade Soil: Friable soil, free from contaminants and materials deleterious to plant growth to depth as specified.

#### **1.4 SUBMITTALS**

- A. At least 7 working days prior to use on site or the start of work, the Contractor shall submit the following information to the Owner's Representative. All product samples must include sufficient volume for the Owner's Representative to make a reasonable analysis.
  - 1. Certified Analysis:
    - a. All compost mixture components required by these specifications or as required by testing laboratories to bring soil into compliance with these specifications.
    - b. All fertilizer mixes required by the specifications or as required by testing laboratories to bring soil into compliance with these specifications.
    - c. All on-site or imported topsoil or water quality soil media required by these specifications.
  - 2. Where any tests show results failing to conform to the required standards the Contractor shall include with the testing report a recommended treatment plan to bring the material into conformance.
  - 3. Product Samples:
    - a. Backfill Soil Mixture.
    - b. Water Quality Mixture.

#### **1.5 QUALITY ASSURANCE**

- A. Soil Preparation – All soil preparation work shall be done under the supervision of a Contractor having experience in landscape construction. All work shall be done in accordance with proper horticultural practices.
- B. Herbicide Application - Applications of herbicide for weed control, as required, shall be made only by an applicator currently licensed under State and Federal law/
- C. The Contractor shall store fertilizer and other required materials in a dry place and free from the intrusion of moisture.

- D. All topsoil and compost must be tested by an independent testing laboratory and certified that it is in conformance with the requirements of these specifications.
- E. Soil/Compost Testing Laboratory Qualifications: An independent laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.
- F. Topsoil Analysis: Furnish soil analysis by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; deleterious material; pH; and mineral and plant-nutrient content of topsoil.
  - 1. Topsoil Analysis Report must include analysis of suitability of topsoil for plant growth. State recommended quantities of nitrogen, phosphorus, and potash nutrient, soil conditioners and soil amendments may be added to produce satisfactory topsoil.
- G. Compost Analysis: Furnish compost analysis by a qualified testing laboratory stating the volumes, quantities, and ratios of component parts specified.
  - 1. Compost Analysis Report must include analysis of suitability of compost for plant growth. State volumes and quantities of recommended amendments necessary to produce satisfactory compost.

## **1.6 PROJECT CONDITIONS**

- A. Prior to the work of this section all rough graded surfaces shall be free of:
  - 1. Concrete, asphalt, and other construction debris;
  - 2. Limbs, twigs, cones, seed-pods and other woody material; and
  - 3. Rock, gravel or other material not suitable for plant growth.
- B. In all plant bed areas the sub-grade shall be free of unsuitable material such as stumps, roots, rocks, concrete, asphalt, or metals, for a minimum depth of 24 inches and in all lawn or seeded areas the sub-grade shall be free of unsuitable material for a minimum depth of 12 inches.
- C. The Contractor shall provide protective covers and barriers as necessary to prevent damage and staining to all site improvements.
- D. The Contractor shall prepare topsoil only when weather and soil conditions allow. Do not attempt soil preparation work when weather or soil conditions would contribute to poor or improper mixing, voids, or other adverse conditions.
- E. The Contractor shall take all reasonable precautions to prevent runoff of topsoil and fertilizers from leaving site or entering storm systems, or any waterway.

## **1.7 SEQUENCING AND SCHEDULE**

- A. Coordinate soil preparation work with installation of other site improvements and planting of trees, shrubs, ground covers and lawns.

## PART 2 PRODUCTS

### 2.1 PLANTING SOILS

A. Planting Soil:

1. ASTM D 5268.
2. Acidity range (pH) of 5.5 to 7.
3. A minimum of 4 percent, and a maximum of 20 percent organic material content by volume.
4. A maximum of 25 percent decaying content by volume.
5. Free of stones 1 inch or larger in any dimension and other extraneous materials harmful to plant growth.
6. Textural Class Requirements: Topsoil textural analysis shall fall within the following gradations.

Textural Class	% of Total Weight	Average %
Sand (0.05-2.0mm dia.)	45 – 75	60%
Silt (0.002-0.05mm dia.)	15 – 35	25%
Clay (less than 0.002mm dia.)	05 – 20	15%

- B. Subgrade Soil: Friable soil, free from contaminants and materials deleterious to plant growth to depth as specified in Part 1 – General, Project Conditions.

### 2.2 WATER QUALITY MIX

Furnish imported topsoil for vegetated stormwater facilities conforming to the following:

- A. Standard Blend for public and private facilities – Use this blend for all vegetated stormwater management facilities, except those in the right-of-way.
1. General Composition - The material shall be any blend of loamy soil, sand, and compost that is 30-40% compost (by volume) and meets the other criteria in this specification.
    - a. Analysis Requirements for the Blended Material:
      - 1) Particle Gradation - A particle gradation analysis of the blended material, including compost, shall be conducted in conformance with ASTM C117/C136 (AASHTO T11/T27). The analysis shall include the following sieve sizes: 1 inch, 3/8 inch, #4, #10, #20, #40, #60, #100, #200. The gradation of the blend shall meet the following gradation criteria.

Sieve Size	Percent Passing
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1 inch	100
#4	75-100
#10	40-100
#40	15-50
#100	5-25
#200	5-15

The blend shall have a Coefficient of Uniformity (D60/D10) equal to or greater than 6 to ensure it is well graded (has a broad range of particle sizes). The coefficient is the ratio of two particle diameters on a grain-size distribution curve; it is the particle diameter at 60% passing divided by the particle diameter at 10% passing.

- 2) Acidity - The pH (Power of Hydrogen) of the blended material shall be tested and be between 6 to 8.

b. General Requirements for the Blended Material:

- 1) The material shall be loose and friable.
- 2) It shall be well mixed and homogenous.
- 3) It shall be free of wood pieces, plastic, and other foreign matter.
- 4) It shall have no visible free water.

## 2.3 INORGANIC SOIL CONDITIONERS

- A. Lime: ASTM C 602, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent and as follows?
- B. Class: Class T, with a minimum 99 percent passing through No. 8 sieve and a minimum 75 percent passing through No. 60 sieve.
- C. Class: Class O, with a minimum 95 percent passing through No. 8 sieve and a minimum 55 percent passing through No. 60 sieve
- D. Provide lime in form of dolomitic limestone.
- E. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, with a minimum 99 percent passing through No. 6 sieve and a maximum 10 percent passing through No. 40 sieve.

- F. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
- G. Aluminum Sulfate: Commercial grade, unadulterated.
- H. Agricultural Gypsum: Finely ground, containing a minimum of 90 percent calcium sulfate.
- I. Sand: Clean, washed, natural or manufactured, free of toxic materials.
- J. Diatomaceous Earth: Calcined, diatomaceous earth, 90 percent silica, with approximately 140 percent water absorption capacity by weight.
- K. Calcined Clay: An inorganic soil amendment formed by expanding clay at high temperatures (calcining), and used to alter soil strength by affecting its ability to retain moisture.
- L. EarthLite Fiter Media, as manufactured by Sunmark Seeds; 1.888.214.7333; Contact – Robin Cook.
- M. Zeolites: Mineral clinoptilolite with at least 60 percent water absorption by weight.
- N. For bidding assume placement and incorporation of 35 lbs. of dolomitic lime per 1,000 square feet.

## **2.4 SOIL AMENDMENTS**

- A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 3/4-inch sieve; soluble salt content of 5 to 10 deciSiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
  - 1. Organic Matter Content: 50 to 60 percent of dry weight.
  - 2. Feedstock: Agricultural, food, or industrial residuals; bio-solids; yard trimmings; or source-separated or compostable mixed solid waste.
- B. Sphagnum Peat: Partially decomposed sphagnum peat moss, finely divided or of granular texture, with a pH range of 3.4 to 4.8.
- C. Muck Peat: Partially decomposed moss peat, native peat, or reed-sedge peat, finely divided or of granular texture, with a pH range of 6 to 7.5, and having a water-absorbing capacity of 1100 to 2000 percent.
- D. Wood Derivatives: Decomposed, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture, free of chips, stones, sticks, soil, or toxic materials.
  - 1. In lieu of decomposed wood derivatives, mix partially decomposed wood derivatives with at least 0.15 lb of ammonium nitrate or 0.25 lb of ammonium sulfate per cubic foot of loose sawdust or ground bark.



- E. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.
- F. For bidding assume planting and seeding beds and areas be amended with 2 inches of compost tilled into the top 6 inches of finished grade.

## **2.5 FERTILIZERS**

- A. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 4 percent nitrogen and 20 percent phosphoric acid.
- B. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.
- C. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
  - 1. Composition: 1 lb/1000 sq. ft. of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
  - 2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.
- D. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition.
  - 1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.
  - 2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.
- E. For bidding assume 10 percent nitrogen, 6 percent phosphorus, and 4 percent potash by weight. At least 50 percent of total nitrogen shall contain no less than 3 percent water-insoluble nitrogen. At least 60 percent of nitrogen content shall be derived from super-phosphate containing not less than 18 percent phosphoric acid or bone meal containing 25 percent – 30 percent phosphoric acid and 2 – 3 percent nitrogen. Potash shall be derived from muriate of potash containing 55 – 60 percent potash.

## **2.6 PRE-EMERGENT HERBICIDE**

- A. Pre-emergent herbicide shall be as directed for condition by currently licensed herbicide applicator.

## **2.7 POST-EMERGENT HERBICIDE**

- A. Post-emergent herbicide shall be as directed for condition by currently licensed herbicide applicator.

## **2.8 WATER**

- A. Water shall be suitable for irrigation, free from oil, acid, alkali, salt or other substances harmful to plant life.

# **PART 3 EXECUTION**

## **3.1 EXAMINATION**

- A. The Contractor shall examine the entire site for conditions that will adversely affect execution, permanence and quality of work, and survival of plant materials. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Rough Grading Inspection - Contractor shall notify Owner's Representative a minimum of 72 hours in advance for inspection of rough grades.
- C. The Contractor shall verify that rough grades and slopes of areas to be planted areas are set at sufficient depth to allow for placement of specified materials. If the site is not suitable for landscaping operations, the Contractor shall perform necessary corrective work.

## **3.2 GENERAL PREPARATION OF GROUND SURFACES – ALL PLANTING OR SEEDING AREAS**

- A. The Contractor shall eliminate uneven areas and low spots, remove lumber, stones, sticks, mortar, concrete, rubbish, debris, contaminated soil and any other material harmful to plant life, in shrub and ground cover beds.
- B. The Contractor shall verify that invasive species and weeds have been eliminated prior to the placement of topsoil. The Contractor must not place topsoil until all living weed matter has been eliminated.
- C. Weed eradication shall include herbicide and non-herbicide methods. Eradication shall include and is not limited to elimination of the following invasive species and weeds:

Cirsium arvense (Canadian Thistle).

Convolvulus spp. (Morning Glory).

Cytisus scoparius (Scotch Broom).

Dipsacus sylvestris (Common Teasel).

Equisetum spp. (Horsetail).

Festuca arundinaceae (Tall Fescue).

Hedera helix (English Ivy).	Myriophyllum spicatum (Eurasian Milfoil).
Holcus canatus (Velvet Grass).	Phalaris arundinaceae (Reed Canary Grass).
Lolium spp. (Rye Grasses).	Rubus discolor (Himalayan Blackberry).
Lotus corniculatus (Bird's Foot Trefoil).	Solanum spp. (Nightshade).
Lythrium salicaria (Purple Loose Strife).	Trifolium spp. (Clovers).
Melilotus spp. (Sweet Clover).	

1. Herbicide application shall be by manual 'spot spraying', wicking, or backpack methods per manufacturer's specifications.
2. Herbicide application shall be as directed by a currently licensed applicator and shall be strictly applied by manufacturer's specifications, and applicable codes and regulations.
3. Remove invasive plant material after herbicide application has effectively stopped plant growth. Dispose legally off-site.
4. After initial spraying and removal of weeds, and prior to placing topsoil, the contractor shall water the subgrade sufficiently to germinate dormant weed seeds.
  - a. Prior to this weed crop producing seeds, the contractor shall spray these weeds with herbicide and remove them from the site.
  - b. Before continuing with topsoil placement the contractor shall verify with the Owner's Representative whether or not to repeat this treatment,
5. Selective hand removal by non-herbicide methods shall be utilized if herbicide application threatens existing plantings.
6. Existing or new plantings damaged or killed by herbicide application shall be replaced immediately at no additional cost to the Owner.

### 3.3 PLACING PLANTING SOILS

- A. Verify that planting soil is stockpiled in sufficient quantities to be placed at depths specified. The Contractor shall notify the Owner's Representative immediately if supplies are inadequate or do not meet specifications for topsoil. The Contractor shall provide imported topsoil meeting the requirements of this section if the supply of existing on-site topsoil is insufficient.
- B. Planting soil shall be placed at specified grades between any existing or constructed points on the site, such as curbs, walls, walks and paving.

### 3.4 SOIL PREPARATION IN PLANTING BEDS

- A. Prepare subgrade to depth as specified in Part 1 – General, Project Conditions

- B. Loosen subgrade of planting beds to a minimum depth of 4 inches. Remove stones larger than 1-inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
  - 1. Apply 16-16-16 fertilizer at a rate of 6 lbs. per 1000 s.f. directly to subgrade before loosening.
  - 2. Thoroughly blend planting soil mix off-site before spreading.
    - a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
    - b. Allow Mix line with dry soil before mixing fertilizer.
  - 3. Spread planting soil mix to a depth of 6 inches but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
    - a. Spread approximately 4 inches of planting soil mix over loosened subgrade. Mix thoroughly into top 2 inches of subgrade. Spread remainder of planting soil in 4-inch lifts.
    - b. Allow sufficient depth of topsoil placement to allow for finish grade to be one 1-inch below any paved surface after placement of bark mulch.
- C. Finish Grading: Grade planting beds to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.
- D. Restore planting beds if eroded or otherwise disturbed after finish grading and before planting.

### **3.5 SOIL PREPARATION IN SOD AND SEEDED LAWN AREAS**

- A. Limit lawn subgrade preparation to areas to be planted.
- B. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 4 inches. Remove stones larger than 1-inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
  - 1. Apply 16-16-16 fertilizer at a rate of 6 lbs. per 1000 s.f. directly to subgrade before loosening.
  - 2. Thoroughly blend planting soil mix off-site before spreading or spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil mix.
    - a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
    - b. Mix lime with dry soil before mixing fertilizer.
  - 3. Spread planting soil mix to a depth of 6 inches but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.

- a. Spread approximately 4 inches of planting soil mix over loosened subgrade. Mix thoroughly into top 2 inches of subgrade. Spread remainder of planting soil in 4-inch lifts.
  - b. Reduce elevation of planting soil to allow for soil thickness of sod.
- C. Unchanged Subgrades: If lawns are to be planted in areas unaltered or undisturbed by excavating, grading, or surface soil stripping operations, prepare surface soil as follows:
  - 1. Remove existing grass, vegetation, and turf. Do not mix into surface soil.
  - 2. Loosen surface soil to a depth of at least of 6 inches. Apply soil amendments and fertilizers according to planting soil mix proportions and mix thoroughly into top 4 inches of soil. Till soil to a homogeneous mixture of fine texture.
    - a. Apply 16-16-16 fertilizer at a rate of 6 lbs. per 1000 s.f. directly to subgrade before loosening.
  - 3. Remove stones larger than 1-inch in any dimension and sticks, roots, trash, and other extraneous matter.
  - 4. Legally dispose of waste material, including grass, vegetation, and turf.
- D. Seeded Grass:
  - 1. Rototill surface of seedbed to a minimum depth of 6 inches.
  - 2. Regrade and float to final finish grade, adding topsoil where required, with final grade to match existing or revised slopes, banks, etc. Grade to eliminate washing and puddles. Slope to drain water away from all buildings or structures.
- E. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus ½-inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit fine grading to areas that can be planted in the immediate future.
- F. Moisten prepared lawn areas before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- G. Restore areas if eroded or otherwise disturbed after finish grading and before planting.
  - 1. The Contractor is responsible to reimburse the Owner for the certified appraised value of any designated plant material damaged or removed without the approval of the Owner's Representative.

### **3.6 CLEANUP**

- A. Keep project site free from accumulation of debris, topsoil, and other material.
- B. At completion of each area of work, completely remove debris, equipment and surplus materials.

- C. Any paved area or surfaces stained or soiled from landscaping materials shall be cleaned with a power sweeper using water under pressure. Building surfaces shall be washed with proper equipment and materials as approved by the Owner's Representative.

**END OF SECTION**

## **SECTION 329219 – SEEDING**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### **1.2 SUMMARY**

- A. Work consists of providing all labor, material and equipment for installing and establishing seeded Field Grass, Lawn and other special seed mixes as indicated below.
  - 1. Plant and establish seed mixture(s) in areas shown on drawings.
- B. Related Sections include the following:
  - 1. Section 329113; Soil Preparation.

#### **1.3 DEFINITIONS**

- A. Finish Grade: Elevation of finished surface of planting soil.
- B. Manufactured Soil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- C. Planting Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.
- D. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill immediately beneath planting soil.

#### **1.4 SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Product Certifications: From seed vendor for each grass-seed mono-stand or mixture stating the botanical and common name and percentage by weight of each species and variety, and

percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

- 1. Certification of each seed mixture for turfgrass sod, identifying source, including name and telephone number of supplier.

- C. Product Certificates: For soil amendments and soil conditioners, signed by product manufacturer.

## **1.5 QUALITY ASSURANCE**

- A. Work performed as described in this section shall be done under the supervision of a contractor having experience in landscape construction.
- B. Work and material supplied shall comply with applicable requirements of the United States Department of Agriculture (USDA).
- C. Delivery, Storage, and Handling:
  - 1. Deliver grass seed in original containers showing analysis of seed mixture, percentage of pure seed, year of production, net weight, date of packaging and location of packaging. Damaged packages are not acceptable.
  - 2. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

## **1.6 PROJECT CONDITIONS**

- A. Season: Seed or sod only between March 15 and October 15.
- B. Weather conditions: Seeding is not permitted during the following conditions:
  - 1. Cold weather: When air or surface temperature is less than 32 degrees F.
  - 2. Hot weather: When air temperature is greater than 80 degrees F.
  - 3. Soil Temperature: When soil temperature is less than 55 degrees F.
  - 4. Wet weather: When ground becomes saturated.
  - 5. Windy weather. When wind velocity is greater than 10 mph.

## **1.7 SUBSTANTIAL COMPLETION**

- A. Substantial completion is achieved after the Contractor has installed all plants, seeding and associated materials, and provides Owner's Representative with a written request to inspect said work. Plant and seed areas will be considered substantially complete when in compliance with the following conditions as directed by the Owner's representative and documented by written acknowledgement of Owner's Representative.
  - 1. Plant Conditions: Healthy, free of pests and disease, and in vigorous condition.
  - 2. Turf: Healthy, free of pests and disease, and with 90 percent cover and no bare areas greater than six square inches.
  - 3. Roots: Seeding roots thoroughly knitted to the soil.



## **1.8 WARRANTY**

- A. The warranty of plant materials furnished and planted under this contract shall be for one full year from the date of Substantial Completion and written acceptance as specified herein.
- B. At the end of the warranty period, all seeded areas not meeting requirements of these specifications shall be reseeded with the same species and size as originally specified. Such replacement shall be made in the same manner as specified for the original plantings, and at no extra cost to the Owner. The warranty on reseeded areas shall be extended for one full season's cycle after reseeding has been completed.

## **PART 2 - PRODUCTS**

### **2.1 SEED MIXES**

- A. General
  - 1. Seed shall meet or exceed Blue Tag quality according to current Oregon Certified Seed Standards published by Oregon State University,
  - 2. Seeds shall be labeled in accordance with USDA Rules and Regulations under the Federal Seed Act.
  - 3. Seeds shall be furnished in sealed, standard containers unless written exception is granted.
  - 4. Noxious weed seed not to exceed 1% by weight.
  - 5. Seed that is wet or moldy or has been damaged in transit will not be accepted.
- B. The Contractor shall furnish suppliers certificate guaranteeing that the seed conforms to the above requirements and USDA certification. Seed shall be delivered to the contract site in unopened containers bearing the USDA and suppliers certificates.

### **2.2 WATER**

- A. Water shall be free from oil, acid, alkali, salt and other substances harmful to growth of grass, and shall be from a source approved prior to use.

### **2.3 MULCH**

- A. Straw Mulch: For use where manually or hydraulically applied seed is subject to wind or water erosion. Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.
- B. Sphagnum Peat Mulch: Partially decomposed sphagnum peat moss, finely divided or of granular texture, and with a pH range of 3.4 to 4.8.

- C. Muck Peat Mulch: Partially decomposed moss peat, native peat, or reed-sedge peat, finely divided or of granular texture, with a pH range of 6 to 7.5, and having a water-absorbing capacity of 1100 to 2000 percent.
- D. Compost Mulch: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch sieve; soluble salt content of 2 to 5 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
  - 1. Organic Matter Content: 50 to 60 percent of dry weight.
  - 2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.
- E. Wood-Cellulose Fiber Mulch: For use with the hydraulic application of grass seed and fertilizer.
  - 1. Biodegradable, dyed-wood, cellulose-fiber mulch.
  - 2. Dyed an appropriate color to facilitate visual metering of application materials.
  - 3. Nontoxic and free of plant-growth or germination inhibitors.
  - 4. Maximum moisture content of 15 percent air-dry basis.
  - 5. pH range of 4.5 to 7.5.
- F. Nonasphaltic Soil Tackifier: Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application; nontoxic and free of plant-growth or germination inhibitors. Tackifier shall be capable of penetrating soil surface and binding soil particles; shall provide an adhesive to hold seed and wood-cellulose fibers together and bond them to the soil; and shall be made from naturally occurring and biodegradable materials. Specified tackifier shall be J-Tac or approved equal, per manufacturer's specification for applicable condition, as manufactured by Reclamare Company, 20727 7th Avenue South, Seattle, Washington (206-824-2385).
- G. Asphalt Emulsion: ASTM D 977, Grade SS-1; nontoxic and free of plant-growth or germination inhibitors.

## **2.4 SPECIAL SEEDING AND MULCHING EQUIPMENT**

- A. Hydraulic equipment used for the application of fertilizer, seed and slurry of prepared wood-cellulose fiber shall have a built-in agitation system with an operating capacity sufficient to agitate, suspend and homogeneously mix the slurry specified. The slurry distribution lines shall be large enough to prevent stoppage. The discharge line shall be equipped with a set of spray nozzles that will provide even distribution of the slurry on the various slopes.

## **PART 3 - EXECUTION**

### **3.1 GENERAL PREPARATION**

- A. Verify that grading and soil preparation has been completed correctly.

1. Notify Owner's Representative of any discrepancies; do not proceed with work until discrepancies have been resolved.
- B. Notify Owner's Representative at least 24 hours prior to planting or seeding operations. Owner's Representative will inspect soil preparation, plant materials and plant orientation.

### **3.2 LAWN PREPARATION**

- A. Limit lawn subgrade preparation to areas to be planted. Prepare Sodded Lawn and Seeded areas as directed in Division 2, Soil Preparation.

### **3.3 SEEDING (all seeded areas)**

- A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
  1. Do not use wet seed or seed that is moldy or otherwise damaged.
- B. Rake seed lightly into top 1/8 inch of topsoil, roll lightly, and water with fine spray.
- C. Protect seeded areas with slopes exceeding 1:6 with erosion-control fiber mulch and 1:4 with erosion-control blankets or mats installed and stapled according to manufacturer's written instructions.
- D. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket 1-1/2 inches in loose depth over seeded areas. Spread by hand, blower, or other suitable equipment.
  1. Anchor straw mulch by crimping into topsoil with suitable mechanical equipment.
  2. Bond straw mulch by spraying with asphalt emulsion at the rate of 10 to 13 gal./1000 sq. ft.. Take precautions to prevent damage or staining of structures or other plantings adjacent to mulched areas. Immediately clean damaged or stained areas.
- E. Protect seeded areas from hot, dry weather or drying winds by applying compost mulch within 24 hours after completing seeding operations. Soak and scatter uniformly to a depth of 3/16-inch and roll to a smooth surface.

### **3.4 HYDROSEEDING**

- A. Hydroseeding: Mix specified seed, fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.
  1. Mix slurry with nonasphaltic tackifier.

2. Apply slurry uniformly to all areas to be seeded in a one-step process. Apply mulch at a minimum rate of 1500-lb/acre dry weight but not less than the rate required to obtain specified seed-sowing rate.
3. Apply slurry uniformly to all areas to be seeded in a two-step process. Apply first slurry application at a minimum rate of 500-lb/acre dry weight but not less than the rate required to obtain specified seed-sowing rate. Apply slurry cover coat of fiber mulch at a rate of 1000 lb/acre.

### **3.5 FIRST MOWING**

- A. Mow turf and other 'manicured' seed areas when seed has germinated to a thick stand 4 inches in height, to 1-1/2 inches from ground level with a sharp, sterile, power mower. Remove clippings and dispose legally offsite or cut turf with 'mulching' mower of sufficient power to thoroughly cut and distribute clippings at soil level of lawn.
- B. Mow Field Grass when seed has germinated to a thick stand leaving no bare spots larger than 4 inches in diameter. Remove clippings and dispose legally offsite.

### **3.6 ACCEPTANCE OF SEEDED AREAS**

- A. Satisfactory Seeded Areas: Unless otherwise specified all seeded areas shall at the time of substantial completion, exhibit a healthy, uniform, close stand of the specified seed mix, free of weeds and surface irregularities, with coverage of mix in specified proportions, exceeding 90 percent over any 10 sq. ft. and bare spots not exceeding 5 by 5 inches.
- B. Satisfactory Seeded Turf: At the time of substantial completion, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. and bare spots not exceeding 5 by 5 inches.
- C. Satisfactory Sodded Turf: At the time of substantial completion, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, open joints, bare areas, and surface irregularities.
- D. Reestablish turf that does not comply with requirements and continue maintenance until lawns are satisfactory.

### **3.8 CLEANUP, PROTETION AND ACCEPTANCE**

- A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.
- C. Remove non-degradable erosion-control measures after grass establishment period.
- D. Obtain written Conditional Acceptance from the Owner's Representative after all turf areas have been mowed at least twice.

**END OF SECTION**

## **SECTION 33 11 00 – WATER DISTRIBUTION PIPING**

### **PART 1 GENERAL**

#### **1.1. RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections:
  - 1. Section 31 23 17 “Trenching”
  - 2. Section 33 12 00 “Water Appurtenances”
- C. City of Beaverton Design and Construction Standards.
- D. AWWA – American Water Works Association.
- E. Oregon Plumbing Specialty Code.

#### **1.2. SUMMARY**

- A. Work of this section consists of furnishing and installing pipe and fittings for potable water line and fire water line in accordance with the applicable requirements of the standards listed below.
  - 1. Project Drawings
  - 2. Public Right-of-Way: All public work construction in the public right-of-way shall be in accordance with the applicable requirements of the City of Beaverton Design and Construction Standards.

#### **1.3. SUBMITTALS**

- A. Section 01 33 00 – Submittal Procedures: Requirements for submittals
- B. Product Data: Submit data on pipe materials, pipe fittings, valves, and accessories.
- C. Manufacturer’s Certificate: Certify products meet or exceed specified requirements.
- D. Project Record Documents: Record as-constructed locations of piping mains, valves, connections, thrust restraints, and invert elevations.
- E. Identify and describe unexpected variations to subsoil conditions or discovers of uncharted utilities.

#### **1.4. QUALITY ASSURANCE**

- A. Perform Work in accordance with City of Beaverton Design and Construction Standards.

#### **1.5. DELIVERY, STORAGE, AND HANDLING**

- A. Deliver and store valves in shipping containers with manufacturer’s name and pressure rating labeling in place.

- B. Store pipe and pipe materials in designated areas on-site.
- C. Store polyethylene materials out of sunlight.

## **PART 2 PRODUCTS**

### **2.1. WATER PIPING**

- A. Public Water mains 6" and larger.
  - 1. Push-on joint Ductile Iron Pipe, Class 52, cement-mortar lined conforming to ANSI/AWWA C104/A 21.4 and ANSI A21.51. Rubber ring gaskets shall conform to ANSI A21.11, suitable for the specified pipe sizes and pressures. Fitting joints shall be mechanical joint ends.
- B. Private water lines 4" and larger.
  - 1. Push-on joint Ductile Iron Pipe, Class 52, cement-mortar lined conforming to ANSI/AWWA C104/A 21.4 and ANSI A21.51. Rubber ring gaskets shall conform to ANSI A21.11, suitable for the specified pipe sizes and pressures. Fitting joints shall be mechanical joint ends.
  - 2. PVC AWWA C-900 and AWWA C905, designated for potable water use. Class DR 18, 150 psi, and DR 14, 200 psi.
- C. Private water lines 3" and smaller
  - 1. Uponor AquaPEX, designated for potable water use.

### **2.2. FITTINGS**

- A. Ductile Iron Fittings shall conform to ANSI / AWWA C110 / A21.10 and/or ANSI / AWWA C153/ A 21.53, class 350. Fitting joints shall have mechanical joint (MJ) ends.
- B. Mechanical Joint Fittings and Restraints
  - 1. Mechanical joint fittings shall be ductile iron short pattern.
  - 2. Fittings shall conform to ANSI / AWWA C110 / A21.10 and shall be of a class at least equal to that of the adjacent pipe.
  - 3. Bolts shall be Cor-Ten or ductile iron tee-head bolts.
  - 4. Mechanical Joint Restraints.
    - a. The restraint shall be MEGALUG Series 1100 restraint device as manufactured by EBAA Iron, Inc. or equal.
- C. Flanged Fittings
  - 1. Flanged fittings shall conform to ANSI / AWWA C110/A21.10 and shall be faces and drilled Class 124 flanges that match ANSI B16.1 fittings.
  - 2. Flanged fittings shall be ductile iron.

3. Flange bolts and nuts shall be Grade 304 or 316 stainless steel with standard course threads. Threads on bolts and nuts shall be coated with a food grade anti-seize material to prevent thread galling.
- D. Gaskets
1. Gasket material for flanged joints in ductile iron pipe shall consist of 1/8-inch thick, full-face one-piece, cloth inserted, rubber gaskets conforming to section 4 of ANSI/ AWWA C207 and ANSI B16.21.
- E. Joints
1. Joints shall be restrained using either mechanical joint restraints, Field Lok™ (Tyton), or approved equal.
- F. Thrust Blocks and Straddle Blocks
1. Use thrust block and straddle block materials shall be 3,500 psi minimum compressive strength concrete and installed per Standard Details.

## **PART 3 EXECUTION**

### **3.1. PREPARATION**

- A. Verify existing utility water main size, location and inverts are as indicated on the Drawings.

### **3.2. EXCAVATION**

- A. Excavate pipe trench in accordance with Section 31 23 17 Trenching. Hand trim excavation for accurate placement of pipe to elevations indicated on Drawings.

### **3.3. INSTALLATION**

- A. Install ductile iron pipe and fittings in accordance with AWWA C600 and manufactures' instructions and as shown on the Contract Drawings.
- B. Install PVC pipe in accordance with AWWA C605 and manufactures' instructions.
- C. Install water pipe in conformance with City of Beaverton Design and Construction Standards.

### **3.4. DISINFECTION AND TESTING**

- A. Disinfection and testing shall be in conformance with City of Beaverton Standards.

## **END OF SECTION**