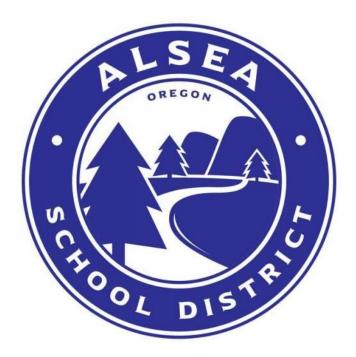
# **PROJECT MANUAL**

# **ALSEA SCHOOL DISTRICT**

**POWER PANEL ROOM & HALLWAY ADDITION** PHASE 1b-7



# 100% AGENCY & BID ISSUE 27 JANUARY 2022

SITE ADDRESS: ALSEA SCHOOL DISTRICT 301 SOUTH 3<sup>rd</sup> STREET ALSEA, OREGON 97324



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# **PROJECT TEAM**



# **OWNER:**

ALSEA SCHOOL DISTRICT 301 SOUTH 3<sup>rd</sup> STREET ALSEA, OREGON 97324



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# SECTION 011000 - SUMMARY OF WORK AND GENERAL REQUIREMENTS

# PART 1 - GENERAL

# 1.1. RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.
- 1.2. DESCRIPTION OF THE PROJECT

A 783 sf. Addition to the existing Alsea School building. The Addition will consist of new construction including a power panel room and interconnecting hallway with integral ADA ramps. The hallway will serve to connect the existing main building to the current existing woodshop.

Future phases that will impact this project will include; walk-in coolers (to be added to the west portion of the new hallway and a power panel room phase (1a.2) and will consist of electrical panels, building electrical entrance, transfer switch, meter and service panels. The school will be occupied during the school year. There is NO asbestos abatement required for this phase of the project.

FUTURE BOND PHASES (Listed for reference purposes only, see

- 1a2 NEW POWER SERVICE CONSTRUCTION
- 1a3 NEW VOC / CTIL SHOP
- 1c9 HVAC CLASSROOM UPGRADES
- 1c11 NEW 6-8TH CLASSROOM BUILDING
- 1c13 NEW HALL AT METAL BUILDING & TEACHERS BREAK
- 2a14 OLD BOILER ROOM DEMOLITION
- 2b15 CAFETERIA & KITCHEN RE-PURPOSE
- 2c3 FRONT OFFICE REMODEL
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- 2c25 COMMUNITY CENTER ADDITION
- 2c26 OLD KITCHEN CLASSROOM RE-PURPOSE

# 1.3. CONTRACT DOCUMENTS

A. The Contract Documents for the Work are entitled:

POWER PANEL ROOM & HALLWAY ADDITION PHASE 1b-7 Alsea Rock School District

- B. The Contract Documents are dated; 2-1-22, 2-2-21, 1-12-21, ,1-15-22, 1-17-21
- 1.4. TYPE OF CONTRACT
  - A. Project will be constructed under a prime contract with project CM/GC.
- 1.5. WORK PHASES
  - A. The work shall be conducted in a singular overall phase. See section 1.2 for project delivery.
  - B. See section 013200 for scheduling requirements.
- 1.6. USE OF PREMISES
  - General: Contractor shall have use of premises for construction operations, including use of designated areas of the Project site, during the construction period.
     Contractor's use of premises is limited by Owner's right to continually occupy facility, perform work or to retain other contractors on portions of Project.
  - B. Use of Site: Limit use of premises indicated on the Drawings. This area will be further defined at the preconstruction meeting. Do not disturb portions of Project site beyond areas in which the Work is indicated.
  - C. Contractor shall maintain roads and streets surrounding the project site in an accessible and clean condition throughout the construction period.
    - 1. Roads and streets surrounding the project site shall not be blocked to vehicle traffic at any time by operations under this Contract.
    - 2. Contractor shall remove and sweep construction debris due to work under this Contract from paved sidewalks, roads and streets adjacent to and in direct vicinity of the site on a daily basis.
    - 3. Contractor and construction personnel shall not park equipment or personal vehicles along roads and streets surrounding the project site, nor in a manner to

disrupt traffic flow or access to any adjacent properties.

- 4. Contractor shall not enter adjacent properties, private driveways, etc., for any reason. Do not use adjacent properties or private driveways for vehicle turn-around.
- 5. Contractor shall not drive on, park on, or store equipment or materials on properties adjacent to the site without the express written permission of the owner of such properties. Materials stored on adjacent properties shall not be considered as "stored on site" for determining amounts of payments owed to Contractor.
- 1.7. OWNER'S OCCUPANCY REQUIREMENTS
- A. Owner Occupancy of existing facility: Owner will occupy and use the facility during construction in this project. The contractor shall adhere to this owner's right.
- 1.8. WORK RESTRICTIONS
- A. On-Site Work Days and Hours:

# Construction activities can occur Monday through Friday 7 a.m. to 5:30 p.m. expanded work days or hours may be allowed by the CM/GC on an as needed justifiable basis.

- A. Existing Utility Interruptions: Do not interrupt utilities serving others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
  - 1. Notify Owners Authorized Representative not less than three days in advance of proposed utility interruptions.
  - 2. Do not proceed with utility interruptions without Owners Authorized Representative permission
- 1.9. SPECIFICATION FORMATS AND CONVENTIONS
- A. Specification Format: The Specifications are organized into Divisions and Sections using the 50-division format and CSI/CSC's "Master Format" numbering system.
  - 1. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents

- 2. Division 01: Sections in Division 01 govern the execution of the Work of all Sections in the Specifications.
- B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
  - 1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
  - 2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
    - a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

# 1.10. FIRE RATED ASSEMBLIES

- A. Fire rated construction shall conform to all requirements of fire rated assemblies referenced on the Drawings described in the Specifications, and/or included in appendices in the Project Manual.
  - 1. The Contractor shall provide all components necessary to conform to any and all referenced assemblies.

# 1.11. STORM WATER CONTROL

A. Contractor shall implement all provisions of storm water control and pollution prevention requirements contained in the Contract Documents. Contractor shall conform to all requirements of United States Environmental Protection Agency (EPA) "National Pollutant Discharge Elimination System" regulations and make required applications to EPA. Storm water control and pollution prevention plans will remain available for review at Construction Manager's construction office throughout the course of the Work.

# 1.12. OWNERSHIP OF REMOVALS

A. The Contractor shall be responsible for any and all demolition and removal as may be

necessary and required to fulfill the requirements of the Contract Documents.

- B. All removals shall belong to the Contractor and shall be removed from the premises by him and legally disposed of at his expense.
- 1.13. WORK NOT NOTED, DETAILED, OR SPECIFIED
  - A. All work required for a complete installation or assembly shall be included in the Contractor's Contract Price. Where minor portions of required work are not noted, detailed or specified, such work shall be done in accordance with proven construction practice, industry standards, or as directed by Architect. Such required work shall be done at no additional cost to Owner.

Provide all means, methods, labor, materials, and equipment to provide project scope of work as defined in the contract documents. All associated work shall be completed, per manufacturer's specifications, building codes, ordinances and requirements, and other trades and/or as directed by Owners Authorized Representative

- 1.14. DIMENSIONS AND MEASUREMENTS
  - A. Contractor shall field verify all dimensions pertaining to the work and shall be responsible for the determination of all quantities of materials required for the work and for the accuracy of all dimensions of materials and items fabricated for this project. Contractor shall not rely on the scale drawings in the project Drawings in the determination of exact quantities or dimensions.
- 1.15. GENERAL INSTALLATION PROVISIONS
  - A. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Installation of affected components shall not proceed until unsatisfactory conditions have been corrected in an acceptable manner.
  - B. Manufacturer's Instructions. Contractor shall comply with manufacturer's installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents.
  - B. Contractor shall inspect materials or equipment immediately upon delivery and prior to installation and shall reject damaged and defective items.
  - C. Contractor shall provide all attachment and connection devices and methods necessary for securing Work. Secure Work true to line and level. Allow for expansion and building movement.

- E. Visual Effects: Contractor shall provide uniform joint widths in exposed Work. Arrange joints in exposed Work to obtain the best visual effect. Refer questionable choices to Architect for final decision.
- F. Contractor shall check and recheck measurements, dimensions, and elevations before starting each installation and shall be responsible for the accuracy of all measurements, dimensions, and elevations.
- G. Contractor shall install each component during acceptable weather conditions.
- H. Mounting Heights: Where mounting heights are not indicated, Contractor shall install individual components at standard mounting heights recognized within the industry for the particular application indicated. Refer questionable mounting height decisions to the Architect for final decision. Mount items on walls to conform to the requirements of the Americans with Disabilities Act.
- I. Blocking and Backing: Contractor shall provide blocking and backing in walls, ceiling, etc., for all items mounted on walls, ceilings, etc., for which blocking and backing is required. Verify blocking and backing requirements for all wall and ceiling mounted items and provide such blocking and backing at no additional cost to the Owner, whether or not such items and / or blocking are indicated on the Drawings. Verify all blocking and backing is installed prior to installation of finish materials. Contractor shall include, but not limit to, blocking and backing for the following:
  - 1. Other wall and ceiling mounted items and indicated Owner furnished / Contractor installed items
  - 2. Mechanical, plumbing, and electrical items, fixtures, and equipment.

# 1.16. CLEANING AND PROTECTION

- A. During handling and installation, The Contractor shall clean and protect construction in progress and adjoining materials in place. Apply protective coverings where required to ensure protection from damage or deterioration at Substantial Completion.
- B. The Contractor shall clean and maintain completed construction as frequently as necessary through the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- C. Limiting Exposures: The Contractor shall supervise construction activities to ensure that no part of the construction completed or in progress, is subject to harmful, dangerous, damaging or otherwise deleterious exposure from any source during the construction period.

# 1.17. REQUIREMENTS OF DRAWINGS AND SPECIFICATIONS

A. All items of Work shown or noted on the Drawings and / or described in the Project Manual shall be provided by the Contractor as a part of his Work. Should an item be shown or noted on the Drawings and not described in the Project Manual, the Contractor shall provide the item at no additional cost to the Owner. Should an item be described in the Project Manual and not shown or noted on the Drawings, the Contractor shall provide the item at no additional cost to the Owner.

# 1.18. CONTRACTOR'S STAGING AREA

A. Initial Staging areas include immediate areas surrounding area of work. Specific areas will be discussed more in depth at the Pre-construction meeting and shall be further defined by the CM/GC.

END OF SECTION 011000

# SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

### PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.

#### 1.3 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions." Or on another form which the Architect deems appropriate.

#### 1.4 PROPOSAL REQUESTS (PR) / CHANGE ORDER REQUESTS (COR)

- A. Owner-Initiated Proposal Requests / Change Order Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
  - 1. Proposal Requests issued by Architect are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
  - 2. Within time specified in Proposal Request after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
    - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.

- c. Include costs of labor and supervision directly attributable to the change.
- d. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
- B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change to Architect.
  - Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
  - 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
  - 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
  - 4. Include costs of labor and supervision directly attributable to the change.
  - 5. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
  - 6. Comply with requirements in Division 01 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.
- C. Proposal Request Form: Use AIA Document G709 for Contractor initiated Proposals, or on another form which the Architect deems appropriate.

# 1.5 CHANGE ORDER PROCEDURES (CO)

- A. On Owner's approval of a Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on form provided by Owner.
- B. Any Change Order prepared, including but not limited to those arising by reason of the parties' mutual agreement or by mediation, shall constitute a final and full settlement of all matters relating to or affected by the change in the work, including, but not limited to, all direct, indirect and consequential costs associated with such change and

any and all adjustments to the Contract Sum and Contract Time. In the event a Change Order increases the Contract Sum, the Contractor shall include the work covered by such Change Order in the Application for Payment as if such work were originally part of the Project and Contract Documents.

C. By the execution of a Change Order, the Contractor agrees and acknowledges that he has had sufficient time and opportunity to examine the change in work which is the subject of the Change Order and that he has undertaken all reasonable efforts to discover and disclose any concealed or unknown conditions which may to any extent affect the Contractor's ability to perform in accordance with the Change Order. Aside from those matters specifically set forth in the Change Order, the Owner shall not be obligated to make any adjustments to either the Contract Sum or Contract Time by reason of any conditions affecting the change in work addressed by the Change Order, which could have reasonably been discovered or disclosed by the Contractor's examination.

# 1.6 CONSTRUCTION CHANGE DIRECTIVE (CCD)

- A. Construction Change Directive: Architect may issue a Construction Change Directive on form provided by Owner. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
  - 1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
  - 1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

# **1.7 ARCHITECTS SUPPLEMENTAL INSTRUCTIONS**

A. (ASI) are issued by the Architect to clarify the documents, reply to RFI's, request additional work or to make minor changes to the project documents. The Contractor shall review the ASI for potential cost or time implications to the contract. If the contractor believes an ASI contains added work or changes that involve increases or decreases in the contract amount or time, the contractor shall provide a Change order Request (COR) to the Architect so as to start a change in the contract.

END OF SECTION 012600

# SECTION 014000 - QUALITY REQUIREMENTS

# PART 1 - GENERAL

# 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

# 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
  - 1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
  - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
  - 3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owners Authorized Representative, or authorities having jurisdiction are not limited by provisions of this Section.

#### 1.3 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect
- C. Mockups: Full-size, physical assemblies that are constructed on-site. Mockups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review

construction, coordination, testing, or operation; they are not Samples. Approved mockups establish the standard by which the Work will be judged.

- D. Laboratory Mockups: Full-size, physical assemblies that are constructed at testing facility to verify performance characteristics.
- E. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
- F. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.
- G. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.
- H. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- I. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- J. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
  - 1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to trades people of the corresponding generic name.
- K. Experienced: When used with an entity, "experienced" means having successfully completed previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

# 1.4 CONFLICTING REQUIREMENTS

A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and

requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

# 1.5 SUBMITTALS

- A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- B. Reports: Prepare and submit certified written reports FOR contractor provided tests and inspections that include the following:
  - 1. Date of issue.
  - 2. Project title and number.
  - 3. Name, address, and telephone number of testing agency.
  - 4. Dates and locations of samples and tests or inspections.
  - 5. Names of individuals making tests and inspections.
  - 6. Description of the Work and test and inspection method.
  - 7. Identification of product and Specification Section.
  - 8. Complete test or inspection data.
  - 9. Test and inspection results and an interpretation of test results.
  - 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
  - 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
  - 12. Name and signature of laboratory inspector.
  - 13. Recommendations on re-testing and re-inspecting.
- C. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

# 1.6 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful inservice performance, as well as sufficient production capacity to produce required units.
- D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.
- F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
  - 1. Requirement for specialists shall not supersede building codes and regulations governing the Work.
- G. Testing Agency Qualifications: An independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
- H. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
  - 1. Contractor responsibilities include the following:
    - a. Provide test specimens representative of proposed products and construction.

- b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
- c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
- d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
- e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
- f. When testing is complete, remove test specimens, assemblies, mockups, and laboratory mockups; do not reuse products on Project.
- 2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, Owner, and Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
- I. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
  - 1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
  - 2. Notify Architect ten days in advance of dates and times when mockups will be constructed.
  - 3. Demonstrate the proposed range of aesthetic effects and workmanship.
  - 4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
    - a. Allow ten days for initial review and each re-review of each mockup.
  - 5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
  - 6. Demolish and remove mockups when directed, unless otherwise indicated.

# 1.7 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
  - 1. Owners Authorized Representative will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.

- 2. Costs for retesting and re-inspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.
- B. Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
  - 1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
    - a. Contractor's testing agency shall be acceptable to Owner and Architect.
    - b. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
  - 2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
  - 3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
  - 4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
  - 5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 01 Section "Submittal Procedures."
- D. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- E. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
  - 1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
  - 2. Determine the location from which test samples will be taken and in which insitu tests are conducted.
  - 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.

- 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
- 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
- 6. Do not perform any duties of Contractor.
- F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel but not less than 24 hours in advance of operations requiring tests and inspections. Provide the following:
  - 1. Access to the Work.
  - 2. Incidental labor and facilities necessary to facilitate tests and inspections.
  - 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
  - 4. Facilities for storage and field curing of test samples.
  - 5. Delivery of samples to testing agencies.
  - 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
  - 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- G. Coordination: Coordinate sequence of activities to accommodate required qualityassurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
  - 1. Schedule times for tests, inspections, obtaining samples, and similar activities.

# 1.8 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Owner will engage a qualified testing agency and / or special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:
  - 1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
  - 2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
  - 3. Submitting a certified written report of each test, inspection, and similar qualitycontrol service to Architect with copy to Contractor and to authorities having jurisdiction.

- 4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
- 5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
- 6. Retesting and reinspecting corrected work.

# PART 2 - PRODUCTS (Not Used)

# PART 3 - EXECUTION

# 3.1 TEST AND INSPECTION LOG

- A. Prepare a record of tests and inspections. Include the following:
  - 1. Date test or inspection was conducted.
  - 2. Description of the Work tested or inspected.
  - 3. Date test or inspection results were transmitted to Architect.
  - 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

# 3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
  - 1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
  - 2. Comply with the Contract Document requirements for Division 01 Section "Cutting and Patching."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

# SECTION 014200 - REFERENCES

### PART 1 - GENERAL

# 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

# 1.2 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.
- J. "Owner": When applicable to providing direction during the project as it directly relates to activities which impact schedule and cost, the owner shall be understood to

#### REFERENCES

be the 'Owners Authorized Representative Aka CM/GC' whom is introduced as such in the established Pre-Construction meeting.

K. "CM/GC": Construction Manager / General Contractor shall be the 'owners Representative as defined herein.

# 1.3 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
  - 1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

#### 1.4 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Thomson Gale's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."
- B. As contained on construction documents: Refer to abbreviations listed on drawing sheets of the construction documents, whereas they apply to each specific sheet contained therein.

END OF SECTION 014200

# SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

#### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

A. Drawings and provisions of The Contract Sections apply to this Section.

#### 1.2 SUMMARY

A. This Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

#### 1.3 USE CHARGES

- A. General: Cost or use charges for temporary facilities shall be included in the Contract Sum. Consult CM/GC for shared facility coordination
- B. Water Service: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.
- C. Electric Power Service: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.
  - 1. If on site conditions require; Contractor shall supplement existing building electrical system with portable generators as required to pursue the Work. Such generators and fuel shall be provided at no additional cost to Owner.

#### 1.4 QUALITY ASSURANCE

- A. Electric Service: Comply with all applicable standards and regulations for temporary electric service.
- B. PRODUCTS (NOT USED)

# PART 2 - EXECUTION

### 2.1 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed.

#### 2.2 TEMPORARY UTILITY INSTALLATION

- A. Water Service: Use of Owner's existing water service facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owners Authorized Representative. Refer to Paragraph 1.3.B. above.
  - 1. Where installations below an outlet might be damaged by spillage or leakage, provide a drip pan of suitable size to minimize water damage. Drain accumulated water promptly from pans.
- B. Electric Power Service: Use of Owner's existing electric power service will be permitted, as long as equipment is maintained in a condition acceptable to Owners Authorized Representative. Refer to Paragraph 1.3.C. above.
- C. Telephone Service: Provide temporary telephone service. A Cellular telephone is acceptable.

#### 2.3 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
  - 1. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owners Authorized Representative.
- B. Parking: Use designated existing parking areas for construction personnel.
   Coordinate such use with the Owners Authorized Representative when the facility is being used or is occupied during construction activities.

- C. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction.
- D. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
  - 1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

# 2.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects. Provide measures to prevent discharge of airborne dust in accordance with requirements of applicable jurisdictions.
- B. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- C. Temporary Protectives: Provide temporary Protective measures for protection of construction, existing, in progress and completed, from exposure, water from any source, foul weather, other construction operations, and similar activities.
- D. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.
- E. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
  - 1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.
- F. Stormwater Control: Comply with authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- G. Tree and plant Protection: Protect trees and root systems from damage, flooding, and erosion.

# 2.5 PROTECTION OF BUILDING OCCUPANTS AND VISITORS

- A. Contractor shall provide all protections, barricades, warning devices, etc. as necessary to protect building occupants and visitors.
- B. Contractor shall remove tools, cords, construction materials, debris, etc. from occupant and visitor accessible work areas at the end of each work period.
- C. Contractor shall not leave work areas, tools, equipment, etc. unsupervised at any time.

# 2.6 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
- C. Termination and Removal: Remove each temporary facility when need for its service has ended, or no later than Substantial Completion. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
  - 1. Materials and facilities that constitute temporary facilities are property of Contractor. Consider inserting specific removal requirements, as illustrated in first subparagraph below.
  - 2. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section "Closeout Procedures."

END OF SECTION 015000

# SECTION 016000 - PRODUCT REQUIREMENTS

#### PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and product substitutions.
- B. Contractor shall incorporate into the Work only those products specified, indicated as basis-of-design products, those products approved in addenda, or as approved after award of Contract under conditions set forth in Paragraphs 1.4 and 2.2 below.

#### 1.3 DEFINITIONS

- A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
  - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
  - 2. New Products: Items that have not previously been incorporated into another project or facility, except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.
  - 3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

- B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
- C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics.

# 1.4 SUBMITTALS

- A. Substitution Requests: Submit Digital PDF's of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
  - 1. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
    - a. Statement indicating why specified material or product cannot be provided.
    - b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
    - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
    - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
    - e. Samples, where applicable or requested.
    - f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and Owners Authorized Representative.
    - g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
    - h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
    - i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction

cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.

- j. Cost information, including a proposal of change, if any, in the Contract Sum.
- k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
- I. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
- 2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within 10 days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or 10 days of receipt of additional information or documentation, whichever is later.
  - a. Form of Acceptance: Change Order.
  - b. Use product specified if Architect cannot make a decision on use of a proposed substitution within time allocated.

# 1.5 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.
  - 1. Contractor is responsible for providing products and construction methods compatible with all other products and construction methods of other contractors.

# 1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
  - 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.

- 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
- 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
- 4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

# C. Storage:

- 1. Store products to allow for inspection and measurement of quantity or counting of units.
- 2. Store materials in a manner that will not endanger Project structure.
- 3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
- 4. Store cementitious products and materials on elevated platforms.
- 5. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
- 6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
- 7. Protect stored products from damage and liquids from freezing.
- 8. Provide a secure location and enclosure at Project site for storage of materials and equipment by contractor's construction forces. Coordinate location with Owners Authorized Representative.

# 1.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
  - 1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
  - 2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.

- 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
- 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.
- 3. Refer to Divisions 02 through 49 Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures."

# PART 2 - PRODUCTS

# 2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.
  - 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
  - 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
  - 3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
  - 4. Where products are accompanied by the term "as selected," Architect will make selection.
  - 5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
  - 6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
  - Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with provisions in Part 2 "Comparable Products" Article to obtain approval for use of an unnamed product.
- B. Product Selection Procedures:
  - 1. Product: Where Specifications name a single product and manufacturer, provide the named product that complies with requirements.
  - 2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements.

- 3. Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
- 4. Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
- Available Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.
- Available Manufacturers: Where Specifications include a list of manufacturers, provide a product by one of the manufacturers listed, or an unnamed manufacturer, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.
- Product Options: Where Specifications indicate that sizes, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide the specified product or system. Comply with provisions in Part 2 "Product Substitutions" Article for consideration of an unnamed product or system.
- 8. Basis-of-Design Product: Where Specifications name a product, provide the specified product. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Products by other manufacturers are subject to approval by way of a substitution request submitted to the Architect prior to issuance of the defined legal day for the last addendum.
- 9. Visual Matching Specification: Where Specifications require matching an established Sample, select a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
  - a. If no product available within specified category matches and complies with other specified requirements, comply with provisions in Part 2 "Product Substitutions" Article for proposal of product.
- 10. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product that complies with other specified requirements.
  - a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.
  - b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern,

density, or texture from manufacturer's product line that includes both standard and premium items.

## 2.2 PRODUCT SUBSTITUTIONS

- A. Timing: Following award of Contract, Architect will consider requests for substitution for products specified, or approved by addendum under any or all of the following conditions:
  - 1. The specified product cannot be provided within the Contract Time. The request will not be considered if the product cannot be provided as a result of the Contractor's failure to pursue the Work promptly or coordinate activities properly.
  - 2. The specified product cannot receive necessary approvals by governing authorities and the requested substitution con be approved.
  - 3. A substantial advantage is offered the Owner, in terms of cost, time, energy conservation or other considerations of merit, after deducting offsetting responsibilities the Owner may be required to bear. Additional responsibilities for the Owner may include additional compensation to the Architect for redesign and evaluation services, increased cost of other construction by the Owners Authorized Representative or separate Contractors, and similar considerations.
  - 4. The specified product cannot be provided in a manner that is compatible with other materials, or cannot be properly coordinated, warranted, or insured, and where the Contractor certifies that the substitution will overcome the deficiency.
- B. By making a request for substitution, contractor warrants that:
  - 1. Requested substitution does not require extensive revisions to the Contract Documents.
  - 2. Requested substitution is consistent with the Contract Documents and will produce indicated results.
  - 3. Substitution request is fully documented and properly submitted.
  - 4. Requested substitution will not adversely affect Contractor's Construction Schedule.
  - 5. Requested substitution has received necessary approvals of authorities having jurisdiction.
  - 6. Requested substitution is compatible with other portions of the Work.
  - 7. Requested substitution has been coordinated with other portions of the Work.
  - 8. Requested substitution provides specified warranty.
  - 9. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

10. If reference to a special warranty form was added where a single warranty must cover work by several contractors, insert form here and delete "Not Used" above.

END OF SECTION 016000

#### SECTION 017300 - EXECUTION

#### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
  - 1. Construction layout.
  - 2. General installation of products.
  - 3. Progress cleaning.
  - 4. Protection of installed construction.
  - 5. Correction of the Work.

#### 1.3 SUBMITTALS

- A. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal, if any.
- PART 2 PRODUCTS (Not Used)

#### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existing construction affecting the Work.
- B. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

- 1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
  - a. Description of the Work.
  - b. List of detrimental conditions, including substrates.
  - c. List of unacceptable installation tolerances.
  - d. Recommended corrections.
- 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
- 3. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

## 3.2 PREPARATION

- A. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- B. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- C. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

#### 3.3 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
  - 1. Make vertical work plumb and make horizontal work level.
  - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated or as indicated on Drawings or as specified, whichever is the more stringent requirement.

- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- F. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
  - 1. Allow for building movement, including thermal expansion and contraction.
- G. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- H. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

## 3.4 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
  - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
  - 2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F (27 deg C).
  - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
  - 1. Remove liquid spills promptly.

- 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Burying or burning waste materials on-site shall not be permitted. Washing waste materials down sewers or into waterways shall not be permitted.
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

## 3.5 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

## 3.6 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 01 Section "Cutting and Patching."
  - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.

- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- 3.7 PROGRESS STAGING AND TOOL COLLECTION
  - A. General: Collect, gather and collect all tools at days end.

END OF SECTION 017300

## SECTION 017329 - CUTTING AND PATCHING

## PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

A. This Section includes procedural requirements for cutting and patching.

## 1.3 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.
- B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

#### 1.4 SUBMITTALS

- A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 5 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:
  - 1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
  - 2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
  - 3. Products: List products to be used and firms or entities that will perform the Work.
  - 4. Dates: Indicate when cutting and patching will be performed.
  - 5. Utility Services and Mechanical/Electrical Systems: List services/systems that cutting and patching procedures will disturb or affect. List services/systems that will be relocated and those that will be temporarily out of service. Indicate how long services/systems will be disrupted.

- 6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
- 7. Architect's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

## 1.5 QUALITY ASSURANCE

- A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
- B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
- C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
- D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- E. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

## 1.6 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties, if any.

# 1.7 MATERIALS

A. General: Comply with requirements specified in other Sections.

- B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
  - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

## PART 2 - EXECUTION

## 2.1 EXAMINATION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
  - 1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
  - 2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

## 2.2 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

# 2.3 PERFORMANCE

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
  - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

- B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
  - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
  - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
  - 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
  - 4. Proceed with patching after construction operations requiring cutting are complete.
- C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.
  - 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
  - 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
    - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    - b. Restore damaged pipe covering to its original condition.
    - c. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
- D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 017329

## SECTION 017836 - WARRANTIES

## PART 1 - GENERAL

## 1.1. RELATED DOCUMENTS

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

## 1.2. SUMMARY

- A. This Section specifies general administrative and procedural requirements for warranties required by the Contract Documents, including manufacturer's standard warranties on products and special warranties.
  - 1. Specific requirements for warranties for the Work and products and installation that are specified to be warranted are included in the individual Sections of Divisions-2 through -28.
  - 2. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.
- B. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.
- C. The term "warranty" in this Specifications Section shall also mean "guarantee", which term "guarantee" is used in other Specifications Sections. All conditions specified herein for "warranties" shall also apply to "guarantees".

#### 1.3. DEFINITIONS

- A. Standard Product Warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.
- B. Special Warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

## 1.4. WARRANTY REQUIREMENTS

- A. Related Damages and Losses: When correcting warranted Work that has failed, the Contractor shall, at no additional cost to the Owner, remove and replace other Work that has been damaged as a result of such failure, or that must be removed and replaced to provide access for correction of warranted Work.
- B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding; reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation. Such reinstatement shall also apply to warranties for items of Work required to be removed, replaced, and / or altered to correct failed warranted Work.
- C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible all costs of replacing and / or rebuilding defective and affected Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.
- D. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, right and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.
  - 1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.
- E. The Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

## 1.5. SUBMITTALS

- A. Submit written warranties to the Architect prior to the date certified for Substantial Completion. The commencement date for all warranties shall be the date of final Substantial Completion for the Work.
  - 1. The Contractor's use of items covered by required warranties shall not change

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the date of commencement of such warranties. Should additional costs be accrued related to the Contractor's use of warranted items prior to the date of final Substantial Completion, such costs shall be paid to the item manufacturer by the Contractor.

- B. When a special warranty is required to be executed by the Contractor, or the Contractor and a subcontractor, supplier, or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties unless a form for the special warranty is provided. Submit a draft to the Owner through the Architect for approval prior to final execution.
  - 1. Refer to individual Sections of Divisions-2 through -28 for specific content requirements, and particular requirements for submittal of special warranties.

PART 2 - PRODUCTS (Not applicable.)

PART 3 - EXECUTION (Not applicable.)

END OF SECTION 017836

## SECTION 024119 - SELECTIVE STRUCTURE DEMOLITION

## PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Demolition and removal of selected portions of building or structure.

#### 1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owners Authorized Representative.
- C. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.
- D. Remove and Retain: Detach items from existing construction, prepare for reuse, and reinstall where indicated.
- E. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

#### 1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.
- B. Historic items, relics, antiques, and similar objects of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
  - 1. Carefully salvage in a manner to prevent damage and promptly return to Owners Authorized Representative.

## 1.5 PRE- INSTALLATION MEETINGS

- A. Pre-demolition Conference: Conduct conference at Project site. May be done concurrently at the Pre-Construction conference.
  - 1. Inspect and discuss condition of construction to be selectively demolished.
  - 2. Review limitations of existing structure.
  - 3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
  - 4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
  - 5. Review areas where existing construction is to remain and requires protection.

## 1.6 INFORMATIONAL SUBMITTALS

- A. Proposed Protection Measures: Submit report, including drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control, and for noise control. Indicate proposed locations and construction of barriers.
- B. Schedule of Selective Demolition Activities: Indicate the following:
  - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
  - 2. Coordination for shutoff, capping, and continuation of utility services, if any.
  - 3. Use of elevator and stairs.
  - 4. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
- C. Inventory: Submit a list of items to be removed and salvaged and deliver to Owners Authorized Representative prior to start of demolition.

## 1.7 CLOSEOUT SUBMITTALS

- A. Inventory: Submit a list of items that have been removed and salvaged.
- B. Landfill Records: Indicate receipt and acceptance of hazardous wastes, if any, by a landfill facility licensed to accept hazardous wastes.

## 1.8 FIELD CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

# D. Hazardous Materials: A hazardous materials survey has been done and it is not expected that hazardous materials will be encountered in the Work.

- 1. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owners Authorized Representative. Hazardous materials will be removed by Owner under a separate contract.
- E. Storage or sale of removed items or materials on-site is not permitted.
- F. Utility Service: Maintain existing utilities in service and protect them against damage during selective demolition operations.
  - 1. Maintain fire-protection facilities in service during selective demolition operations.

## PART 2 - PRODUCTS

## 2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

## PART 3 - EXECUTION

#### 3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

- B. Review any available record documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in record documents.
- C. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

## 3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
  - 1. Comply with requirements for existing services/systems interruptions specified in Division 01 Section "Summary."
  - 2. Owners Authorized Representative will arrange to shut off indicated services/systems when requested by Contractor.

## 3.3 PREPARATION

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
  - 1. Comply with requirements for access and protection specified in Division 01 Section "Temporary Facilities and Controls."
- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
  - 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
  - 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
  - 3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
  - 4. Cover and protect furniture, furnishings, and equipment that have not been removed.
  - 5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Division 01 Section "Temporary Facilities and Controls."

- C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
  - 1. Strengthen or add new supports when required during progress of selective demolition.

# 3.4 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
  - 1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
  - 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
  - 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
  - 4. Do not use cutting torches.
  - 5. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
  - 6. Remove elevated items and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
  - 7. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
  - 8. Dispose of demolished items and materials promptly.
- B. Removed and Salvaged Items:
  - 1. Clean salvaged items.
  - 2. Store items in a secure area until delivery to Owners Authorized Representative.
  - 3. Transport items to Owner's storage area on-site.
  - 4. Protect items from damage during transport and storage.
- C. Removed and Reinstalled Items:
  - 1. Clean and repair items to functional condition adequate for intended reuse.
  - 2. Protect items from damage during transport and storage.

- 3. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and reinstalled in their original locations after selective demolition operations are complete.

## 3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, then remove concrete between saw cuts.
- B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.
- C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.
- D. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers. The RFCI document can be found at:

http://www.rfci.com/recommended-work-practices/

# 3.6 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site.
  - 1. Do not allow demolished materials to accumulate on-site.
  - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
  - 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
- B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

## 3.7 CLEANING

A. Clean adjacent surfaces, structures, and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119

## SECTION 033000 - CAST-IN-PLACE CONCRETE

#### 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. This specification section shall be used to supplement the structural specifications found on the 'S' series sheets in the Project Drawings.

#### 1.2 SUMMARY

- A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
  - 1. Footings.
  - 2. Foundation walls.
  - 3. Slabs-on-grade.
  - 4. Concrete slab sealing.

#### 1.3 DEFINITIONS

A. Cementitious Materials: Portland cement subject to compliance with requirements.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
- C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

- 1. Corner bars for providing for continuity of horizontal reinforcing around corners of footings, foundation walls, and other concrete items <u>are</u> required and shall be shown on shop drawings.
- 2. Approval of shop drawings by the Architect shall not relieve the Contractor of providing all reinforcing noted, shown, or implied by the project Contract Documents.
- D. Product Data: For each of the following, signed by manufacturers:
  - 1. Admixtures.
  - 2. Form materials and form-release agents.
  - 3. Steel reinforcement and accessories.
  - 4. Curing compounds.
  - 5. Floor and slab treatments.
  - 6. Vapor retarders.
  - 7. Semirigid joint filler.
  - 8. Joint-filler strips.
  - 9. Concrete slab sealing materials.

## 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
- B. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.
- C. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
  - 1. ACI 301, "Specification for Structural Concrete," Sections 1 through 5.
  - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- D. Concrete Testing Service: The Owner will engage a qualified 3<sup>rd</sup> party independent testing agency to perform evaluation tests.
- E. Special Inspections: The Owner will engage an inspection agency to provide special inspections per Structural Notes on Drawings and as required by the International Building Code. Costs for such inspection shall be paid directly to the inspection agency by the Owner.

- 1.6 DELIVERY, STORAGE, AND HANDLING
  - A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

## PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  - 1. Products: Subject to compliance with requirements, provide one of the products specified.
  - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
  - 3. Products or manufacturers other than those specified are subject to approval by Architect prior to bidding.

## 2.2 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.
- D. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
  - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- E. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spilling of concrete on removal.
  - 1. Furnish units that will leave no corrodible metal closer than 1 inch (25 mm) to the plane of exposed concrete surface.

- 2. Furnish ties that, when removed, will leave holes no larger than 1 inch (25 mm) in diameter in concrete surface.
- 3. Furnish ties with integral water-barrier plates to walls indicated to receive damp proofing or waterproofing.

## 2.3 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- B. Plain-Steel Wire: ASTM A 82, as drawn.

## 2.4 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), plain-steel bars, cut bars true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
  - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

## 2.5 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
  - 1. Portland Cement: ASTM C 150, Type I or II, gray.
    - a. Fly Ash: ASTM C 618, 20 percent of cementitious materials maximum.
- B. Normal-Weight Aggregates: ASTM C 33, coarse aggregate graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
  - 1. Maximum Coarse-Aggregate Size: 3/4 inch (19 mm) nominal.
- C. Water: ASTM C 94/C 94M and potable.

## 2.6 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
  - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
  - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
  - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
  - 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
  - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
  - 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

## 2.7 VAPOR RETARDERS

- A. Plastic Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape and penetration boots or seals. Vapor Retarder to be placed DIRECTLY BELOW concrete slab at all interior slabs.
  - 1. Products:
    - a. Fortifiber Corporation; Moistop Ultra A.
    - b. Raven Industries Inc.; Vapor Block 15.
    - c. Reef Industries, Inc.; Griffolyn Type 105.

#### 2.8 FLOOR AND SLAB TREATMENTS

- A. Concrete Floor Slab Sealers:
  - 1. Basis-of-Design Products: Provide the following:
    - a. At Exposed Concrete: Convergent Concrete Technologies "Pentra-Guard".
- B. Concrete floor slab sealers by other manufacturers are subject to approval prior to bidding.

## 2.9 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
  - 1. Available Products:
    - a. ChemMasters; Spray-Film.
    - b. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Aquafilm.
    - c. Dayton Superior Corporation; Sure Film.
    - d. Euclid Chemical Company (The); Eucobar.
    - e. Kaufman Products, Inc.; Vapor Aid.
    - f. Lambert Corporation; Lambco Skin.
    - g. L&M Construction Chemicals, Inc.; E-Con.
    - h. MBT Protection and Repair, Div. of ChemRex; Confilm.
    - i. Meadows, W. R., Inc.; Sealtight Evapre.
    - j. Metalcrete Industries; Waterhold.
    - k. Nox-Crete Products Group, Kinsman Corporation; Monofilm.
    - I. Sika Corporation, Inc.; SikaFilm.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlappolyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
  - 1. Products:
    - a. ChemMasters; Safe-Cure Clear.
    - b. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; W.B. Resin Cure.
    - c. Dayton Superior Corporation; Day Chem Rez Cure (J-11-W).
    - d. Euclid Chemical Company (The); Kurez DR VOX.
    - e. Kaufman Products, Inc.; Thinfilm 420.
    - f. Lambert Corporation; Aqua Kure-Clear.
    - g. L&M Construction Chemicals, Inc.; L&M Cure R.
    - h. Meadows, W. R., Inc.; 1100 Clear.

i. Nox-Crete Products Group, Kinsman Corporation; Resin Cure E.

## 2.10 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- B. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

## 2.11 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
  - 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials: Fly ash may be used to reduce the total amount of Portland cement in concrete footings, foundation walls and piers and concrete walls only. Limit percentage, by weight, of cementitious materials other than Portland cement in concrete as follows:
  - 1. Fly Ash: 15 percent.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.
- D. Admixtures: Use admixtures according to manufacturer's written instructions.
  - 1. Use water-reducing or high-range water-reducing admixture in concrete, as required, for placement and workability.
  - 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
  - 3. Use water-reducing admixture in pumped concrete, and concrete with a watercementitious materials ratio below 0.50.

## 2.12 CONCRETE MIXTURES FOR BUILDING ELEMENTS

## A. SEE STRUCTURAL DRAWINGS COVER SHEET FOR MORE INFORMATION.

- B. Footings: Proportion normal-weight concrete mixture as follows:
  - 1. Minimum Compressive Strength: 4000 psi at 28 days.
  - 2. Maximum Water-Cementitious Materials Ratio: 0.45.
  - 3. Slump Limit: 4 inches to 6 inches.
  - 4. Air Content: 4.5 to 7.0 percent, at point of delivery for 3/4-inch nominal maximum aggregate size.
- C. Foundation Walls: Proportion normal-weight concrete mixture as follows:
  - 1. Minimum Compressive Strength: 4000 psi at 28 days.
  - 2. Maximum Water-Cementitious Materials Ratio: 0.45.
  - 3. Slump Limit: 4 inches to 6 inches.
  - 4. Air Content: 4.5 to 7.0 percent, at point of delivery for 3/4-inch nominal maximum aggregate size.
- D. Slabs-on-Grade, Exterior: Proportion normal-weight concrete mixture as follows:
  - 1. Minimum Compressive Strength: 4000 psi at 28 days.
  - 2. Maximum Water-Cement Ratio: 0.45.
  - 3. Slump Limit: 4 inches to 6 inches.
  - 4. Air Content: 4.5 to 7.0 percent, at point of delivery for 3/4-inch nominal maximum aggregate size.
- E. Slabs-on-Grade, Interior:
  - 1. Minimum Compressive Strength: 4000 psi at 28 days.
  - 2. Maximum Water-Cement Ratio: 0.45.
  - 3. Slump Limit: 4 inches.
  - 4. Air Content: none, at point of delivery for 3/4-inch nominal maximum aggregate size.
- F.
- 2.13 FABRICATING REINFORCEMENT
  - A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."
    - 1. Corner bars for providing for continuity of horizontal reinforcing around corners of footings, foundation walls, and other concrete items <u>are</u>required.

## 2.14 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.
  - 1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

## PART 3 - EXECUTION

- 3.1 FORMWORK
  - A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
  - B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
  - C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
    - 1. Class A, 1/8 inch (3.2 mm) for smooth-formed finished surfaces.
    - 2. Class B, 1/4 inch (6 mm) for rough-formed finished surfaces.
  - D. Construct forms tight enough to prevent loss of concrete mortar.
  - E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
    - 1. Install keyways, reglets, recesses, and the like, for easy removal.
    - 2. Do not use rust-stained steel form-facing material.
  - F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete only where indicated.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

## 3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
- B. All sleeves, anchor bolts, dowels, and reinforcing items, together with anchors, weld plates, bearing plates, etc. to be set in concrete, shall be positioned and securely anchored in place prior to placement of concrete. Such items shall not be pushed into freshly placed concrete.

## 3.3 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.

- 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved[ at least 70 percent of] its 28-day design compressive strength.
- 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

## 3.4 SHORES AND RESHORES

- A. Comply with ACI 318 (ACI 318M) and ACI 301 for design, installation, and removal of shoring and reshoring.
  - 1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.
- B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.
- C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

## 3.5 VAPOR RETARDERS

- A. Plastic Vapor Retarders: Place, protect, and repair vapor retarders according to ASTM E 1643 and manufacturer's written instructions.
  - 1. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.
  - 2. Seal all penetrations (pipe, conduit, etc.) with manufacturers prefabricated penetration boots or seals.

## 3.6 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
  - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

## 3.7 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
  - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
  - 2. Form keyed joints where indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
  - 3. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
  - 4. Space vertical joints in walls as indicated.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

- 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
- 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
  - 1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
  - 2. Terminate full-width joint-filler strips not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished concrete surface where joint sealants, specified in Division 07 Section "Joint Sealants," are indicated.
  - 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

## 3.8 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect in writing.
  - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

- 1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
- 1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
- 2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- D. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
  - 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
  - 2. Maintain reinforcement in position on chairs during concrete placement.
  - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
  - 4. Slope surfaces uniformly to drains where required.
  - 5. Begin initial floating using bull floats or darbies to form a uniform and opentextured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- E. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
  - 1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
  - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
  - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- F. Hot-Weather Placement: Comply with ACI 301 and as follows:
  - Maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

# 3.9 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
  - 1. Apply to concrete surfaces not exposed to view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
  - 1. Apply to concrete surfaces exposed to view.
    - a. Vertical surfaces of exterior side of concrete foundation walls exposed to view shall be finished as smooth-formed finish.

# b. DO NOT SACK FINISH EXPOSED SMOOTH-FORMED FINISH CONCRETE.

C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

# 3.10 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
  - 1. Apply float finish to surfaces indicated or to receive trowel finish.

- C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
  - 1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
  - 2. Finish surfaces to the following tolerances, according to ASTM E 1155 (ASTM E 1155M), for a randomly trafficked floor surface:
    - a. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 30; with minimum local values of flatness, F(F) 25; and of levelness, F(L) 20 for slabs on grade.
- D. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated. While concrete is still plastic, slightly scarify surface with a fine broom.
  - 1. Comply with flatness and levelness tolerances for trowel finished floor surfaces.
- E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
  - 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

# 3.11 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at

correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

## 3.12 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete slabs according to ACI 308.1, by one or a combination of the following methods:
  - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
    - a. Water.
    - b. Continuous water-fog spray.
    - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.
  - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moistureretaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

- a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
- b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
- c. Cure concrete surfaces to receive floor coverings with either a moistureretaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.
- 3. Curing Compound: Use only at slabs to be covered with carpet or resilient flooring. Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
  - a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer.

# 3.13 CONCRETE SLAB SEALING

- A. Concrete Slab Sealing: Prepare, apply, and finish concrete slab sealer according to manufacturer's written instructions.
  - 1. Remove all contaminants and complete surface repairs.
  - 2. Do not apply to concrete that is less than 28 days' old.
  - 3. Apply sealers using methods and coverage rates recommended by manufacturer.

# 3.14 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
  - 1. Defer joint filling until concrete has aged at least one month. Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches (50 mm) deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

## 3.15 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part Portland cement to two and one-half parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
  - Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension in solid concrete, but not less than 1 inch (25 mm) in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill formtie voids with patching mortar or cone plugs secured in place with bonding agent.
  - 2. Repair defects on surfaces exposed to view by blending white Portland cement and standard Portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
  - 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
  - Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
  - 2. After concrete has cured at least 14 days, correct high areas by grinding.

- 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
- 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
- 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
- 6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch (19-mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
- 7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

# 3.16 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections as required by applicable codes, as required by agencies having jurisdiction, and as directed by the Architect and prepare test reports. Costs for such testing will be paid directly to the inspecting and testing agency by the Owner.
- B. Inspections may include the following.:

- 1. Steel reinforcement placement.
- 2. Verification of use of required design mixture.
- 3. Concrete placement, including conveying and depositing.
- 4. Curing procedures and maintenance of curing temperature.
- 5. Verification of concrete strength before removal of shores and forms from beams and slabs.
- C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172.
  - 1. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
  - 2. Air Content: ASTM C 231, pressure method, for normal-weight concrete. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
  - 3. Concrete Temperature: ASTM C 1064/C 1064M.
  - 4. Compression Test Specimens: ASTM C 31/C 31M.
  - 5. Compressive-Strength Tests: ASTM C 39/C 39M; one set of specimens tested at 7 days and one set of specimens at 28 days.
  - 6. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
  - 7. Strength of each concrete mixture will be satisfactory only if no compressivestrength test value falls below specified compressive strength.
  - 8. Test results will be reported in writing to Architect, Owner, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
  - 9. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
  - 10. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
  - 11. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

- 12. Correct deficiencies in the Work that test reports and inspections indicate dos not comply with the Contract Documents.
- D. Measure floor and slab flatness and levelness according to ASTM E 1155 (ASTM E 1155M) within 48 hours of finishing.

END OF SECTION 033000

## SECTION 061000 - ROUGH CARPENTRY

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract apply to this Section.
- B. General Structural Notes and Specifications shown on the Drawings apply to this section.

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Dimensional lumber.
  - 2. Wood blocking, backing, plates, and nailers.
  - 3. Preservative treated lumber.
  - 4. Fasteners and hangers.

### 1.3 DEFINITIONS

- A. Dimension Lumber: Lumber of 2 inches nominal (38 mm actual) or greater but less than 5 inches nominal (114 mm actual) in least dimension.
- B. Lumber grading agencies, and the abbreviations used to reference them, include the following:
  - 1. WWPA: Western Wood Products Association.

### 1.4 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
  - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.

- 2. Product information and structural property data for engineered wood products and structural data and shop drawings for engineered joists (roof trusses) prepared, stamped, and signed by licensed Oregon professional engineer.
- B. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:
  - 1. Wood-preservative-treated wood.
  - 2. Fire-retardant-treated wood.
- C. Layout / Shop Drawings: For each type of engineered joist product, including spacings, blocking, bridging, connectors, fasteners, etc.

## 1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

## PART 2 - PRODUCTS

## 2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
  - 1. Factory mark each piece of lumber with grade stamp of grading agency.
  - 2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
  - 3. Provide dressed lumber, S4S, unless otherwise indicated.
- B. Engineered Wood Products: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
  - 1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2. Engineered wood products shall be as specified herein, of types and sizes specified in Structural Notes and per notes and details on Drawings.

# 2.2 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: American Wood Preservers' Association (AWPA) AWPA C2.
  - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the American Lumber Standards Committee (ALSC) Board of Review.
- D. Application: Treat items indicated on Drawings as "WPT."

## 2.3 PRESERVATIVE WOOD TREATMENT BY PRESSURE PROCESS

- General: Where lumber is indicated as preservative-treated wood or is specified herein to be treated, comply with applicable requirements of AWPA Standards C2 (Lumber). Mark each treated item with the AWPB or SPIB Quality Mark Requirements.
- B. Pressure-treat above-ground items with water-borne preservatives to a minimum retention of 0.25 pcf. For interior uses, after treatment, kiln-dry lumber to a maximum moisture content of 19 percent. Treat indicated items.
  - 1. All wood members in direct contact with concrete or masonry shall be pressure treated as specified herein.

## 2.4 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Comply with performance requirements in AWPA C20 (lumber) and AWPA C27 (plywood).
  - 1. Use Exterior type for exterior locations and where indicated.
  - 2. Use Interior Type A, High Temperature (HT) for areas at or above roof deck level.
  - 3. Use Interior Type A, unless otherwise indicated.
- B. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.

### **ROUGH CARPENTRY**

C. Application: Treat items indicated on Drawings as "FRT" or "Fire Retardant Treated".

## 2.5 DIMENSION LUMBER

- A. For light framing (non structural, 2" to 4" thick, 2 to 4" wide) including non load bearing studs, blocking, curbs, etc.
  - 1. No. 2 and better, or as noted on drawings
    - a. Douglas Fir and Douglas Fir-Larch graded under WWPA or WCLIB rules.
- B. For structural light framing and structural framing (2" to 4" thick, 2" and wider) including joists, load bearing studs, plates, ledgers, lintels, beams, etc.
  - 1. No. 2 and better, or as noted on drawings
    - a. Douglas Fir and Douglas Fir-Larch graded under WWPA or WCLIB rules.
    - 3. Sizes: As indicated on the Drawings.
- C. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
  - 1. Blocking.
  - 2. Backing.
  - 3. Nailers.
- D. For items of dimension lumber size, provide Construction or No. 2 grade lumber with 15 percent maximum moisture content and the following species:
  - 1. Hem-fir; WWPA.
- E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

### 2.6 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
  - 1. Where rough carpentry is exposed to weather, in ground contact, pressurepreservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: The American Society of Mechanical Engineers International (ASME) ASME B18.6.1.
- E. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).
- F. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.
- G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
  - 1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
  - 2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 (ASTM F 738M and ASTM F 836M, Grade A1 or A4).
- H. Fastening Requirements: Fastener types, sizes, and spacings shall be as specified on Drawings and per requirements of the 2006 International Building Code.

## 2.7 METAL FRAMING ANCHORS

- A. Basis-of-Design Products: Subject to compliance with requirements, provide metal framing anchor and hanger products indicated on Drawings by the following:
  - 1. Simpson Strong-Tie Co., Inc.

Equivalent products to those specified require architect / engineer review and approval prior to Bid.

B. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer that meet or exceed those of basis-of-design products. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

C. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.

## 2.11. MISCELLANEOUS MATERIALS

- A. Sill Sealer Gaskets: Glass fiber resilient insulation fabricated in strip form for use as a sill sealer; 1 inch nominal thickness compressible to 1/32 inch; selected from manufacturer's standard widths to suit width of sill members indicated; in rolls of 50 feet or 100 feet in length. (For use at all exterior wall sill plates).
- B. Asphalt-Saturated Building Paper: No. 15, unperforated organic felt, complying with ASTM D226 Type 1, 36" wide, approximate weight 18 lbs./square, asbestos free. (For separation of untreated wood and masonry surfaces).

## PART 3 - EXECUTION

## 3.1 INSTALLATION, GENERAL

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate blocking, backing, plates, nailers and similar supports to comply with requirements for attaching other construction.
- B. Metal Framing Anchors: Install metal framing to comply with manufacturer's written instructions.
- C. Provide blocking, backing, plates, and nailers as indicated and as required to support facing materials, fixtures, specialty items, trim, and other items as indicated.
- D. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

# E. Comply with AWPA M4 for applying field treatment to cut surfaces of preservativetreated lumber.

## 1. Use copper naphthenate.

F. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated on Drawings and as required by the 2006 edition of the IBC.

## 3.2 WOOD GROUNDS, NAILERS, BLOCKING, AND SLEEPERS

- A. Install wood grounds, nailers, blocking, and sleepers where shown and where required for screeding or attachment of other work. Form to shapes as shown and cut as required for true line and level of work to be attached. Coordinate location with other work involved.
- B. Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, where indicated. Provide washers at all nuts.

## 3.3. WOOD FURRING

- A. Install plumb and level with closure strips at edges and openings. Shim with wood as required for tolerance of finished work.
  - 1. Firestop furred spaces on walls at each floor level and at ceiling line of top story, with wood blocking or noncombustible materials, accurately fitted to close furred spaces.
- 3.4. WOOD FRAMING, GENERAL
- A. Framing Standard: Comply with N.F.P.A. "Manual for Wood Frame Construction," and with all applicable provisions of the International Building Code, 2003 Edition, Chapter 23.
- B. Framing with Engineered Wood Products: Install framing composed of engineered lumber and joist products to comply with manufacturer's directions.
- C. Install framing members of size and spacing indicated.
- D. Anchor and nail as shown, and to comply with the most restrictive provisions of the following:
  - 1. National Evaluation Report No. NER-272 for pneumatic or mechanical driven staples, P-Nails, and allied fasteners.
  - 2. Table 2304.9.1 of the International Building Code, 2003 Edition.
  - 3. Published requirements of manufacturers of engineered framing members, proprietary sheathing products, and metal framing anchors.
- E. Do not splice structural members between supports.
- F. Firestop concealed spaces of wood framed walls and partitions at each floor level, at the ceiling line of the top story and not to exceed 8'-0" o.c. vertically.

Where firestops are not automatically provided by the framing system used, use closely fitted wood blocks of nominal 2-inch-thick lumber of the same width as framing members.

## 3.5. STUD FRAMING

- A. General: Arrange studs so that wide face of stud is perpendicular to direction of wall or partition and narrow face is parallel. Install single bottom plate and double top plates using 2-inch-thick members whose widths equal that of studs. Set exterior wall sill plates on sill sealer gasket. Nail or anchor plates to supporting construction.
- B. Construct corners and intersections with not less than 3 studs. Install miscellaneous blocking and framing as shown and as required for support of facing materials, fixtures, specialty items, and trim.
  - 1. Install continuous horizontal blocking row at each 8 foot level of singlestory partitions over 8 feet high using nominal 2-inch thick members of same width as wall or partitions.
- Frame openings with multiple studs and headers. Install nailed header members of thickness equal to width of studs, or provide furring on narrower members.
   Set headers on edge and support on jamb studs.
  - 1. For nonbearing partitions, install double-jamb studs and headers per Drawings, but not less than 3 ½ inches deep for openings 4 feet and less in width, and not less than 5 ½ inches deep for wider openings.
  - 2. For load-bearing partitions, install per notes and requirements on Drawings but not less than double-jamb studs for openings 4 feet and less in width, and triple-jamb studs for wider openings. Install headers of type and depth shown or noted on Drawings.

END OF SECTION 061000

### SECTION 061600 - SHEATHING

### PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Wall sheathing.
  - 2. Roof sheathing.
  - 3. Miscellaneous sheathing.
  - 4. Fasteners.

### 1.3 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, and specified criteria.
- 1.4 DELIVERY, STORAGE, AND HANDLING
  - A. Stack plywood and other panels flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

### PART 2 - PRODUCTS

- 2.1 WOOD PANEL PRODUCTS, GENERAL
  - A. Plywood: DOC PS 1.
  - B. Oriented Strand Board: DOC PS 2.
  - C. Thickness: As needed to comply with requirements specified, but not less than thickness indicated on drawings.

D. Factory mark panels to indicate compliance with applicable standard.

## 2.2 WALL SHEATHING

A. Oriented-Strand-Board Wall Sheathing: Exposure 1, APA Rated

## SEE STRUCTURAL DRAWINGS AND SPECIFICATIONS

- 2.3 ROOF SHEATHING
  - A. Oriented-Strand-Board Roof Sheathing: Exposure 1, APA Rated

## SEE STRUCTURAL DRAWINGS AND SPECIFICATIONS

### 2.4 MISCELLANEOUS SHEATHING

A. Oriented – Strand Board, Exposure 1, at concealed locations or plywood, DOC PS 1, Exposure 1 C-D plugged, fire retardant treated where indicated, at exposed to view locations.

### 2.5 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
  - 1. For roof and wall sheathing, provide fasteners **with** hot-dip zinc coating complying with ASTM A 153/A 153M or of Type 304 stainless steel.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.

### PART 3 - EXECUTION

- 3.1 INSTALLATION, GENERAL
  - A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction, unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated on Drawings and complying with the following:
  - 1. NES NER-272 for power-driven fasteners.
  - 2. Table 2304.9.1, "Fastening Schedule," 2009 "International Building Code."
- D. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.
- E. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

## 3.2 WOOD STRUCTURAL PANEL INSTALLATION

- General: Comply with applicable recommendations in APA Form No. E30S, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
  - 1. Roof Sheathing:
    - a. Nail to wood trusses, engineered joists, and related roof framing.
    - b. Space panels 1/8 inch (3 mm) apart at edges and ends.
    - c. Refer to the notes on the Drawings for fastener type, size, and spacing.
    - d. Install roof sheathing with ply clips.
  - 2. Wall Sheathing
    - a. Nail to wood studs, plates, blocking and related wall framing.

### SHEATHING

- b. Refer to notes on the Drawings for standard fastener type, size, and spacing.
- c. Refer to Shear Wall Schedule on Drawings for shear wall fasteners and spacings.

END OF SECTION 061600

## SECTION 062023 - INTERIOR FINISH CARPENTRY

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.

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Window Sills

#### 1.3 DEFINITIONS

A. Interior finish carpentry includes exposed finished wood.

#### 1.4 SUBMITTALS

- A. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
  - 1. Show details full size.
  - 2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
- B. Samples for Selection:
  - 1. Oak / Birch

### 1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
- B. Installer Qualifications: Fabricator of products.

## 1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

## 1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
  - 1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.
  - 2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

## 1.8 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

## PART 2 - PRODUCTS

## 2.1 MATERIALS

- A. Wood Products: Comply with the following:
  - 1. Hardboard: AHA A135.4.

## 2.2 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln dried to less than 15 percent moisture content, treated per American Wood Preservers Association (AWPA) AWPA C20.

## 2.3 FABRICATION, GENERAL

- A. Interior Woodwork Grade: Unless otherwise indicated, provide Custom-grade interior woodwork complying with referenced quality standard.
- B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.
- C. Fabricate woodwork to dimensions, profiles, and details indicated.

## 2.4 OAK / BIRCH WINDOW SILLS

- A. Grade: Custom.
- B. High-Pressure Decorative Laminate Grade: HGS.
  - 1. As selected by Architect from manufacturer's full range in the following categories:
    - a. Match Wood Door stain
    - b. Patterns, matte finish.

### 2.5 PREPARATION

- A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.
- B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and back priming.
- 2.6 INSTALLATION
  - A. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.

- B. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).
- C. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- D. Touch up finishing work specified in this Section after installation of woodwork. Fill screw holes with matching filler where exposed.

# 2.7 ADJUSTING AND CLEANING

- A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean woodwork on exposed and semi-exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 064023

## SECTION 071355 – SELF ADHERED SHEET FLASHING

## 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.

### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Self-adhered sheet flashing, use as necessary at roofing sub-assembly and at parapet caps & metal flashing.

#### 1.3 SUBMITTALS

A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of waterproofing.

### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product brand name and type, and date of manufacture.
- B. Store rolls according to manufacturer's written instructions.
- C. Protect stored materials from direct sunlight.

### 1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Apply sheet flashing within the range of ambient and substrate temperatures recommended by manufacturer. Do not apply flashing to a damp or wet substrate.
  - 1. Do not apply flashing in snow, rain, fog, or mist.

## PART 2 - PRODUCTS

### 2.1 SHEET FLASHING

- A. Self-Adhered Sheet Flashing: High density polyethylene sheet backed by butyl adhesive.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide the following:
    - a. Grace; Vycor Butyl (High Temperature)
  - 2. Products by other manufacturers are subject to approval prior to bidding.

## 2.2 AUXILIARY MATERIALS

- A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.
  - 1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.

### PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.
  - 1. Verify that substrate is visibly dry and free of moisture.
  - 2. Notify Architect in writing of anticipated problems using sheet flashing over substrate.
  - 3. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 SURFACE PREPARATION

A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for sheet flashing application.

## 3.3 SHEET FLASHING INSTALLATION

- A. Install fully adhered sheets over entire area to receive sheet flashing according to manufacturer's written instructions and as shown on Drawings.
- B. Accurately align sheets and maintain uniform side and end laps of minimum dimensions required. Stagger end laps.
- C. Repair tears, voids, and lapped seams in sheet flashing not complying with requirements. Slit and flatten fishmouths and blisters.

## 3.4 PROTECTION AND CLEANING

- A. Protect sheet flashing from damage and wear during remainder of construction period.
- B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 071355

## SECTION 071616 - CRYSTALLINE WATERPROOFING

### 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.

### 1.2 SUMMARY

- A. Section includes crystalline waterproofing.
- B. Related Requirements:
  - 1. Section 033000 "Cast-in-Place Concrete" for concrete slabs serving as protective topping for water-proofing and the finishing of concrete walls and slabs to receive waterproofing.

## 1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, and installation instructions.

### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: The Chem-Crete Pavix CCC100 crystalline concrete penetrating moisture protection system, as manufactured by International Chem-Crete, is approved for use on this project.
- B. Applicator: Applicators shall be approved by International Chem-Crete as certified applicators
- C. Retain "Product Certificates" Paragraph below to require submittal of product certificates from manufacturers.
- D. Product Certificates: For each type of waterproofing, patching, and plugging material.

- E. Product Test Reports: For each product formulation, for tests performed by manufacturer and witnessed by a qualified testing agency.
- F. Field quality-control reports.
- G. Warranty: Sample warranty.

## 1.6 QUALITY ASSURANCE

- A. Applicator Qualifications: A firm experienced in applying crystalline waterproofing similar in material, design, and extent to that indicated for this Project, whose work has resulted in applications with a record of successful in-service performance shall be approved by manufacturer as certified applicators
- B. Manufacturer Qualifications: ISO 9001 registered; capable of providing field-service representation during construction.
- C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
  - 1. Build mockup of typical horizontal surfaces 10 sq. ft. in size. Area of application, if approved, may be considered as a final install area.
  - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

# 1.7 FIELD CONDITIONS

- A. Weather Limitations: Proceed with application only when existing and forecasted weather conditions permit crystalline waterproofing to be performed in accordance with manufacturer's written instructions.
- B. Proceed with waterproofing work only after pipe sleeves, vents, curbs, inserts, drains, and other projections through the substrate to be waterproofed have been completed. Proceed only after substrate defects, including honeycombs, voids, and cracks, have been repaired to provide a sound substrate free of forming materials, including reveal inserts.
- C. Ambient Conditions: Proceed with waterproofing work only Do not apply on exterior substrate if precipitation is forecast within 2 hours of coating completion @ 70°F air temperature. If precipitation occurs during exterior application, discontinue

application process immediately. Areas already treated do not require protection. Allow to cure for one hour @ 75°F air temperature before allowing vehicle traffic

## 1.8 WARRANTY

- A. Special Warranty: Applicator agrees to repair or replace components of crystalline waterproofing that fail in materials or workmanship within specified warranty period. Applicator shall not be liable for consequential damages with respect to water leakage; other defects caused by structural failure, movement of the structure; or other causes beyond Applicator's control.
  - 1. Failures include, but are not limited to, the following:
    - a. Failure to maintain watertight conditions within specified warranty period.
  - 2. Warranty Period: five years from date of Substantial Completion.
  - 3. Submit warranty paperwork within the manufacturer's timeframe for validation and inspection if required.

## PART 2 - PRODUCTS

## 2.1 WATERPROOFING MATERIALS

- A. Crystalline Waterproofing: Prepackaged, proprietary blend of portland cement, specially treated sand, and active chemicals that, when mixed with water and applied, penetrates into concrete and concrete unit masonry and reacts chemically with the byproducts of cement hydration in the presence of water to develop crystalline growth within substrate capillaries to produce an impervious, dense, waterproof substrate; with properties complying with or exceeding the criteria specified below.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide 'Chem-Crete' Pavix CCC1 00 crystalline concrete penetrating product.
  - 2. All other manufacturers and products shall be considered for use prior to bid.

## 2.2 ACCESSORY MATERIALS

A. Patching Compound: Factory-premixed cementitious repair mortar, crack filler, or sealant with crystalline waterproofing properties; recommended by waterproofing

manufacturer for filling and patching tie holes, honeycombs, reveals, and other imperfections; and compatible with substrate and other materials indicated.

- 1. Crack Filler: International Chem-Crete CEM 140 or other cementitious repair material approved by International Chern-Crete.
- 2. Sealant: International Chem-Crete Chem- Joint 65 or others approved by International Chem-Crete.
- 3. Cleaner: International Chem-Crete Biodegradable Conclean CCC 060.
- B. Water: Potable.

## PART 3 - EXECUTION

- 3.1 EXAMINATION
  - A. Verifv that the work done under other sections meets the following requirements:
    - 1. That the concrete substrate surface is clean, dry and sound.
    - 2. That the concrete was cured for a minimum of 7 days.
    - 3. That a water absorption test is employed to determine absorption of concrete substrate. Mist area to be treated with water. Water should readily absorb into concrete substrate, if water beads at surface the presents of a sealer is possible.
    - 4. That damaged areas of the concrete substrate be restored to match adjacent areas. Use CEM 140 or other cementitious repair material approved by International Chem-Crete.

### 3.2 PREPARATION

- A. Comply with manufacturer's written instructions.
- B. Protect other work from damage caused by cleaning, preparation, and application of waterproofing. Provide temporary enclosure to confine spraying operation and to ensure adequate ambient temperatures and ventilation conditions for application.
- C. Surface Preparation: Compressed air,
- D. Pressure washing or any method of abrading can be used as proper preparation method to insure clean, sound concrete surface. Assure that concrete surface is free of

any sealers, which may impede absorption of Chem-Crete Pavix CCC1 00 into concrete substrate matrix.

- E. Cleaning: Surface contaminated with oil or grease shall be vigorously scrubbed with International Conclean CCC060 biodegradable detergent. Thoroughly wash, clean and dry concrete substrate. Areas where oil or other contaminants penetrate deep into the concrete may require removal by mechanical methods.
- F. Moving Cracks: Route all large cracks, remove dust debris, and fill flush with Chem-Joint 65 or other flexible epoxy approved by International Chem-Crete.
- G. Moving Joints: Seal secondary control joints with Chem-Joint 65 or other sealant approved by International Chem-Crete. Consult International Chem-Crete for details on moving cracks, expansion joint details and moving control joints.
- H. Non-moving Control Joints: Seal secondary control joints with Chem-Joint 65 or other sealant approved by International Chem- Crete.
- I. Non-moving Cracks: Route all large cracks, remove dust debris, and fill flush with CEM140 cementitious repair material or other cementitious repair material approved by International Chem-Crete.
- J. Surface Conditions: Surface shall be clean, dry and sound.

# 3.3 APPLICATION

- A. General: Comply with waterproofing manufacturer's written instructions for application and curing
- B. Agitate Chem-Crete Pavix CCC100 in pail or drum to assure uniform dispersion of solids. Apply at a minimum square footage rate of 175 ft2 (16.26 m<sup>2</sup>) per gallon (9 mils wft) to a maximum square footage rate of 200 ft2 (18.58 m<sup>2</sup>) per gallon (8 mils wft). Chem-Crete Pavix CCC100 can be applied using low pressure spray equipment, rollers, brooms or squeegees. For larger applications, such as highways, parking garages or airports, it is recommended to apply the Chem-Crete CCC100 using a high volume commercial sprayer.
- C. Do not apply Chem-Crete Pavix CCC100 on exterior substrate if precipitation is forecast within 2 hours of coating completion @ 70°F (21.1°C) air temperature. If precipitation occurs during exterior application, discontinue application process immediately. Areas already treated with Chem-Crete Pavix CCC100 do not require protection.
- D. Allow to cure for one hour @ 75°F (23.9°C) air temperature before allowing vehicle traffic.

# 3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect completed application of waterproofing.
- B. Testing: Fill tanks or shut off foundation dewatering system to expose structure to normal service conditions. Examine for leaks.
- C. Monitoring:
  - a. Monitor active leaks at cracks and joints and allow to self-seal for two days or up to two weeks, depending on job site and ambient conditions.
  - b. General Contractor shall repair leaking cracks or joints not sealed in allowable time frame.
  - c. Repair moving cracks using polyurethane injection or other method.
- D. Prepare test and inspection reports.

## 3.5 PROTECTION

A. During curing period, protect treated surfaces from damage by wind, sun, rain, puddling of water, and temperatures below 50 deg. F.

## END OF SECTION 071616

# SECTION 072100 – THERMAL & SOUND ATTENUATION INSULATION

## 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.

### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Perimeter wall insulation (supporting backfill).
  - 2. Concealed building insulation.
  - 3. Exposed building insulation.
  - 4. Vapor retarders.
  - 5. Sound attenuation insulation.
  - 6. Closed Cell Spray Polyurethane Foam (SPF)

### 1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

### 1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of building insulation through one source from a single manufacturer.
- B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
  - 1. Surface-Burning Characteristics: ASTM E 84.
  - 2. Fire-Resistance Ratings: ASTM E 119.
  - 3. Combustion Characteristics: ASTM E 136.
  - 4. DELIVERY, STORAGE, AND HANDLING
- C. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with

THERMAL & SOUND ATTENUATION INSULATION

manufacturer's written instructions for handling, storing, and protecting during installation.

- D. Protect plastic insulation as follows:
  - 1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
  - 2. Protect against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
  - 3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

# PART 2 - PRODUCTS

# 2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  - 1. Products: Subject to compliance with requirements, provide one of the products specified.
  - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
- B. Products by other manufacturers are subject to approval by the Architect prior to bidding.

## 2.2 FOAM-PLASTIC BOARD INSULATION

- A. Extruded-Polystyrene Board Insulation: ASTM C 578, of type and density indicated below, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively:
  - 1. Manufacturers:
    - a. DiversiFoam Products.
    - b. Dow Chemical Company.
    - c. Owens Corning.
    - d. Pactiv Building Products Division.
  - 2. Type IV, 1.60 lb/cu. ft. (26 kg/cu. m).

## 2.3 GLASS-FIBER BLANKET INSULATION

- A. Manufacturers:
  - 1. CertainTeed Corporation.
  - 2. Guardian Fiberglass, Inc.
  - 3. Johns Manville.
  - 4. Knauf Fiber Glass.
  - 5. Owens Corning.
- B. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- C. Where glass-fiber blanket insulation is indicated by the following thicknesses, provide blankets in batt or roll form with thermal resistances indicated:
  - 1. 3-1/2 inches (89 mm) thick with a thermal resistance of 11 deg F x h x sq. ft./Btu at 75 deg F (1.9 K x sq. m/W at 24 deg C).
  - 2. 5 ½ inches (140mm) thick with a thermal resistance of 19 deg F x h x sq. f.t./BTU at 75 deg F (3.3K x sq. m/w at 24 deg C).
  - 3. At attic space, none required, see roofing section 075423.

## 2.4 CLOSED CELL SPRAY POLYURETHANE FOAM (SPF)

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. CertainTeed Corporation.
  - 2. Johns Manville.
  - 3. BASF
  - 4. Owens Corning
- B. Basis of Design.

Johns Manville, JM Corboond III or equalRetain one or more of four subparagraphs below. If retaining more than one, indicate location of each on Drawings or by inserts.

- 1. R-Value per inch 7.0
- 2. Flame Spread index < 75
- 3. Air Permanence (perms-in) class 1 < 0.1

- 4. Apply as per manuf. Recommendations
- 5. Apply where indicated on the drawings.

## 2.5 VAPOR RETARDERS

- A. Fire-Retardant, Reinforced-Polyethylene Vapor Retarders: 2 outer layers of polyethylene film laminated to an inner reinforcing layer consisting of either nonwoven grid of nylon cord or polyester scrim and weighing not less than 22 lb/1000 sq. ft. (10 kg/100 sq. m), with maximum permeance rating of 0.1317 perm (7.56 ng/Pa x s x sq. m) and with flame-spread and smoke-developed indexes of not more than 5 and 60, respectively.
  - 1. Products:
    - a. Raven Industries Inc.; DURA-SKRIM 2FR.
    - b. Reef Industries, Inc.; Griffolyn T-55 FR.
- B. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vaporretarder manufacturer for sealing joints and penetrations in vapor retarder.
- C. Vapor-Retarder Fasteners: Pancake-head, self-tapping steel drill screws; with fender washers.
- D. Single-Component Nonsag Urethane Sealant: ASTM C 920, Type I, Grade NS, Class 25, Use NT related to exposure, and Use O related to vapor-barrier-related substrates.

### 2.6 AUXILIARY INSULATING MATERIALS

- A. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by insulation manufacturers for sealing joints and penetrations in vapor-retarder facings.
- B. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.

## PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and for other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

# 3.2 PREPARATION

A. Clean substrates of substances harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

# 3.3 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice, rain, and snow.
- C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Water-Piping Coordination: If water piping is located within insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.
- E. For preformed insulating units, provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

# 3.4 INSTALLATION OF PERIMETER INSULATION

- A. On vertical surfaces, set insulation units in adhesive applied according to manufacturer's written instructions. Use adhesive recommended by insulation manufacturer.
  - 1. If not otherwise indicated, extend insulation a minimum of 24 inches (610 mm) below exterior grade line.
- B. Bevel top edges of insulation as indicated on the Drawings.
- C. Protect below-grade insulation on vertical surfaces from damage during backfilling by applying protection course with joints butted. Set in adhesive according to insulation manufacturer's written instructions.

D. Protect top edge of insulation from damage during concrete work.

# 3.5 INSTALLATION OF GENERAL BUILDING INSULATION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Set vapor-retarder-faced units with vapor retarder to warm-in-winter side of construction, unless otherwise indicated.
  - 1. Tape joints, penetrations, and ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.
- C. Install mineral-fiber insulation in cavities formed by framing members according to the following requirements:
  - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
  - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
  - 3. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures.
  - 4. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically.
- D. Install glass-fiber board insulation on indicated substrates by adhesively attached, spindle-type insulation anchors as follows:
  - 1. Fasten insulation anchors to substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application indicated.
  - 2. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation below indicated thickness.
  - 3. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.
  - 4. Tape over all joints and penetrations with manufacturer's recommended foil tape to seal vapor retarder.

# 3.6 INSTALLATION OF INSULATION IN CEILINGS FOR SOUND ATTENUATION

A. Install unfaced glass fiber blanket insulation as and where indicated on the Drawings.

### 3.7 INSTALLATION OF VAPOR RETARDERS

- A. General: Extend vapor retarder to extremities of areas to be protected from vapor transmission. Secure in place with anchorage system as indicated. Extend vapor retarder to cover miscellaneous voids in insulated substrates. Seal vertical joints in vapor retarders over framing by lapping not less than two wall studs.
- B. Before installing vapor retarder, apply urethane sealant to flanges of metal framing including runner tracks, metal studs, and framing around door and window openings. Seal overlapping joints in vapor retarders with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Seal butt joints with vapor-retarder tape. Locate all joints over framing members or other solid substrates.
- C. Firmly attach vapor retarders to metal framing and solid substrates with vapor-retarder fasteners as recommended by vapor-retarder manufacturer.
- D. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarder. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarder.

# 3.8 PROTECTION

A. Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

#### END OF SECTION 072100

#### SECTION 072500 - WEATHER BARRIERS

#### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

A. Drawings and provisions of Fixed Price Construction Contract and Divisions-1 Specification Sections apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Infiltration barrier as indicated on the Drawings and as specified herein.

#### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

#### PART 2 - PRODUCTS

#### 2.1 WATER-RESISTIVE INFILTRATION BARRIER (BUILDING WRAP)

- A. Infiltration Barrier (Building Wrap): ASTM E 1677, Type I air barrier; with flame-spread and smoke-developed indexes of less than 25 and 50, respectively, when tested according to ASTM E 84; UV stabilized; and acceptable to authorities having jurisdiction.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide the following:
    - a. DuPont (E. I. du Pont de Nemours and Company); Tyvek Commercial Wrap.
    - b. Guardian Building Products Distribution; Energy Saver FP system
  - 2. Products by other manufacturers are subject to approval prior to bidding.
- B. Building-Wrap Tape: Pressure-sensitive plastic tape recommended by building-wrap manufacturer for sealing joints and penetrations in building wrap.

# PART 3 - EXECUTION

### 3.1 WATER-RESISTIVE INFILTRATION BARRIER INSTALLATION

- A. Cover exposed exterior surface of walls to receive metal siding (not insulated metal building panels) with water-resistive infiltration barrier.
- B. Building Wrap: Comply with manufacturer's written instructions.
  - 1. Seal seams, edges, fasteners, and penetrations with tape.
  - 2. Extend into jambs of openings and seal corners with tape.
  - 3. Provide sufficient attachments to secure building wrap until metal siding is installed.

#### END OF SECTION 072500

# SECTION 072650 – UNDERSLAB VAPOR BARRIERS

#### PART 1 – GENERAL

#### 1.1 SUMMARY

- A. Products supplied under this section:
  - 1. Vapor barrier and installation accessories for installation under concrete slabs.

# B. Related sections:

- 1. Section 03 30 00 Cast-in-Place Concrete
- 2. Section 07 26 00 Vapor Retarders

#### 1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM):
  - 1. ASTM E1745-17 Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.
  - 2. ASTM E1643-11 Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
- B. Technical Reference American Concrete Institute (ACI):
  - 1. ACI 302.2R-06 Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials.
  - 2. ACI 302.1R-15 Guide to Concrete Floor and Slab Construction.

# 1.3 SUBMITTALS

- A. Quality control/assurance:
  - 1. Summary of test results per paragraph 9.3 of ASTM E1745.
  - 2. Manufacturer's samples and literature.
  - 3. Manufacturer's installation instructions for placement, seaming, penetration prevention and repair, and perimeter seal per ASTM E1643.
  - 4. All mandatory ASTM E1745 testing must be performed on a single production roll per ASTM E1745 Section 8.1.

### PART 2 – PRODUCTS

#### 2.1 MATERIALS

- A. Vapor barrier shall have all of the following qualities:
  - 1. Maintain permeance of less than 0.01 Perms [grains/ (ft<sup>2</sup> · hr. · inHg)] as tested in accordance with mandatory conditioning tests per ASTM E1745 Section 7.1 (7.1.1-7.1.5).
  - 2. Other performance criteria:
    - a. Strength: ASTM E1745 Class A.
    - b. Thickness: 20 mils minimum
  - 3. Provide third party documentation that all testing was performed on a single production roll per ASTM E1745 Section 8.1
- B. Vapor barrier products:
  - 1. Basis of Design: Stego Wrap 20-Mil Vapor Barrier by Stego Industries LLC., (877) 464-7834
  - 2. Substitution as per an equal basis.

# 2.2 ACCESSORIES

- A. Seams:
  - 1. Stego Tape by Stego Industries LLC
- B. Sealing Penetrations of Vapor barrier:
  - 1. Stego Mastic by Stego Industries
  - 2. Stego Tape by Stego Industries
- C. Perimeter/edge seal:
  - 1. Stego Crete Claw by Stego Industries
  - 2. Stego Term Bar by Stego Industries
  - 3. StegoTack Tape (double-sided sealant tape) by Stego Industries LLC,
- D. Penetration Prevention:
  - 1. Beast Foot by Stego Industries LLC
- E. Vapor Barrier-Safe Screed System
  - 1. Beast Screed by Stego Industries, LLC

# PART 3 – EXECUTION

#### 3.1 PREPARATION

- A. Ensure that subsoil is approved by Architect or Geotechnical Engineer.
  - 1. Level and compact base material.

#### 3.2 INSTALLATION

# A. <u>INSTALL VAPOR BARRIER DIRECTLY UNDER CONCRETE SLAB ON GRADE. NO</u> <u>EXCEPTIONS.</u>

- B. Install vapor barrier in accordance ASTM E1643.
  - 1. Unroll vapor barrier with the longest dimension parallel with the direction of the concrete placement and face laps away from the expected direction of the placement whenever possible.
  - 2. Extend vapor barrier to the perimeter of the slab. If practicable, terminate it at the top of the slab, otherwise (a) at a point acceptable to the structural engineer or (b) where obstructed by impediments, such as dowels, water-stops, or any other site condition requiring early termination of the vapor barrier. At the point of termination, seal vapor barrier to the foundation wall, grade beam or slab itself. Seal vapor barrier to the entire perimeter wall or footing/grade beam with double sided StegoTack Tape, or both Stego Term Bar and StegoTack Tape, per manufacturer's instructions. Ensure the concrete is clean and dry prior to adhering tape.
  - 3. Overlap joints 6 inches and seal with manufacturer's seam tape.
  - 4. Apply seam tape/Crete Claw to a clean and dry vapor barrier.
  - 5. Seal all penetrations (including pipes) per manufacturer's instructions.
  - 6. For interior forming applications, avoid the use of non-permanent stakes driven through vapor barrier. Use blunt-end and/or threaded nail stakes (screed pad posts) and insert them into Beast Foot. Ensure Beast Foot's peel-and-stick adhesive base is fully adhered to the vapor barrier
  - 7. If non-permanent stakes must be driven through vapor retarder, repair as recommended by vapor retarder manufacturer.
  - 8. Use reinforcing bar supports with base sections that eliminate or minimize the potential for puncture of the vapor barrier.
  - 9. Repair damaged areas with vapor barrier material of similar (or better) permeance, puncture and tensile.
  - 10. For vapor barrier-safe concrete screeding applications, install Beast Screed (vapor barrier-safe screed system) per manufacturer's instructions prior to placing concrete.

# END OF SECTION 072650

### SECTION 074643.13 - ENGINEERED WOOD SIDING

#### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Engineered wood siding.
    - a. Vertical siding.
    - b. Trim and fascia.
    - c. Soffit.
  - 2. Accessories.
- B. Related Requirements:
  - 1. Section 061000 "Rough Carpentry" for wood stud substrate support framing.
  - 2. Section 061600 "Sheathing" for wall sheathing substrates.
  - 3. Section 072100 "Thermal Insulation" for continuous insulation behind exterior cladding.
  - 4. Section 072500 "Weather Barriers" for water-resistive barriers.
  - 5. Section 079200 "Joint Sealants" for sealants at edges and transitions between composite composition siding system and exterior cladding.

#### 1.2 DEFINITIONS

A. Treated Engineered Wood: Engineered wood products manufactured for exterior use treated with manufacturer's proprietary process to resist fungal decay and termite damage.

#### 1.3 COORDINATION

A. Coordinate engineered wood siding installation with flashings, trim, and construction of other adjoining work to ensure proper sequencing, construction progress, and to provide a leakproof, secure, and noncorrosive installation.

#### 1.4 ACTION SUBMITTALS

A. Product Data: For each type of product and component included in engineered wood siding system. Include the following:

- 1. Construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of product and accessory included in siding system.
- 2. Installation methods, including nailing patterns.
- 3. Siding manufacturer's requirements for products to be installed by others.
- 4. Maintenance and periodic inspection recommendations.

# 1.5 INFORMATIONAL SUBMITTALS

- A. Qualifications: For Installer.
- B. Evaluation Reports: For engineered wood siding system, from ICC-ES in compliance with AC321.
- C. Sample warranties.

# 1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of product, including related accessories, to include in maintenance manuals.

# 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Installers trained by siding manufacturer.
- A. Panel to comply with HUD-UM-40c HUD Building Product Standards and Certification Program for Plywood and Other Performance Rated Wood-Based Structural-Use Panels.

# 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components and other manufactured items so as not to be damaged or deformed. Package components for protection during transportation and handling with manufacturer's name and identification of products.
- B. Unload, store, and erect components in a manner to prevent bending, warping, twisting, and surface damage. Maintain slip sheet until piece is being prepared for installation.
- C. Store components on flat surfaces clear of the ground. Store under roof or covered with suitable weathertight and ventilated covering, and in accordance with manufacturers' written instructions.

#### 1.9 WARRANTY

- A. Manufacturer's Trim and Siding Limited Warranty: Manufacturer agrees to repair or replace components of engineered wood siding against substrate damage within specified warranty period.
  - 1. Substrate damage is defined as deterioration, buckling, and overlay issues caused by manufacturing defects or termite damage.
  - 2. Hail damage is defined as a crack or chip in the surface overlay, or product substrate dents exceeding 3/8 inch in length or diameter and is caused by hail.
  - 3. Limited Warranty Period: 50 years from date of installation and written to Owner on date of Substantial Completion.

# PART 2 - PRODUCTS

# 2.1 SOURCE LIMITATIONS

A. Provide components and materials specified in this Section from single manufacturer for a complete and compatible assembly.

#### 2.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide engineered wood siding system tested to APA PS2 and PRP 108, in compliance with current IBC / OSSP and certified to be without permanent deformation or failure of structural members in accordance with design wind velocities for Project geographic location and probability of occurrence based on data from wind velocity maps provided in ASCE 7 and as approved by authorities having jurisdiction (AHJ).
  - 1. Design Loads: As indicated on drawings
- B. Fire-Resistance Performance: Comply with ASTM E119 for testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency acceptable to AHJ.
  - 1. Surface-Burning Characteristics: Provide engineered wood siding system with a Class C flame-spread index of 76 to 200 or less and a smoke-developed index of 0 to 450 or less when tested in accordance with ASTM E84 and UL 723.
- C. Thermal Movement Performance: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects.

- D. Certified Wood: Wood products to be labeled in accordance with the AF&PA's Sustainable Forestry Initiative, or be certified and labeled in accordance with the standards of the Programme for Endorsement of Forest Certification.
- E. Certified Wood: Wood products to be certified in accordance with the American Tree Farm System's "AFF Standard," the AF&PA's Sustainable Forestry Initiative, or the standards of the Programme for Endorsement of Forest Certification.
- F. Composite Wood Products: Products to be made using ultra-low-emitting formaldehyde resins as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" or made with no added formaldehyde.
- G. Composite Wood Products: Products to be made without added urea formaldehyde.

# 2.3 ENGINEERED WOOD SIDING

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Louisiana-Pacific Corporation; LP SmartSide Trim & Siding and ExpertFinish Trim & Siding or comparable product by one of the following:
  - 1. Allura.
  - 2. James Hardie.
  - 3. LP Smartside
- B. Treated Engineered Wood Panel Siding: Exterior-grade, resin-saturated, paper overlay laminated to EPA-registered zinc-borate-treated engineered wood siding. Exposed edges beveled and sealed for moisture resistance. Manufacturer's acrylic finish.
  - Basis-of-Design Product: Subject to compliance with requirements, provide Louisiana-Pacific Corporation; LP SmartSide [Panel] [Vertical Panel] Siding, [38] [76] [190] Series or comparable product.
  - 2. Thickness: 0.418 inch or 0.578 inch
  - 3. Width: 4'
  - 4. Length: 12'
  - 5. Edges: [Shiplap] [Square].
  - 6. Grooves: Channel grooves at 8 inches o.c.
  - 7. Texture: Cedar Texture
- C. Treated Engineered Wood Soffit: Exterior-grade, resin-saturated, paper overlay laminated to EPA-registered zinc-borate-treated engineered wood siding. Exposed edges beveled and sealed for moisture resistance. Manufacturer's acrylic finish.

- 1. Basis-of-Design Product: Subject to compliance with requirements, provide Louisiana-Pacific Corporation; LP SmartSide Soffit, [38] [76] [190] Series or comparable product.
- 2. Thickness: 0.418 inch or 0.578 inch.
- 3. Width: as indicated / required on drawings
- 4. Length: 8 ft. or 16 ft.
- 5. Edges: Square.
- 6. Texture: Cedar texture; unvented and vented as indicated on drawings.
- D. Treated Engineered Wood Trim and Fascia: Provide manufacturer's standard trim and fascia board, angles, and similar components at corners, transitions, and rough openings meeting the performance requirements.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Louisiana-Pacific Corporation; LP SmartSide Trim & Fascia
  - 2. Thickness: as indicated on drawings
  - 3. Width: as indicated on drawings
  - 4. Length: 16 ft.
  - 5. Edges: Square.
  - 6. Texture: Cedar Texture

#### 2.4 ACCESSORIES

- A. Fasteners: Hot-dipped galvanized nails, with 0.092-inch diameter shank, in length required to penetrate [wood structural panels and ]structural framing a minimum of 1-1/2 inches, as recommended in writing by composite siding system manufacturer suitable for and compatible with system materials. Larger diameter fasteners may be required depending on wind pressure, wind speed, and wind exposure category limitations for structures in product approvals PR-N124 or ESR-1301.
- B. Sealant: ASTM C920, minimum Class 25 sealant.
- C. Water-Resistive Barrier: ASTM D226 or other approved water-resistive barrier.
- D. Air Barrier: ASTM E1677.
  - 1. Seam Tape: Air barrier manufacturer's standard product.
- E. Non-Compressible Drainable Housewrap: (See separate specification section)
- F. Flashing:
  - 1. Provide flashing at window and door heads and where indicated on Drawings. Refer to Division 07 for sheet metal flashing.
  - 2. Material: Aluminum.

- a. Finish: Siliconized polyester coating.
- b. Finish: High-performance organic finish.
- c. Finish: Factory-prime coating.

#### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, engineered wood siding system supports, and other conditions affecting performance of the Work.
  - 1. Examine wall framing to verify that support members and anchorage have been installed within alignment tolerances required by engineered wood siding manufacturer.
  - 2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by engineered wood siding manufacturer.
    - a. Verify that air and moisture barrier has been installed over sheathing substrate to prevent air infiltration and water penetration.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

# 3.2 INSTALLATION

- A. General: Install engineered wood siding in accordance with manufacturer's written instructions in orientation, sizes, and locations indicated. Anchor engineered wood siding and other components of the Work securely in place.
  - 1. Shim or otherwise plumb substrates receiving engineered wood siding system.
  - 2. Flash engineered wood siding at perimeter of all openings.
  - 3. Locate and space fastenings in uniform vertical and horizontal alignment.
  - 4. Seal engineered wood substrates exposed to weather to prevent moisture intrusion and water buildup.
    - a. Seal around penetrations.
    - b. Seal each exposed cut of siding and trim. It is not recommended to field spray-applied coatings on cuts.
    - c. Seal each butt joint from weather by covering with joint moldings, sealant, or factory prefinished ends.
  - 5. Install flashing and trim as engineered wood siding work proceeds.
  - 6. Align bottoms of engineered wood siding.

- 7. Provide weathertight escutcheons for pipe- and conduit-penetrating engineered wood siding system.
- B. Metal Protection: Where dissimilar metal flashings contact each other or corrosive substrates, protect against galvanic action as recommended in writing by siding manufacturer.
- C. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
- D. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level. Install work with laps, joints, and seams that are permanently watertight.
  - 1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to achieve waterproof performance.
- E. Replace engineered wood siding components that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074643

# SECTION 075423 - THERMOPLASTIC POLYOLEFIN (TPO) ROOFING

#### 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.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Mechanically Attached TPO membrane roofing system.
  - 2. Vapor retarder.
  - 3. Roof insulation.
  - 4. Substrate board.
  - 5. Walkway Pads

#### **1.3 RELATED SECTIONS**

- A. Section 024119 Selective Structure Demolition
- B. Section 076200 Sheet Metal Flashing
- C. Section 079200 Joint Sealants

#### 1.4 DEFINITIONS

- A. TPO: Thermoplastic polyolefin.
- B. Roofing Terminology: See ASTM D 1079 and glossary in NRCA's "The NRCA Roofing and Waterproofing Manual" for definitions of terms related to roofing work in this Section.

#### 1.5 PERFORMANCE REQUIREMENTS & REFERENCES

A. General Performance: Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather

without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.

- B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.
- C. Roofing System Design: Provide membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to ASCE/SEI 7.
- D. Referenced Standards: These standards form part of this specification only to the extent they are referenced as specification requirements.
  - 1. ASTM C 1177/C 1177M Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2004.
  - 2. ASTM C 1289 Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2013.
  - 3. ASTM C 1549 Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer; 2009.
  - 4. ASTM D 638 Standard Test Method for Tensile Properties of Plastics; 2010.
  - 5. ASTM D 1004 Standard Test Method for Initial Tear Resistance of Plastic Film and Sheeting; 2009.
  - 6. ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2000.
  - 7. ASTM D6878/D6878M Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing; 2011a.
  - 8. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials; 2013a.
  - 9. ASTM E 136 Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C; 2012.
  - 10. FM 1-28 Design Wind Loads; Factory Mutual System; 2007.
  - 11. FM 1-29 Roof Deck Securement and Above Deck Roof Components; Factory Mutual System; 2006.
  - 12. PS 1 Construction and Industrial Plywood; 2009.
  - 13. PS 20 American Softwood Lumber Standard; 2010.

E. SPRI ES-1 - Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems; 2007. (ANSI/SPRI ES-1).

# 1.6 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For roofing system, including plans, elevations, sections, details, and attachments to other work, specific to this project, prepared by roofing membrane manufacturer.
  - 1. Flashings and membrane terminations.
  - 2. Tapered insulation, including slopes.
  - 3. Roof plan showing orientation of membrane roofing and fastening spacings (as applicable), and patterns for membrane roofing sheets.
  - 4. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
- C. Detailed Installation Instructions: Specific to this project, prepared by roofing membrane manufacturer.
- D. Qualification Data: For qualified Installer and manufacturer.
- E. Field quality-control reports.
- F. Maintenance Data: For roofing system to include in maintenance manuals.
- G. Warranties: Sample of special warranties.

# 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by membrane roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty (Duration specified elsewhere in this section).
- B. The roofing installer shall be thoroughly experienced and upon request be able to provide evidence of having at least 5 years' successful experience installing TPO roofing and having installed at least (3) roofing applications of similar size and complexity within the last 24 months.

- C. Crew Experience and Supervision: Provide adequate number of experienced workmen regularly engaged in this type of work who are skilled in the application techniques of the materials specified.
- D. Provide at least one foreman / superintendent who is a FACTORY CERTIFIED INSTALLER of the roofing system being installed. Such person will be on the job at all times roofing work is in progress.
- E. Perform Work in accordance with NRCA Roofing and Waterproofing Manual and manufacturer's written instructions.
- F. ROOFING MANUFACTURER'S TECHNICAL REPRESENTATIVE SHALL MAKE SITE INSPECTIONS BEFORE, DURING AND AFTER INSTALLATION OF WORK AND AT FREQUENCY AS REQUIRED TO ENABLE MANUFACTURER TO ISSUE SPECIFIED WARRANTY.
  - **1.** Perform and document inspections by designated and properly qualified Technical representative of membrane manufacturer.
  - 2. Verify that materials and Work meet specified requirements.
  - **3.** Should Work and/or materials not meet specified requirements, advise Architect with recommended course of action.
- G. Source Limitations: Obtain components including roof insulation and fasteners for membrane roofing system from same manufacturer as membrane roofing or approved by membrane roofing manufacturer.
- H. Exterior Fire-Test Exposure: ASTM E 108, Class A or Class B; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.
  - 1. Provide roofing membrane and bonding adhesive as required to meet Class A or Class B on the steep slopes encountered on this project.
- I. Preinstallation Roofing Conference: Conduct conference at Project site.
  - 1. Meet with Owner, Architect, roofing Installer, and roofing system manufacturer's representative, deck Installer.
  - 2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.

- 3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
- 4. Review structural loading limitations of roof deck during and after roofing.
- 5. Review flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
- 6. Review temporary protection requirements for roofing system during and after installation.
- 7. Review roof observation and repair procedures after roofing installation.

# 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer.
   Protect stored liquid material from direct sunlight.
  - 1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

# 1.9 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

# 1.10 WARRANTY

A. Special Warranty: Manufacturer's standard or customized form, without monetary limitation, in which manufacturer agrees to repair or replace components of

membrane roofing system that fail in materials or workmanship within specified warranty period.

1. Special warranty includes membrane roofing, flashings, roof insulation, fasteners, cover boards, substrate board, roofing accessories, and other components of membrane roofing system.

# 2. Warranty Period: Twenty five (25) years from date of Substantial Completion.

B. Special Project Warranty: **The Contractor shall submit roofing Installer's warranty, on warranty form included in Project Manual following this Section**, signed by Installer, covering the Work of this Section, including all components of membrane roofing system such as membrane roofing, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders, roof pavers, and walkway products, for the following warranty period:

# 1. Installers Warranty Period: Three years (3) from date of Substantial Completion.

# PART 2 - PRODUCTS

# 2.1 TPO MEMBRANE ROOFING

- A. Fabric-Reinforced Thermoplastic Polyolefin Sheet: ASTM D 6878, internally fabric or scrim reinforced, uniform, flexible TPO sheet.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Firestone "UltraPly" (Basis of Design)
    - b. Carlisle "Sure-Weld"
  - 2. Products by other manufacturers are subject to approval prior to bidding.
  - 3. Thickness: 60 mils (1.5 mm), nominal.
  - 4. Exposed Face Color: Manufacturer's standard white.
  - 5. Sheet Width: 8'-0"<u>+</u>6".

# 2.2 AUXILIARY MEMBRANE ROOFING MATERIALS

A. General: Auxiliary membrane roofing materials recommended by roofing system manufacturer for intended use, and compatible with membrane roofing.

- 1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
- Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
  - a. Plastic Foam Adhesives: 50 g/L.
  - b. Gypsum Board and Panel Adhesives: 50 g/L.
  - c. Multipurpose Construction Adhesives: 70 g/L.
  - d. Fiberglass Adhesives: 80 g/L.
  - e. Contact Adhesive: 80 g/L.
  - f. Other Adhesives: 250 g/L.
  - g. Single-Ply Roof Membrane Sealants: 450 g/L.
  - h. Nonmembrane Roof Sealants: 300 g/L.
  - i. Sealant Primers for Nonporous Substrates: 250 g/L.
  - j. Sealant Primers for Porous Substrates: 775 g/L.
- B. Sheet Flashing: Manufacturer's standard unreinforced thermoplastic polyolefin sheet flashing, 55 mils (1.4 mm) thick, minimum, of same color as sheet membrane.
- C. Bonding Adhesive: Manufacturer's standard and as required for steep slope applications.
- D. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch (25 by 3 mm) thick; with anchors.

# E. Reglets / Roofing Termination: Access to existing roofing shall be FRY REGLET 'SPRINGLOK', FLASHING SYSTEM AS SHOWN ON DRAWINGS, or equal.

- F. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.
- G. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.
- H. TPO Coated Metal: If and where indicated on the Drawings, metal flashings, etc. shall be sheet steel, factory coated with a TPO (color to match roofing membrane) material to which the roof membrane may be heat welded. Such coated metal shall be as manufactured by and as furnished by the manufacturer of the roofing membrane. Coated metal so furnished shall be fabricated to required shapes by local fabricator or by roof membrane manufacturer at Contractor's option. Gauges, sizes and details of coated metal installations shall be as shown on the drawings. Coated color shall match color or roofing membrane.

# 2.3 SUBSTRATE BOARD

- A. Substrate Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, 1/4 inch thick.
  - 1. Product: Subject to compliance with requirements, provide the following:
    - a. At horizontal surfaces: Georgia-Pacific Corporation; Dens Deck or approved equal.
    - b. At Vertical Surfaces to be adhered, such as parapet walls; Georgia-Pacific Corporation; Dens Deck 'PRIME' or approved equal.
  - 2. Products by other manufacturers are subject to approval prior to bidding.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening substrate board to roof deck.

#### 2.4 VAPOR RETARDER

- A. Laminated Sheet: Three ply laminate of low density polyethylene top and bottom layers and high strength cord center grid.
  - 1. Maximum flame spread 5; maximum smoke developed 60, both per ASTM E-84.
  - 2. Lap and Joint Sealing Tape: Pressure-sensitive tape of type recommended by vapor retarder manufacturer for sealing laps, joints and penetrations in vapor retarder.
  - 3. Product: Subject compliance with requirements, provide the following:
    - a. Reef Industries; Griffolyn Type-55FR.
  - 4. Products by other manufacturers are subject to approval prior to bidding.

# 2.5 ROOF INSULATION

- A. General: Preformed roof insulation boards manufactured or approved by TPO membrane roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated and that produce UL classification for roofing assembly.
- B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, glass-fiber mat facer on both major surfaces.

**1.** Use polyisocyanurate board insulation for layers of field insulation as indicated in drawings. See Roof assembly detail in the drawings.

### 2.6 INSULATION ACCESSORIES

- A. General: Furnish roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with membrane roofing.
- B. Fasteners: Factory-coated steel fasteners and metal plates complying with corrosionresistance provisions in FM Approvals 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.

#### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:
  - 1. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Install roofing, insulation, flashings, and accessories in accordance with roofing manufacturer's published instructions and recommendations for the specified roofing system. Where manufacturer provides no instructions or recommendations, follow good roofing practices and industry standards. Comply with federal, state, and local regulations.
- D. Obtain all relevant instructions and maintain copies at project site for duration of installation period.
- E. Do not start work until Pre-Installation Notice has been submitted to manufacturer as notification that this project requires a manufacturer's warranty.
- F. Perform work using competent and properly equipped personnel.
- G. Temporary closures, which ensure that moisture does not damage any completed section of the new roofing system, are the responsibility of the applicator. Completion

of flashings, terminations, and temporary closures shall be completed as required to provide a watertight condition.

- H. Install roofing membrane only when surfaces are clean, dry, smooth and free of snow or ice; do not apply roofing membrane during inclement weather or when ambient conditions will not allow proper application; consult manufacturer for recommended procedures during cold weather. Do not work with sealants and adhesives when material temperature is outside the range of 60 to 80 degrees F (15 to 25 degrees C).
- I. Protect adjacent construction, property, vehicles, and persons from damage related to roofing work; repair or restore damage caused by roofing work.
- J. Protect from spills and overspray from bitumen, adhesives, sealants and coatings.
- K. Particularly protect metal, glass, plastic, and painted surfaces from bitumen, adhesives, and sealants within the range of wind-borne overspray.
- L. Protect finished areas of the roofing system from roofing related work traffic and traffic by other trades.
- M. Until ready for use, keep materials in their original containers as labeled by the manufacturer.
- N. Consult membrane manufacturer's instructions, container labels, and Material Safety Data Sheets (MSDS) for specific safety instructions. Keep all adhesives, sealants, primers and cleaning materials away from all sources of ignition.

# 3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.
- C. Complete terminations and flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

# 3.3 METAL ACCESSORIES

A. Metal Roof Edging and Fascia: Continuous metal edge member serving as termination

of roof membrane and retainer for metal fascia; watertight with no exposed fasteners; mounted to roof edge nailer.

- 1. Anchor Bar Cleat: 20 gage, 0.036 inch (0.9 mm) G90 coated commercial type galvanized steel with pre-punched holes.
- 2. Fasteners: Factory-provided corrosion resistant fasteners, with drivers; no exposed fasteners permitted.
- 3. Scuppers: Welded watertight.
- 4. Accessories: Provide matching brick wall cap, downspout, extenders, and other special fabrications as shown on the drawings.
- B. Parapet Copings: Formed metal coping with galvanized steel anchor/support cleats for capping any parapet wall; watertight, maintenance free, without exposed fasteners; butt type joints with concealed splice plates; mechanically fastened as indicated; Firestone PTCF.
  - 1. Wind Performance:
    - a. At least the minimum required when tested in accordance with ANSI/SPRI ES-1 Test Method RE-3, current edition.
    - b. Provide product listed in current Factory Mutual Research Corporation Approval Guide with at least FM 1-90 rating.
  - 2. Description: Coping sections allowed to expand and contract freely while locked in place on anchor cleats by mechanical pressure from hardened stainless steel springs factory attached to anchor cleats; 8 inch (200 mm) wide splice plates with factory applied dual non-curing sealant strips capable of providing watertight seal.
  - 3. Material and Finish: 24 gage, 0.024 inch (0.06 mm) thick galvanized steel with Kynar 500 finish in manufacturer's standard color; matching concealed joint splice plates; factory-installed protective plastic film.
  - 4. Dimensions:
    - a. Wall Width: As indicated on the drawings.
    - b. Piece Length: Minimum 144 inches (3650 mm).
  - 5. Anchor/Support Cleats: 20 gage, 0.036 inch thick prepunched galvanized cleat with 12 inch wide stainless steel spring mechanically locked to cleat at 72 inches on center.
  - 6. Special Shaped Components: Provide factory-fabricated pieces necessary for complete installation, including miters, corners, intersections, curves, pier caps, and end caps; minimum 14 inch long legs on corner, intersection, and end pieces.
  - 7. Fasteners: Factory-furnished; electrolytically compatible; minimum pull out resistance of 240 pounds (109 kg) for actual substrate used; no exposed fasteners

# 3.4 VAPOR-RETARDER INSTALLATION

A. Laminate Sheet: Install laminate-sheet vapor retarder in a single layer over area to receive vapor retarder, side and end lapping each sheet a minimum of 2 inches and 6 inches, respectively. Seal laps with self-adhesive tape. Seal vapor retarder all perimeters and at penetrations with self-adhesive tape or sealant.

- 1. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into membrane roofing system.
- 2. Install vapor retarder at framed over area at perimeter of roof as shown on Drawings.

# 3.5 INSULATION INSTALLATION

- A. Coordinate installing membrane roofing system components, so insulation is not exposed to precipitation or left exposed at the end of the workday.
- B. Comply with membrane roofing system and insulation manufacturer's written instructions for installing roof insulation.
- C. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2 inches or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches (150 mm) in each direction.
- D. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- E. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch (6 mm) with insulation.
  - 1. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.
- F. Mechanically Fastened Insulation: Fasten insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
  - 1. Insulation fastening spacing, penetration into substrate, and fastener type shall be determined by roofing membrane manufacturer.

# 3.6 SUBSTRATE BOARD

A. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.

1. Fasten substrate board to roof deck with insulation anchors as required to resist uplift pressures at corners, perimeter, and field of roof as determined by roofing membrane manufacturer.

# 3.7 MECHANICALLY FASTENED MEMBRANE ROOFING INSTALLATION

- A. Spacing and penetration of Mechanical Attachment into substrate shall be determined by roofing membrane manufacturer.
- B. Beginning at low point of roof, place membrane without stretching over substrate and allow to relax at least 30 minutes before attachment or splicing; in colder weather allow for longer relax time.
- C. Lay out the membrane pieces so that field and flashing splices are installed to shed water.
- D. Install membrane without wrinkles and without gaps or fishmouths in seams; bond and test seams and laps in accordance with membrane manufacturer's instructions and details.
- E. Install membrane mechanically attached to the substrate using fasteners and edge securement as specified and as required by membrane manufacturers.
- F. Mechanical Attachment: Install fasteners in the seams, covered by membrane.
  - 1. Lay out fasteners in compliance with FM Class specified in PART 2, as recommended by membrane manufacturer, and as indicated, whichever is most stringent.
  - 2. Properly engage fasteners in the deck with head flush with the countersunk portion of seam plate.
- G. Edge Securement: Secure membrane at all locations where membrane terminates or goes through an angle change greater than 2 in 12 inches (1:6) using mechanically fastened reinforced perimeter fastening strips, plates, or metal edging as indicated or as recommended by roofing manufacturer.
  - 1. Exceptions: Round pipe penetrations less than 18 inches (460 mm) in diameter and square penetrations less than 4 inches (200 mm) square.
  - 2. Metal edging is not merely decorative; ensure anchorage of membrane as intended by roofing manufacturer.

# 3.8 FLASHING INSTALLATION

- A. Install flashings, including laps, splices, joints, bonding, adhesion, and attachment, as required by membrane manufacturer's recommendations and details.
- B. Metal Accessories: Install metal edgings, gravel stops, and copings in locations indicated on the drawings, with horizontal leg of edge member over membrane and flashing over metal onto membrane.
  - 1. Follow roofing manufacturer's instructions.
  - 2. Remove protective plastic surface film immediately before installation.
  - 3. Install water block sealant under the membrane anchorage leg.
  - 4. Flash with manufacturer's recommended flashing sheet unless otherwise indicated.
  - 5. Where single application of flashing will not completely cover the metal flange, install additional piece of flashing to cover the metal edge.
  - 6. If the roof edge includes a gravel stop and sealant is not applied between the laps in the metal edging, install an additional piece of self-adhesive flashing membrane over the metal lap to the top of the gravel stop; apply seam edge treatment at the intersections of the two flashing sections.
  - 7. When the roof slope is greater than 1:12, apply seam edge treatment along the back edge of the flashing.
- C. Scuppers: Set in sealant and secure to structure; flash as recommended by manufacturer.
- D. Roofing Expansion Joints: Install as recommended by roofing manufacturer.
- E. Flashing at Walls, Curbs, and Other Vertical and Sloped Surfaces: Install weathertight flashing at all walls, curbs, parapets, curbs, skylights, and other vertical and sloped surfaces that the roofing membrane abuts to; extend flashing at least 8 inches (200 mm) high above membrane surface.
  - 1. Use the longest practical flashing pieces.
  - 2. Evaluate the substrate and overlay and adjust installation procedure in accordance with membrane manufacturer's recommendations.
  - 3. Complete the splice between flashing and the main roof sheet with specified splice adhesive before adhering flashing to the vertical surface.
  - 4. Provide termination directly to the vertical substrate as shown on roof drawings.
- F. Roof Drains:
  - Taper insulation around drain to provide smooth transition from roof surface to drain. Use specified pre-manufactured tapered insulation with facer or suitable bonding surface to achieve slope; slope not to exceed manufacturer's recommendations.
  - 2. Position membrane, then cut a hole for roof drain to allow 1/2 to 3/4 inch (12 to 19

mm) of membrane to extend inside clamping ring past drain bolts.

- 3. Make round holes in membrane to align with clamping bolts; do not cut membrane back to bolt holes.
- 4. Apply sealant on top of drain bowl where clamping ring seats below the membrane
- 5. Install roof drain clamping ring and clamping bolts; tighten clamping bolts to achieve constant compression.
- G. Flashing at Penetrations: Flash all penetrations passing through the membrane; make flashing seals directly to the penetration.
  - 1. Pipes, Round Supports, and Similar Items: Flash with specified pre-molded pipe flashings wherever practical; otherwise use specified self-curing elastomeric flashing.
  - Pipe Clusters and Unusual Shaped Penetrations: Provide penetration pocket at least 2 inches (50 mm) deep, with at least 1 inch (25 mm) clearance from penetration, sloped to shed water.
  - 3. Structural Steel Tubing: If corner radii are greater than 1/4 inch (6 mm) and longest side of tube does not exceed 12 inches (305 mm), flash as for pipes; otherwise, provide a standard curb with flashing.
  - 4. Flexible and Moving Penetrations: Provide weathertight gooseneck set in sealant and secured to deck, flashed as recommended by manufacturer.

# 3.8 FINISHING AND WALKWAY INSTALLATION

- A. Install walkways at access points to the roof, around rooftop equipment that may require maintenance, and where indicated on the drawings.
- B. Walkway Pads: Adhere to the roofing membrane, spacing each pad at minimum of 1.0 inch (25 mm) and maximum of 3.0 inches (75 mm) from each other to allow for drainage.
  - 1. If installation of walkway pads over field fabricated splices or within 6 inches (150 mm) of a splice edge cannot be avoided, adhere another layer of flashing over the splice and extending beyond the walkway pad a minimum of 6 inches (150 mm) on either side.
  - 2. Install walkway pads underneath new maintenance platforms adjacent large HVAC units.
  - 3. Prime the membrane, remove the release paper on the pad, press in place, and walk on pad to ensure proper adhesion.

# 3.9 FIELD QUALITY CONTROL

A. Roof Inspections: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation as required for issuance of specified warranty.

- B. Repair or remove and replace components of membrane roofing system where inspections indicate that they do not comply with specified requirements.
- C. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

# 3.10 PROTECTING AND CLEANING

- D. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.
- E. Correct deficiencies in or remove membrane roofing system that does not comply with requirements; repair substrates; and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- F. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 075423

# **SINGLE PLY ROOFING WARRANTY**

WHEREAS
Of (Address)
Herein called the "Roofing Contractor", has performed roofing and associated ("work") on following project:
Owner:
Address:
Name and Type of Building:
Address:
Area of Work:Date of Acceptance:
Warranty Period: Three (3) years Date of Expiration:

AND WHEREAS Roofing Contractor has contracted (either directly with Owner or indirectly as subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period.

NOW THEREFORE Roofing Contractor hereby warrants, subject to terms and conditions herein set forth, that during Warranty period he will at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work, and as are necessary to maintain said work in watertight condition.

In addition to making the work watertight, the Roofing Contractor shall remove and / or repair deteriorated materials, improper workmanship, improper installation, and other irregularities which in the opinion of the Roofing Manufacturer's technical representative do not conform to acceptable roofing practices and conditions. These repairs shall be made prior to expiration of the three (3) year Warranty period and to the satisfaction of the Roofing Manufacturer's technical representative.

1. This Warranty is made subject to the following terms and conditions:

Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by: a) lightning; windstorm; b) fire; c) Failure of roofing deflection, deterioration, and decomposition; d) faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work; and e) activity on roofing by others including construction contractors, maintenance personnel, other persons, and animals whether authorized or unauthorized by Owner.

When Work has been damaged by any foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Contractor, and until cost and expense thereof has been paid by Owner or by another responsible party so designated.

- 2. The Roofing Contractor is responsible for damage to work covered by this Warranty, but is not consequential to damages to building or building contents, resulting from leaks or faults or defects of work.
- 3. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Contractor, including cutting, patching and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void upon date of said alterations, but only to extent said alterations affect work covered by this Warranty. If Owner engages Roofing Contractor to perform said alterations, Warranty shall not become null and void, unless Roofing Contractor, prior to proceeding with said work, shall claim that said alterations would like damage or deteriorate work, thereby reasonably justifying a limitation of termination of this Warranty.
- 4. During Warranty period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void upon date of said change, but only to extent said change affects work covered by this Warranty.
- 5. The Owner shall promptly notify Roofing Contractor of observed, known or suspected leaks, defect or deterioration, and shall afford reasonable opportunity for Roofing Contractor to inspect work, and to examine evidence of such leaks, defects or deterioration.

6. This Warranty is recognized to be the only Warranty of Roofing Contractor on said work, and is in addition to the Roofing Guarantee furnished by the Roofing Manufacturer, and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to him in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Contractor of responsibility for performance of original work in accordance with requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontractor with Owner's General Contractor.

IN WITNESS THEREOF, this instrument has been dully executed this:

Day of,\_\_\_\_\_, 20\_\_\_\_\_

Cosigned by General Contractor / CMGC By:

(General Contractor / CMGC)

(Business Address)

(Signature)

(Roofing Contractor)

(Business Address)

(Signature)

(Title)

(Title)

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# SECTION 076200 - SHEET METAL FLASHING AND TRIM

#### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Manufactured Products:
    - a. Manufactured counter-flashings.
  - 2. Formed Products:
    - a. Formed roof sheet metal fabrications.
    - b. Formed wall sheet metal fabrications.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies as indicated shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Thermal Movements: Provide sheet metal flashing and trim that allows for thermal movements from ambient and surface temperature changes.
  - 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

### 1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory, including prefinished metal materials.

- B. Samples for Selection: For each type of sheet metal flashing, trim, and accessory indicated with factory-applied color finishes involving color selection, 1'-0" x 1'-0" size samples of requested colors.
- C. Qualification Data: For qualified fabricator.

# 1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
- B. Sheet Metal Flashing and Trim Standard: Comply with Sheet Metal and Air Conditioning Contractors National Association's (SMACNA) "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.

# 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
- B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal flashing and trim installation.

# 1.7 WARRANTY

- A. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
    - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
    - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
  - 2. Finish Warranty Period: 20 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.
- B. Metallic-Coated Steel Sheet: Restricted flatness steel sheet, metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
  - 1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation; structural quality.
  - 2. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, Class AZ50 coating designation, Grade 40 (Class AZM150 coating designation, Grade 275); structural quality.
  - 3. Surface: Smooth, flat
  - 4. Exposed Coil-Coated Finish: (Prefinished Steel):
    - a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions, or
    - b. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
  - 5. Color for prefinished steel: To match metal roof panels.
  - 6. TPO coated metal shall be as specified in Specifications Section 075423.

## 2.2 UNDERLAYMENT MATERIALS

- A. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
- B. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils (0.76 to 1.0 mm) thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
  - 1. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F (116 deg C).
  - 2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F (29 deg C).

- 3. Products: Subject to compliance with requirements, provide one of the following:
  - a. Carlisle Coatings & Waterproofing Inc.; CCW WIP 300HT.
  - b. Grace Construction Products, a unit of W. R. Grace & Co.; Ultra.
  - c. Owens Corning; WeatherLock Metal High Temperature Underlayment.
- C. Slip Sheet: Building paper, 3-lb/100 sq. ft. (0.16-kg/sq. m) minimum, rosin sized.

# 2.3 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
  - 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
    - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating.
    - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
  - Fasteners for Zinc-Coated (Galvanized) or Aluminum-Zinc Alloy-Coated Steel Sheet: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329 or Series 300 stainless steel.
- C. Solder:
  - 1. For Zinc-Coated (Galvanized) Steel: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead or Grade Sn60, 60 percent tin and 40 percent lead.
- D. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
- E. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

- F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- G. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.
- H. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.
- 2.4 FABRICATION, GENERAL
  - A. General: Custom fabricate sheet metal flashing, trim, and roof drainage items to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply and to design, dimensions, geometry, metal thickness, and other characteristics of item indicated on the Drawings. Fabricate items at the shop to greatest extent possible.
    - 1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that indicated for each application.
    - 2. Obtain field measurements for accurate fit before shop fabrication.
    - 3. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
    - 4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.
  - B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.
  - C. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant.
  - D. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.
  - E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
  - F. Seams: Fabricate nonmoving seams in galvanized (non prefinished) steel sheet with flat-lock seams. Tin edges to be seamed, form seams, and solder.

- G. Seams: Fabricate nonmoving seams in prefinished steel sheet with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.
- H. Do not use graphite pencils to mark metal surfaces.

## PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of the Work.
  - 1. Verify compliance with requirements for installation tolerances of substrates.
  - 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- B. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 UNDERLAYMENT INSTALLATION

A. General: Install underlayment if and as indicated on Drawings.

## 3.3 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
  - 1. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
  - 2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
  - 3. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
  - 4. Install sealant tape where indicated.
  - 5. Torch cutting of sheet metal flashing and trim is not permitted.
  - 6. Do not use graphite pencils to mark metal surfaces.

- B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.
  - 1. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (600 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with sealant concealed within joints.
- D. Seal joints as shown and as required for watertight construction.
- E. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pretin edges of sheets to be soldered to a width of 1-1/2 inches (38 mm), except reduce pre-tinning where pre-tinned surface would show in completed Work.
- F. Rivets: Rivet joints where indicated and where necessary for strength.

# 3.4 ROOF DRAINAGE SYSTEM INSTALLATION

- A. General: Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.
- B. Hanging Gutters: Join sections with riveted and lapped joints sealed with sealant and 6 inch wide strip of uncured EPDM rubber adhered to inside of gutter over joint at bottom and sides. Provide for thermal expansion. Attach gutters as indicated. Provide end closures and seal watertight. Slope to downspouts for complete drainage of gutters.

# 3.5 ROOF, WALL, AND OTHER FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with SMACNA's "Architectural Sheet Metal Manual" and as indicated. Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

## 3.6 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

## 3.7 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder.
- C. Clean off excess sealants.
- D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturers written installation instructions. On completion of installation, remove unused materials and clean finished surfaces. Maintain in a clean condition during construction.
- E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 076200

## SECTION 079200 - JOINT SEALANTS

### 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.

#### 1.2 SUMMARY

A. This Section includes joint sealants for applications indicated on the Drawings that are not specifically included under any other specifications section.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.
- B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

#### 1.4 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

#### 1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

### 1.6 PROJECT CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
  - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg. F (5 deg. C).

#### JOINT SEALANTS

- 2. When joint substrates are wet.
- 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
- 4. Contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

## PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles.
- B. Products by other manufacturers are subject to Architect's approval prior to bidding.

## 2.2 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.
- B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

### 2.3 ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
- B. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- C. Suitability for Immersion in Liquids. Where elastomeric sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247 and qualify for the length of exposure indicated by reference to ASTM C 920 for Class 1 or 2. Liquid used for testing sealants is deionized water, unless otherwise indicated.

- D. Suitability for Contact with Food: Where elastomeric sealants are indicated for joints that will come in repeated contact with food, provide products that comply with Code of Federal Regulations (CFR) 21 CFR 177.2600.
- E. Single-Component Neutral-Curing Silicone Sealant: Use this sealant for joints subject to movement at interior and exterior locations for metals, glass, and ceramic type materials
  - 1. Products:
    - a. Dow Corning Corporation; 790.
    - b. Tremco; Spectrem 1
    - c. GE Silicones; SilPruf SCS2000.
    - d. Pecora Corporation; 864.
- F. Single-Component Mildew-Resistant Acid-Curing Silicone Sealant: Use this sealant for joints in food service areas, toilet rooms, locker rooms and interior wet areas.
  - 1. Products:
    - a. Dow Corning Corporation; 786 Mildew Resistant.
    - b. GE Silicones; Sanitary SCS1700.
    - c. Tremco; Tremsil 200.
- G. Single-Component Nonsag Urethane Sealant: Use this sealant for joints subject to movement are building exterior at concrete and masonry, including expansion / control joints in walls.
  - 1. Products:
    - a. Sika Corporation, Inc.; Sikaflex 1a.
    - b. Sonneborn, Division of ChemRex Inc.; NP 1.
    - c. Tremco; Vulkem 116.

### 2.4 SOLVENT-RELEASE JOINT SEALANTS

- A. Butyl-Rubber-Based Solvent-Release Joint Sealant: Comply with ASTM C 1085. Use this sealant in connection with exterior sheet metal work.
  - 1. Products:
    - a. Bostik Findley; Bostik 300.
    - b. Fuller, H. B. Company; SC-0296.
    - c. Fuller, H. B. Company; SC-0288.

- d. Pecora Corporation; BC-158.
- e. Polymeric Systems Inc.; PSI-301
- f. Sonneborn, Division of ChemRex Inc.; Sonneborn Multi-Purpose Sealant.
- g. Tremco; Tremco Butyl Sealant.

### 2.5 LATEX JOINT SEALANTS

- A. Latex Sealant: Comply with ASTM C 834, Type P, Grade NF. Use this sealant for general interior caulking and at drywall and wood construction to be painted.
- B. Products:
  - 1. Pecora Corporation; AC-20+.
  - 2. Sonneborn, Division of ChemRex Inc.; Sonolac.
  - 3. Tremco; Tremflex 834.

## 2.6 ACOUSTICAL JOINT SEALANTS

- A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard non-sag, paintable, non-staining latex sealant complying with ASTM C 834 and the following:
  - 1. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
  - 2. Products:
    - a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
    - b. United States Gypsum Co.; SHEETROCK Acoustical Sealant.

### 2.7 JOINT-SEALANT BACKING

- A. General: Provide sealant backings of material and type that are non-staining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), O (open-cell material), B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials

or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

## 2.8 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Non-staining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
  - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
  - 2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose

particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air.

- 3. Remove laitance and form-release agents from concrete.
- 4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.:
- B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

## 3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Acoustical Sealant Application Standard: Comply with recommendations in ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.
- D. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
  - 1. Do not leave gaps between ends of sealant backings.
  - 2. Do not stretch, twist, puncture, or tear sealant backings.
  - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- E. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- F. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

- 1. Place sealants so they directly contact and fully wet joint substrates.
- 2. Completely fill recesses in each joint configuration.
- 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- G. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
  - 1. Remove excess sealant from surfaces adjacent to joints.
  - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
  - 3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

## 3.4 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

# 3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION 079200

## SECTION 081113 - HOLLOW METAL FRAMES

### 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.

### 1.2 SUMMARY

- A. Section Includes:
  - 1. Hollow metal doors and frames.

### 1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings.
- B. SDI Designations: Reference to Steel Door Institute (SDI).
- C. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.

### 1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, fire-resistance rating, and finishes.
- B. Shop Drawings: Include the following:
  - 1. Elevations of each door design.
  - 2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
  - 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
  - 4. Locations of reinforcement and preparations for hardware.
  - 5. Details of each different wall opening condition.
  - 6. Details of anchorages, joints, field splices, and connections.
  - 7. Details of accessories.
  - 8. Details of moldings, removable stops, and glazing.
  - 9. Details of conduit and preparations for power, signal, and control systems, if any.

- C. Other Action Submittals:
  - 1. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.
- D. Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labeled assemblies.

## 1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.
- B. Fire-Rated Door Assemblies (if any): Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated.
  - 1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.
  - 1. Provide additional protection to prevent damage to finish of factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch-(102-mm-) high wood blocking. Do not store in a manner that traps excess humidity.
  - 1. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

## 1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings and existing hollow metal frames to be modified and retrofitted by field measurements before fabrication.

### 1.8 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

## PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Amweld Building Products, LLC.
  - 2. Ceco Door Products; an Assa Abloy Group company.
  - 3. Curries Company; an Assa Abloy Group company.
  - 4. Fleming Door Products Ltd.; an Assa Abloy Group company.
  - 5. Kewanee Corporation (The).
  - 6. Mesker Door Inc.
  - 7. Steelcraft; an Ingersoll-Rand company.
  - 8. Or Equal

## 2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.
- D. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z (12G) coating designation; mill phosphatized.
  - For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- F. Powder-Actuated Fasteners in Concrete: (see drawings prior to attachment) Fastener system of type suitable for application indicated, fabricated from corrosion-resistant

materials, with clips or other accessory devices for attaching hollow metal frames of type indicated.

- G. Grout: ASTM C 476, except with a maximum slump of 4 inches (102 mm), as measured according to ASTM C 143/C 143M.
- H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. (96- to 192-kg/cu. m) density; with maximum flame-spread and smoke-development indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- I. Glazing: Comply with requirements in Division 08 Section "Glazing."
- J. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

## 2.3 HOLLOW METAL DOORS

- A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.
  - 1. Design: Flush panel.
  - 2. Core Construction: Manufacturer's standard polystyrene, polyurethane, polyisocyanurate, or vertical steel-stiffener core.
  - 3. Vertical Edges for Single-Acting Doors: Manufacturer's standard.
    - a. Beveled Edge: 1/8 inch in 2 inches (3 mm in 50 mm).
  - 4. Top and Bottom Edges: Closed with flush or inverted 0.042-inch- (1.0-mm-) thick, end closures or channels of same material as face sheets.
  - 5. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."
- A. Exterior Doors: Face sheets fabricated from metallic-coated steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
  - 1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 1 (Full Flush).
- B. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

- C. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.
- D. At NEW doors, Openings in doors for lights and / or louvers shall be cut and perimeter reinforced at place of door manufacture. Do <u>not</u> field cut openings indoors.

## 2.4 HOLLOW METAL FRAMES

- A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.
- B. Interior Frames: Fabricated from cold-rolled steel sheet.
  - 1. Fabricate frames with mitered or coped corners.
  - 2. Fabricate frames as face welded unless otherwise indicated.
  - 3. Frames for Level 3 Steel Doors: 0.053-inch- (1.3-mm-) thick steel sheet.
  - 4. Frames for Borrowed Re-Lights: 0.053-inch- (1.3-mm-) thick steel sheet.
- C. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

## 2.5 FRAME ANCHORS

- A. Jamb Anchors:
  - 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch (1.0 mm) thick, with corrugated or perforated straps not less than 2 inches (50 mm) wide by 10 inches (250 mm) long; or wire anchors not less than 0.177 inch (4.5 mm) thick.
  - 2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch (1.0 mm) thick.
  - 3. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8inch- (9.5-mm-) diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
- B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch (1.0 mm) thick, and as follows:
  - 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

### 2.6 STOPS AND MOLDINGS

- A. Moldings for Glazed Lites in Doors: Minimum 0.032 inch (0.8 mm) thick, fabricated from same material as door face sheet in which they are installed.
- B. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 3/4 inch high, 12 ga. unless otherwise indicated.
- C. Loose Stops for Glazed Lites in Frames: Minimum 3/4 inch high, 12ga. fabricated from same material as frames in which they are installed.

## 2.7 ACCESSORIES

- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- B. Ceiling Struts: Minimum 1/4-inch-thick by 1-inch- (6.4-mm-thick by 25.4-mm-) wide steel.
- C. Grout Guards: Formed from same material as frames, not less than 0.016 inch (0.4 mm) thick.

## 2.8 FABRICATION

- A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.
- C. Hollow Metal Doors:
  - 1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
  - 2. Glazed Lites: Factory cut openings in doors.
- D. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
  - 1. Welded Frames: Weld joints continuously; grind, fill, dress, and make smooth, flush, and invisible.

- 2. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
- 3. Provide countersunk, flat- head security tamper proof headed exposed screws and for exposed fasteners unless otherwise indicated.
- 4. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
- 5. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
- 6. Jamb Anchors: Provide number and spacing of anchors as follows:
  - a. Masonry Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:
    - 1) Two anchors per jamb up to 60 inches (1524 mm) high.
    - 2) Three anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
    - 3) Four anchors per jamb from 90 to 120 inches (2286 to 3048 mm) high.
  - Stud-Wall Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:
    - 1) Three anchors per jamb up to 60 inches (1524 mm) high.
    - 2) Four anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
    - 3) Five anchors per jamb from 90 to 96 inches (2286 to 2438 mm) high.
  - c. Postinstalled Expansion Type: Locate anchors not more than 6 inches (152 mm) from top and bottom of frame. Space anchors not more than 26 inches (660 mm) o.c.
- 7. Door Silencers: Except on weather-stripped or gasketed doors, drill stops to receive door silencers as follows. Keep holes clear during construction.
  - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
  - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- E. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.
- F. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."

- 1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
- 2. Reinforce doors and frames to receive non-templated, mortised and surfacemounted door hardware.
- 3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
- G. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
  - 1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.
  - 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
  - 3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
  - 4. Provide loose stops and moldings on inside of hollow metal work.
  - 5. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

# 2.9 STEEL FINISHES

- A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.
  - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

# 2.10 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### 2.11 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:
  - 1. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
  - 2. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
  - 3. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
  - 4. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a perpendicular line from head to floor.
- C. Drill and tap doors and frames to receive nontemplated, mortised, and surfacemounted door hardware.

## 2.12 INSTALLATION

- A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11.
  - 1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
    - a. At fire-protection-rated openings, install frames according to National Fire Protection Association (NFPA) NFPA 80.
    - b. Where frames are fabricated in sections because of shipping or handling limitations, or where existing frames are to be modified, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
    - c. Install frames with removable glazing stops located on secure side of opening, use security tamper proof headed fasteners.
    - d. Install door silencers in frames before grouting.
    - e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    - f. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.

- g. Field apply bituminous coating to backs of frames that are filled with grout.
- 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
  - a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
- 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
- 4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
- 5. Concrete Walls: Solidly fill space between frames and concrete with grout. Take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.
- 6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
- 7. In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
- 8. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.
- 9. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
  - a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
  - b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
  - c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
  - d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.
- C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
  - 1. Non-Fire-Rated Standard Steel Doors:
    - a. Jambs and Head: 1/8 inch (3 mm) plus or minus 1/16 inch (1.6 mm).
    - b. Between Edges of Pairs of Doors: 1/8 inch (3 mm) plus or minus 1/16 inch (1.6 mm).
    - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch (9.5 mm).

- d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch (19 mm).
- 2. Fire-Rated Doors (if any): Install doors with clearances according to NFPA 80.
- D. Glazing: Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (50 mm) o.c. from each corner.

# 2.13 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow metal work immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- D. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

## END OF SECTION 081113

## SECTION 081416 - FLUSH WOOD DOORS

### 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.

### 1.2 SUMMARY

- A. Section Includes:
  - 1. Solid-core doors with wood-veneer faces.
  - 2. Factory finishing flush wood doors.

#### 1.3 SUBMITTALS

- A. Product Data: For each type of door indicated. Include details of core and edge construction, louvers, and trim for openings. Include factory-finishing specifications.
- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.
- C. Samples for Selection: For factory-finished doors.
- D. Warranty: Sample of special warranty.

### 1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain flush wood doors from single manufacturer.
- B. Quality Standard: In addition to requirements specified, comply with WDMA I.S.1-A, "Architectural Wood Flush Doors."
- 1.5 DELIVERY, STORAGE, AND HANDLING
  - A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in cardboard cartons.

## 1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

## 1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Warping (bow, cup, or twist) more than 1/4-inch (6.4 mm) in a 42-by-84inch (1067-by-2134-mm) section.
    - b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 76.2-mm) span.
  - 2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
  - 3. Warranty Period for Solid-Core Interior Doors: Life of installation.

## PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Algoma Hardwoods, Inc.
  - 2. Eggers Industries.
  - 3. Graham; an Assa Abloy Group company.
  - 4. Oshkosh Architectural Door Company.
  - 5. Vancouver Door Company.
  - 6. VT Industries Inc.
- B. Doors by other manufacturers subject to approval by the Architect prior to bidding.

## 2.2 DOOR CONSTRUCTION, GENERAL

- A. Low-Emitting Materials: Provide doors made with adhesives and composite wood products that do not contain urea formaldehyde.
- B. Window & Door Manufacturers Association (WDMA) WDMA I.S.1-A Performance Grade: Heavy Duty
- C. Particleboard-Core Doors:
  - 1. Particleboard: ANSI A208.1, Grade LD-1 or Grade LD-2, made with binder containing no urea-formaldehyde resin.
  - 2. Blocking: Provide wood blocking in particleboard-core doors as follows:
    - a. 5-inch (125-mm) top-rail blocking, in doors indicated to have closers.
    - b. 5-inch (125-mm) bottom-rail blocking, in exterior doors and doors indicated to have kick, mop, or armor plates.
    - c. 5-inch (125-mm) mid-rail blocking, in doors indicated to have exit devices.

## 2.3 VENEERED-FACED DOORS FOR TRANSPARENT FINISH

- A. Interior Solid-Core Doors:
  - 1. Grade: Custom, with Grade A faces.
  - 2. Species: BIRCH
  - 3. Cut: ROTARY CUT
  - 4. Exposed Vertical Edges: Same species as faces or a compatible species.
  - 5. Core: Particleboard.
  - 6. Construction: Five or seven plies. Stiles and rails are bonded to core, then entire unit abrasive planed before veneering. Faces are bonded to core using a hot press.
  - 7. WDMA I.S.1-A Performance Grade: Heavy Duty

### 2.4 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
- B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with Door Hardware Institute (DHI) DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.

- 1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
- C. Openings: Cut and trim openings through doors in factory.
  - 1. Light Openings: Trim openings with moldings of material and profile indicated.
  - 2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Division 08 Section "Glazing."
  - 3. Louvers: Factory install louvers in prepared openings, if any.

# 2.5 FACTORY FINISHING

- A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
  - 1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on bottom edges, edges of cutouts, and mortises.
- B. Finish doors at factory.
- C. Transparent Finish:
  - 1. Grade: Custom.
  - 2. Finish: WDMA TR-4 conversion varnish or TR-6 catalyzed polyurethane.
  - 3. Staining: As selected by Architect from manufacturer's full range.
  - 4. Effect: Filled finish.
  - 5. Sheen: Semigloss.

## PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Examine doors and installed door frames before hanging doors.
  - 1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
  - 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Hardware: For installation, see Division 08 Section "Door Hardware."
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.
  - 1. Install fire-rated doors, if any, in corresponding fire-rated frames according to NFPA 80.
- C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
  - 1. Clearances: Provide 1/8 inch (3.2 mm) at heads, jambs, and between pairs of doors. Provide 1/8 inch (3.2 mm) from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch (6.4 mm) from bottom of door to top of threshold unless otherwise indicated.
    - a. Comply with NFPA 80 for fire-rated doors, if any.
  - 2. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.
  - 3. Bevel fire-rated doors, if any, 1/8 inch in 2 inches (3-1/2 degrees) at lock edge; trim stiles and rails only to extent permitted by labeling agency.
- D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

## 3.3 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416

### SECTION 085313 - VINYL WINDOWS

### 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.

### 1.2 SUMMARY

A. This Section includes fixed and operable vinyl-framed windows.

### 1.3 DEFINITIONS

- A. Performance class designations according to AAMA/WDMA 101/I.S.2/NAFS:
  - 1. AW: Architectural.
  - 2. HC: Heavy Commercial.
  - 3. C: Commercial.
  - 4. LC: Light Commercial.
  - 5. R: Residential.
- B. Performance grade number according to AAMA/WDMA 101/I.S.2/NAFS:
- C. Structural Test Pressure: For uniform load structural test, is equivalent to 150 percent of the design pressure.
- D. Minimum Test Size: Smallest size permitted for performance class (gateway test size). Products must be tested at minimum test size or at a size larger than minimum test size to comply with requirements for performance class.

### 1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide vinyl windows capable of withstanding the effects of the following loads, based on testing units representative of those indicated for Project that pass AAMA/WDMA 101/I.S.2/NAFS, Uniform Load Structural Test:
  - 1. Design Wind Loads: Determine design wind loads applicable to Project from basic wind speed indicated in miles per hour at 33 feet (10 m) above grade,

according to ASCE 7, Section 6.5, "Method 2-Analytical Procedure," based on mean roof heights above grade indicated on Drawings.

a. Basic Wind Speed: 85 mph (38 m/s).

## 1.5 ACTION SUBMITTALS

- A. Product Data: Include construction details, material descriptions, and fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions for each type of vinyl window indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, hardware, attachments to other work, operational clearances, installation details, and the following:
  - 1. Mullion details, including reinforcement and stiffeners.
  - 2. Joinery details.
  - 3. Expansion provisions.
  - 4. Flashing and drainage details.
  - 5. Weather-stripping details.
  - 6. Glazing details.
  - 7. Window cleaning provisions.
  - 8. For installed products indicated to comply with design loads, include structural analysis data prepared by or under the supervision of a qualified professional engineer detailing fabrication and assembly of vinyl windows, and used to determine structural test pressures and design pressures from basic wind speeds indicated.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
  - 1. Include similar Samples of hardware and accessories involving color selection.
- D. Product Schedule: For vinyl windows. Use same designations indicated on Drawings.

## 1.6 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for each type, class, grade, and size of vinyl window. Test results based on use of downsized test units will not be accepted.
- B. Warranty: Special warranty specified in this Section.

## 1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For operable window sash finishes to include in maintenance manuals.

## 1.8 QUALITY ASSURANCE

- A. Installer Qualifications: An installer acceptable to vinyl window manufacturer for installation of units required for this Project.
  - 1. Installer's responsibilities include providing professional engineering services needed to assume engineering responsibility.
  - 2. Engineering Responsibility: Preparation of data for vinyl windows, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
- B. Manufacturer Qualifications: A manufacturer capable of fabricating vinyl windows that meet or exceed performance requirements indicated and of documenting this performance by inclusion in lists and by labels, test reports, and calculations.
- C. Source Limitations: Obtain vinyl windows through one source from a single manufacturer.
- D. Product Options: Information on Drawings and in Specifications establishes requirements for vinyl windows' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.
- E. Product Options: Drawings indicate size, profiles, and dimensional requirements of vinyl windows and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements." Do not modify size and dimensional requirements.
  - 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
- F. Fenestration Standard: Comply with AAMA/WDMA 101/I.S.2/NAFS, "North American Fenestration Standard Voluntary Performance Specification for Windows, Skylights and Glass Doors," for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.

- G. Glazing Publications: Comply with published recommendations of glass manufacturers and with GANA's "Glazing Manual" unless more stringent requirements are indicated.
- H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to vinyl windows including, but not limited to, the following:
  - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  - 2. Review, discuss, and coordinate the interrelationship of vinyl windows with other exterior wall components. Include provisions for structural anchorage, glazing, flashing, weeping, sealants, and protection of finishes.
  - 3. Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.
  - 4. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

# 1.9 PROJECT CONDITIONS

- A. Field Measurements: Verify vinyl window openings by field measurements before fabrication and indicate measurements on Shop Drawings.
  - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating vinyl windows without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

## 1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace vinyl windows that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Failure to meet performance requirements.
    - b. Structural failures including excessive deflection, water leakage, air infiltration, or condensation.
    - c. Faulty operation of movable sash and hardware.
    - d. Deterioration of vinyl, other materials, and finishes beyond normal weathering.
    - e. Failure of insulating glass.

### **VINYL WINDOWS**

- 2. Warranty Period:
  - a. Window: Two years from date of Substantial Completion.
  - b. Glazing: Five years from date of Substantial Completion.
  - c. Vinyl Finish: Five years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal prior to bidding:
- C. Basis-of-Design Product: Subject to compliance with requirements, provide or a comparable product by the following:

Window Series: Milgard<sup>®</sup> 8000M Montecito<sup>™</sup> Series, FIXED configuration.

### 2.2 MATERIALS

- A. Vinyl Extrusions: Rigid (un-plasticized) hollow PVC extrusions, formulated and extruded for exterior applications, complying with AAMA/WDMA 101/I.S.2/NAFS and the following:
- B. Vinyl Trim and Glazing Stops: Material and finish to match frame members.
- C. Fasteners: Aluminum, nonmagnetic stainless steel, epoxy adhesive, or other materials warranted by manufacturer to be noncorrosive and compatible with vinyl window members, cladding, trim, hardware, anchors, and other components.
  - 1. Exposed Fasteners: Unless unavoidable for applying hardware, do not use exposed fasteners. For application of hardware, use fasteners that match finish of member or hardware being fastened, as appropriate.
- D. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinccoated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.
- E. Reinforcing Members: Aluminum, or nonmagnetic stainless steel, or nickel/chromeplated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or

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zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.

- F. Compression-Type Weather Stripping: Provide compressible weather stripping designed for permanently resilient sealing under bumper or wiper action, and for complete concealment when vinyl window is closed.
  - 1. Weather-Stripping Material: Manufacturer's standard system and materials complying with AAMA/WDMA 101/I.S.2/NAFS.
- G. Replaceable Weather Seals: Comply with AAMA 701/702.

## 2.3 WINDOW

- A. Window Type: Half vent Slider above, Fixed below
- B. AAMA/WDMA Performance Requirements: Provide vinyl windows of performance indicated that comply with AAMA/WDMA 101/I.S.2/NAFS.
- C. Condensation-Resistance Factor (CRF): Provide vinyl windows tested for thermal performance according to AAMA 1503, showing a CRF of 52.
- D. Thermal Transmittance: Provide vinyl windows with a whole-window, U-factor maximum indicated at 15-mph (24-km/h) exterior wind velocity and winter condition temperatures when tested according to ASTM E 1423.
  - 1. U-Factor: 0.22
- E. Solar Heat-Gain Coefficient (SHGC): Provide vinyl windows with a whole-window SHGC maximum of 0.29, determined according to NFRC 200 procedures.
- F. Sound Transmission Class (STC): Provide glazed windows rated for not less than 26 STC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 413.
- G. Air Infiltration: Maximum rate not more than indicated when tested according to AAMA/WDMA 101/I.S.2/NAFS, Air Infiltration Test.
  - 1. Maximum Rate: 0.1 cfm/sq. ft. (5 cu. m/h x sq. m) of area at an inward test pressure of 1.57 lbf/sq. ft. (75 Pa).
- H. Water Resistance: No water leakage as defined in AAMA/WDMA referenced test methods at a water test pressure equaling that indicated, when tested according to AAMA/WDMA 101/I.S.2/NAFS, Water Resistance Test.

- 1. Test Pressure: 15 percent of positive design pressure, but not less than 2.86 lbf/sq. ft. (140 Pa) or more than 15 lbf/sq. ft. (720 Pa).
- I. Operating Force and Auxiliary (Durability) Tests: Comply with AAMA/WDMA 101/I.S.2/NAFS for operating window types indicated.

## 2.4 GLAZING

A. Glass: Refer to Drawings. Capable of matching U-FACTOR listed on Energy Compliance plan, see drawings.

Provide the following as required to accomplish energy requirements; Tinted, insulating-glass units, argon gas filled, low-E coating, double or triple glazing.

### 2.5 HARDWARE

- A. General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with vinyl; designed to smoothly operate, tightly close, and securely lock vinyl windows, and sized to accommodate sash or ventilator weight and dimensions. Do not use aluminum in frictional contact with other metals.
- B. Counterbalancing Mechanism: Comply with AAMA 902.
- C. Sill Cap/Track: Rigid PVC or other weather-resistant plastic track with manufacturer's standard integral color, of thickness, dimensions, and profile indicated; designed to comply with performance requirements indicated and to drain to the exterior.
- D. Locks and Latches: Designed to allow unobstructed movement of the sash across adjacent sash in direction indicated and operated from the inside only.
- E. Roller Assemblies: Low-friction design.
- F. Push-Bar Operators: Provide telescoping-type, push-bar operator designed to open and close ventilators with fixed screens.
- G. Gear-Type Rotary Operators: Comply with AAMA 901 when tested according to ASTM E 405, Method A.
  - 1. Operation Function: All ventilators move simultaneously and securely close at both jambs without using additional manually controlled locking devices.

## 2.6 INSECT SCREENS

- A. General: Design windows and hardware to accommodate screens in a tight-fitting, removable arrangement, with a minimum of exposed fasteners and latches. Fabricate insect screens to fully integrate with window frame. Locate screens on inside of window and provide for each operable exterior sash or ventilator.
  - 1. Aluminum Tubular Frame Screens: Comply with SMA 1004, "Specifications for Aluminum Tubular Frame Screens for Windows.
- B. Aluminum Insect Screen Frames: Manufacturer's standard aluminum alloy complying with SMA 1004. Fabricate frames with mitered or coped joints or corner extrusions, concealed fasteners, and removable PVC spline/anchor concealing edge of frame.
  - 1. Aluminum Tubular Framing Sections and Cross Braces: Roll formed from aluminum sheet with minimum wall thickness as required for class indicated.
  - 2. Finish: Anodized aluminum in manufacturer's standard color.

## 2.7 ACCESSORIES

- A. Dividers (False Muntins): Provide dividers in designs indicated for each sash lite.
  - 1. Material: Extruded, rigid PVC.
  - 2. Design: As shown on Drawings.
  - 3. Color: White.

## 2.8 FABRICATION

- A. Fabricate vinyl windows in sizes indicated on drawings. Include a complete system for assembling components and anchoring windows.
- B. Fabricate vinyl windows that are re-glazable without dismantling sash or ventilator framing.
- C. Weather Stripping: Provide full-perimeter weather stripping for each operable sash and ventilator, unless otherwise indicated.
- D. Mullions: Provide mullions and cover plates as shown, compatible with window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections, as indicated. Provide mullions and cover plates capable of withstanding design loads of window units. Provide manufacturer's standard finish to match window units.

- E. Subframes: Provide subframes with anchors for window units as shown, of profile and dimensions indicated but not less than 0.062-inch- (1.6-mm-) thick extruded aluminum. Miter or cope corners, and weld and dress smooth with concealed mechanical joint fasteners. Provide manufacturer's standard finish to match window units. Provide subframes capable of withstanding design loads of window units.
- F. Factory-Glazed Fabrication: Except for light sizes in excess of 100 united inches (2500 mm width plus length), glaze vinyl windows in the factory where practical and possible for applications indicated. Comply with requirements in Division 08 Section "Glazing" and with AAMA/WDMA 101/I.S.2/NAFS.
- G. Glazing Stops: Provide nailed or snap-on glazing stops coordinated with Division 08 Section "Glazing" and glazing system indicated. Provide glazing stops to match sash and ventilator frames.
- H. Hardware: Mount hardware through double walls of vinyl extrusions or provide corrosion-resistant steel reinforcement complying with requirements for reinforcing members or do both.
- I. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation. Allow for scribing, trimming, and fitting at Project site.

## 2.9 VINYL FINISHES

A. Integral Finish and Color: Uniform, solid, homogeneous tan or light brown interior and exterior.

## PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work. Verify rough opening dimensions, levelness of sill plate, and operational clearances. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weathertight window installation.
  - 1. Wood Frame Walls: Dry, clean, sound, well nailed, free of voids, and without offsets at joints. Ensure that nail heads are driven flush with surfaces in opening and within 3 inches (76 mm) of opening.
  - 2. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.

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3. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 INSTALLATION

- A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing windows, hardware, accessories, and other components.
- B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.
- C. Set sill members in bed of sealant or with gaskets, as indicated, for weathertight construction.
- D. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

## 3.3 ADJUSTING, CLEANING, AND PROTECTION

- A. Adjust operating sashes and ventilators, screens, hardware, and accessories for a tight fit at contact points and weather stripping for smooth operation and weathertight closure. Lubricate hardware and moving parts.
- B. Clean exposed surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
- C. Clean factory-glazed glass immediately after installing windows. Comply with manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels, and clean surfaces.
- D. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.
- E. Protect window surfaces from contact with contaminating substances resulting from construction operations. In addition, monitor window surfaces adjacent to and below exterior concrete and masonry surfaces during construction for presence of dirt, scum, alkaline deposits, stains, or other contaminants. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written recommendations.

END OF SECTION 085313

## DOOR HARDWARE - SECTION 087100

## PART 1 - GENERAL

## 1.1 SUMMARY:

- A. Section Includes: Finish Hardware for door openings, except as otherwise specified herein.
  - 1. Door hardware for steel (hollow metal) doors.
  - 2. Door hardware for wood doors.
  - 3. Door hardware for other doors indicated.
  - 4. Keyed cylinders as indicated.
- B. Related Sections:
  - 1. Division 6: Rough Carpentry.
  - 2. Division 8: Hollow Metal Doors and Frames.
  - 3. Division 8: Wood Doors.
- C. References: Comply with applicable requirements of the following standards. Where these standards conflict with other specific requirements, the most restrictive shall govern.
  - 1. Builders Hardware Manufacturing Association (BHMA)
  - 2. NFPA 101 Life Safety Code
  - 3. NFPA 80 -Fire Doors and Windows
  - 4. ANSI-A156.xx- Various Performance Standards for Finish Hardware
  - 5. UL10C Positive Pressure Fire Test of Door Assemblies
  - 6. ANSI-A117.1 Accessible and Usable Buildings and Facilities
  - 7. DHI /ANSI A115.IG Installation Guide for Doors and Hardware
  - 8. ICC International Building Code
- D. Intent of Hardware Groups
  - 1. Should items of hardware not definitely specified be required for completion of the Work, furnish such items of type and quality comparable to adjacent hardware and appropriate for service required.
  - 2. Where items of hardware aren't definitely or correctly specified, are required for completion of the Work, a written statement of such omission, error, or other discrepancy to be submitted to Architect, prior to date specified for receipt of bids for clarification by addendum; or, furnish such items in the type and quality established by this specification, and appropriate to the service intended.

- 1.2 SUBSTITUTIONS:
  - A. Comply with Division 1.
- 1.3 SUBMITTALS:
  - A. Comply with Division 1.
  - B. Special Submittal Requirements: Combine submittals of this Section with Sections listed below to ensure the "design intent" of the system/assembly is understood and can be reviewed together.
  - C. Product Data: Manufacturer's specifications and technical data including the following:
    - 1. Detailed specification of construction and fabrication.
    - 2. Manufacturer's installation instructions.
    - 3. Wiring diagrams for each electric product specified. Coordinate voltage with electrical before submitting.
    - 4. Submit 6 copies of catalog cuts with hardware schedule.
    - 5. Provide 9001-Quality Management and 14001-Environmental Management for products listed in Materials Section 2.2
  - D. Shop Drawings Hardware Schedule: Submit 6 complete reproducible copy of detailed hardware schedule in a vertical format.
    - 1. List groups and suffixes in proper sequence.
    - 2. Completely describe door and list architectural door number.
    - 3. Manufacturer, product name, and catalog number.
    - 4. Function, type, and style.
    - 5. Size and finish of each item.
    - 6. Mounting heights.
    - 7. Explanation of abbreviations and symbols used within schedule.
    - 8. Detailed wiring diagrams, specially developed for each opening, indicating all electric hardware, security equipment and access control equipment, and door and frame rough-ins required for specific opening.
  - E. Templates: Submit templates and "reviewed Hardware Schedule" to door and frame supplier and others as applicable to enable proper and accurate sizing and locations of cutouts and reinforcing.
    - 1. Templates, wiring diagrams and "reviewed Hardware Schedule" of electrical terms to electrical for coordination and verification of voltages and locations.
  - F. Samples: (If requested by the Architect)
    - 1. 1 sample of Lever and Rose/Escutcheon design, (pair).

- 2. 3 samples of metal finishes
- G. Contract Closeout Submittals: Comply with Division 1 including specific requirements indicated.
  - 1. Operating and maintenance manuals: Submit 3 sets containing the following.
    - a. Complete information in care, maintenance, and adjustment, and data on repair and replacement parts, and information on preservation of finishes.
    - b. Catalog pages for each product.
    - c. Name, address, and phone number of local representative for each manufacturer.
    - d. Parts list for each product.
  - 2. Copy of final hardware schedule, edited to reflect, "As installed".
  - 3. Copy of final keying schedule
  - 4. As installed "Wiring Diagrams" for each piece of hardware connected to power, both low voltage and 110 volts.
  - 5. One set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

## 1.4 QUALITY ASSURANCE

- A. Comply with Division 1.
  - 1. Statement of qualification for distributor and installers.
  - 2. Statement of compliance with regulatory requirements and single source responsibility.
  - 3. Distributor's Qualifications: Firm with 3 years experience in the distribution of commercial hardware.
    - a. Distributor to employ full time Architectural Hardware Consultants (AHC) for the purpose of scheduling and coordinating hardware and establishing keying schedule.
    - b. Hardware Schedule shall be prepared and signed by an AHC.
  - 4. Installer's Qualifications: Firm with 3 years experienced in installation of similar hardware to that required for this Project, including specific requirements indicated.
  - 5. Regulatory Label Requirements: Provide testing agency label or stamp on hardware for labeled openings.
    - a. Provide UL listed hardware for labeled and 20 minute openings in conformance with requirements for class of opening scheduled.

- b. Underwriters Laboratories requirements have precedence over this specification where conflict exists.
- 6. Single Source Responsibility: Except where specified in hardware schedule, furnish products of only one manufacturer for each type of hardware.
- B. Review Project for extent of finish hardware required to complete the Work. Where there is a conflict between these Specifications and the existing hardware, notify the Architect in writing and furnish hardware in compliance with the Specification unless otherwise directed in writing by the Architect.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Packing and Shipping: Comply with Division 1.
  - 1. Deliver products in original unopened packaging with legible manufacturer's identification.
  - 2. Package hardware to prevent damage during transit and storage.
  - 3. Mark hardware to correspond with "reviewed hardware schedule".
  - 4. Deliver hardware to door and frame manufacturer upon request.
- B. Storage and Protection: Comply with manufacturer's recommendations.

## 1.6 **PROJECT CONDITIONS:**

- A. Coordinate hardware with other work. Furnish hardware items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements indicated, as necessary for the proper installation and function, regardless of omissions or conflicts in the information on the Contract Documents.
- B. Review Shop Drawings for doors and entrances to confirm that adequate provisions will be made for the proper installation of hardware.

## 1.7 WARRANTY:

- A. Refer to Conditions of the Contract
- B. Manufacturer's Warranty:
  - 1. Closers: Ten years
  - 2. Exit Devices: Five Years
  - 3. Locksets & Cylinders: Three years
  - 4. All other Hardware: Two years.

## 1.8 OWNER'S INSTRUCTION:

A. Instruct Owner's personnel in operation and maintenance of hardware units.

## 1.9 MAINTENANCE:

- A. Extra Service Materials: Deliver to Owner extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels. Comply with Division 1 Closeout Submittals Section.
  - 1. Special Tools: Provide special wrenches and tools applicable to each different or special hardware component.
  - 2. Maintenance Tools: Provide maintenance tools and accessories supplied by hardware component manufacturer.
  - 3. Delivery, Storage and Protection: Comply with Owner's requirements for delivery, storage and protection of extra service materials.
- B. Maintenance Service: Submit for Owner's consideration maintenance service agreement for electronic products installed.

## PART 2 - PRODUCTS

- 2.1 MANUFACTURERS:
  - A. The following manufacturers are approved subject to compliance with requirements of the Contract Documents. Approval of manufacturers other than those listed shall be in accordance with Division 1.

<u>ltem</u> :	Manufacturer:	<u>Approved</u> :
Hinges	Stanley	Bommer, McKinney
Continuous Hinges	Stanley	Select, ABH
Locksets	MATCH EXISTING BUILDING KEYING SYSTEM	
Cylinders	MATCH EXISTING BUILDING KEYING SYSTEM	
Exit Devices	Precision	Von Duprin XP98,
Closers	Stanley QDC100	LCN XP4040 DEL
Push/Pull Plates	Trimco	Burns, Rockwood
Push/Pull Bars	Trimco	Burns, Rockwood
Protection Plates	Trimco	Burns, Rockwood
Overhead Stops	ABH	Rixson, Glynn Johnson
Door Stops	Trimco	Burns, Rockwood
Flush Bolts	Trimco	ABH, Burns
Coordinator & Brackets	Trimco	ABH, Burns
Threshold & Gasketing	National Guard	Pemko
Electronic Trim	Alarm Lock	No substitutions

## 2.2 MATERIALS:

- A. Hinges: Shall be Five Knuckle Ball bearing hinges
  - 1. Template screw hole locations
  - 2. Bearings are to be fully hardened.
  - 3. Bearing shell is to be consistent shape with barrel.
  - 4. Minimum of 2 permanently lubricated non-detachable bearings on standard weight hinge and 4 permanently lubricated bearing on heavy weight hinges.
  - 5. Equip with easily seated, non-rising pins.
  - 6. Non Removable Pin screws shall be slotted stainless steel screws.
  - 7. Hinges shall be full polished, front, back and barrel.
  - 8. Hinge pin is to be fully plated.
  - 9. Bearing assembly is to be installed after plating.
  - 10. Sufficient size to allow 180-degree swing of door
  - 11. Furnish five knuckles with flush ball bearings
  - 12. Provide hinge type as listed in schedule.
  - 13. Furnish 3 hinges per leaf to 7 foot 6 inch height. Add one for each additional 30 inches in height or fraction thereof.
  - 14. Tested and approved by BHMA for all applicable ANSI Standards for type, size, function and finish
  - 15. UL10C listed for Fire rated doors.
- B. Mortise Type Locks and Latches:
  - 1. Tested and approved by BHMA for ANSI A156.13, Series 1000, Operational Grade 1, Extra-Heavy Duty, Security Grade 2 and be UL10C.
  - 2. Furnish UL or recognized independent laboratory certified mechanical operational testing to 4 million cycles minimum.
  - 3. Provide 9001-Quality Management and 14001-Environmental Management.
  - 4. Fit ANSI A115.1 door preparation
  - 5. Functions and design as indicated in the hardware groups
  - 6. Solid, one-piece, 3/4-inch (19mm) throw, anti-friction latchbolt made of selflubricating stainless steel
  - 7. Deadbolt functions shall have 1 inch (25mm) throw bolt made of hardened stainless steel
  - 8. Latchbolt and Deadbolt are to extend into the case a minimum of 3/8 inch (9.5mm) when fully extended
  - 9. Auxiliary deadlatch to be made of one piece stainless steel, permanently lubricated
  - 10. Provide sufficient curved strike lip to protect door trim
  - 11. Lever handles must be of forged or cast brass, bronze or stainless steel construction and conform to ANSI A117.1. Levers that contain a hollow cavity are not acceptable

- 12. Lock shall have self-aligning, thru-bolted trim
- 13. Levers to operate a roller bearing spindle hub mechanism
- 14. Mortise cylinders of lock shall have a concealed internal setscrew for securing the cylinder to the lockset. The internal setscrew will be accessible only by removing the core, with the control key, from the cylinder body.
- 15. Spindle to be designed to prevent forced entry from attacking of lever
- 16. Provide locksets with 7-pin removable and interchangeable core cylinders
- 17. Each lever to have independent spring mechanism controlling it
- 18. Core face must be the same finish as the lockset.
- C. Cylindrical Type Locks and Latchsets:
  - 1. Tested and approved by BHMA for ANSI A156.2, ND Series, Operational Grade 1, Extra-Heavy Duty, and be UL10C listed.
  - 2. Provide 9001-Quality Management and 14001-Environmental Management.
  - 3. Fit modified ANSI A115.2 door preparation.
  - 4. Locksets and cores to be of the same manufacturer to maintain complete lockset warranty
  - 5. Locksets to have anti-rotational studs that are thru-bolted
  - 6. Keyed lever shall not have exposed "keeper" hole
  - 7. Each lever to have independent spring mechanism controlling it
  - 8. 2-3/4 inch (70 mm) backset
  - 9. 9/16 inch (14 mm) throw latchbolt
  - 10. Provide sufficient curved strike lip to protect door trim
  - 11. Outside lever sleeve to be seamless, of one-piece construction made of a hardened steel alloy
  - 12. Keyed lever to be removable only after core is removed, by authorized control key
  - 13. Provide locksets with 6-pin removable and interchangeable core cylinders
  - 14. Hub, side plate, shrouded rose, locking pin to be a one-piece casting with a shrouded locking lug.
  - 15. Locksets outside locked lever must withstand minimum 1400 inch pounds of torque. In excess of that, a replaceable part will shear. Key from outside and inside lever will still operate lockset.
  - 16. Core face must be the same finish as the lockset.
  - 17. Functions and design as indicated in the hardware groups
- D. Exit Devices:
  - 1. Exit devices to meet or exceed BHMA for ANSI 156.3, Grade 1.
  - 2. Exit devices to be tested and certified by UL or by a recognized independent laboratory for mechanical operational testing to 10 million cycles minimum with inspection confirming Grade 1 Loaded Forces have been maintained.
  - 3. Exit devices chassis to be investment cast steel, zinc dichromate.
  - 4. Exit devices to have stainless steel deadlocking <sup>3</sup>/<sub>4</sub>" through latch bolt.

- 5. Exit devices to be equipped with sound dampening on touchbar.
- 6. Non-fire rated exit devices to have cylinder dogging.
- 7. Non-fire rated exit devices to have ¼" minimum turn hex key dogging.
- 8. Touchpad to be "T" style constructed of architectural metal with matching metal end caps.
- 9. Touchbar assembly on wide style exit devices to have a ¼" clearance to allow for vision frames.
- 10. All exposed exit device components to be of architectural metals and "true" architectural finishes.
- 11. Provide strikes as required by application.
- 12. Fire exit hardware to conform to UL10C and UBC 7-2. UL tested for Accident Hazard.
- 13. The strike is to be black powder coated finish.
- 14. Exit devices to have field reversible handing.
- 15. Provide heavy duty vandal resistant lever trim with heavy duty investment cast stainless steel components and extra strength shock absorbing overload springs. Lever shall not require resetting. Lever design to match locksets and latchsets.
- 16. Provide 9001-Quality Management and 14001-Environmental Management.
- 17. Vertical Latch Assemblies to have gravity operation, no springs.
- 18. Approved Manufacturers
  - a. The following manufacturers will be approved contingent on meeting or exceeding the above performance criteria:
    - 1) Precision Manufactured by Stanley Security Solutions
- E. Cylinders:
  - 1. Provide the necessary cylinder housings, collars, rings & springs as recommended by the manufacturer for proper installation.
  - 2. Provide the proper cylinder cams or tail piece as required to operate all locksets and other keyed hardware items listed in the hardware sets.
  - 3. Coordinate and provide as required for related sections.
- F. Door Closers shall:
  - 1. Tested and approved by BHMA for ANSI 156.4, Grade 1
  - 2. UL10C certified
  - 3. Provide 9001-Quality Management and 14001-Environmental Management.
  - 4. Closer shall have extra-duty arms and knuckles
  - 5. Conform to ANSI 117.1
  - 6. Maximum 2 7/16 inch case projection with non-ferrous cover
  - 7. Separate adjusting valves for closing and latching speed, and backcheck
  - 8. Provide adapter plates, shim spacers and blade stop spacers as required by frame and door conditions
  - 9. Full rack and pinion type closer with 1<sup>1</sup>/<sub>2</sub>" minimum bore

- 10. Mount closers on non-public side of door, unless otherwise noted in specification
- 11. Closers shall be non-handed, non-sized and multi-sized.
- G. Door Stops: Provide a dome floor or wall stop for every opening as listed in the hardware sets.
  - 1. Wall stop and floor stop shall be wrought bronze, brass or stainless steel.
  - 2. Provide fastener suitable for wall construction.
  - 3. Coordinate reinforcement of walls where wall stop is specified.
  - 4. Provide dome stops where wall stops are not practical. Provide spacers or carpet riser for floor conditions encountered
- H. Over Head Stops: Provide a Surface mounted or concealed overhead when a floor or wall stop cannot be used or when listed in the hardware set.
  - 1. Concealed overhead stops shall be heavy duty bronze or stainless steel.
  - 2. Surface overhead stops shall be heavy duty bronze or stainless steel.
- I. Push Plates: Provide with four beveled edges ANSI J301, .050 thickness, size as indicated in hardware set. Furnish oval-head countersunk screws to match finish.
- J. Pulls with plates: Provide with four beveled edges ANSI J301, .050 thickness Plate s with ANSI J401 Pull as listed in hardware set. Provide proper fasteners for door construction.
- K. Push Pull Bars: Provide ANSI J504, .1" Dia. Pull and push bar model and series as listed in hardware set. Provide proper fasteners for door construction.
- L. Kickplates: Provide with four beveled edges ANSI J102, 10 inches high by width less 2 inches on single doors and 1 inch on pairs of doors. Furnish oval-head countersunk screws to match finish.
- M. Door Bolts: Flush bolts for wood or metal doors.
  - 1. Provide a set of Automatic bolts, Certified ANSI/BHMA 156.3 Type 25 for hollow metal label doors.
  - 2. Provide a set of Automatic bolts, Certified ANSI/BHMA 156.3 Type 27 at wood label doors.
  - 3. Manual flush bolts, Certified ANSI/BHMA 156.16 at openings where allowed local authority.
  - 4. Provide Dust Proof Strike, Certified ANSI/BHMA 156.16 at doors with flush bolts without thresholds.
- N. Coordinator and Brackets: Provide a surface mounted coordinator when automatic bolts are used in the hardware set.

- 1. Coordinator, Certified ANSI/BHMA A1156.3 Type 21A for full width of the opening.
- 2. Provide mounting brackets for soffit applied hardware.
- 3. Provide hardware preparation (cutouts) for latches as necessary.
- O. Seals: All seals shall be finished to match adjacent frame color. Seals shall be furnished as listed in schedule. Material shall be UL listed for labeled openings.
- P. Weatherstripping: Provide at head and jambs only those units where resilient or flexible seal strip is easily replaceable. Where bar-type weatherstrip is used with parallel arm mounted closers install weatherstrip first.
  - 1. Weatherstrip shall be resilient seal of (Neoprene, Polyurethane, Vinyl, Pile, Nylon Brush, Silicone)
  - 2. UL10C Positive Pressure rated seal set when required.
- Q. Door Bottoms/Sweeps: Surface mounted or concealed door bottom where listed in the hardware sets.
  - 1. Door seal shall be resilient seal of (Neoprene, Polyurethane, Nylon Brush, Silicone)
  - 2. UL10C Positive Pressure rated seal set when required.
- R. Thresholds: Thresholds shall be aluminum beveled type with maximum height of  $\frac{1}{2}$ " for conformance with ADA requirements. Furnish as specified and per details. Provide fasteners and screws suitable for floor conditions.
- S. Silencers: Furnish silencers on all interior frames, 3 for single doors, 2 for pairs. Omit where any type of seals occur.
- T. Electronic Trim: Electronic Trim shall Be 'Alarm Lock' Trilogy Networx, wireless networking locks.
- 2.3 FINISH:
  - A. Designations used in Schedule of Finish Hardware 3.05, and elsewhere to indicate hardware finishes are those listed in ANSI/BHMA A156.18 including coordination with traditional U.S. finishes shown by certain manufacturers for their products
  - B. Powder coat door closers to match other hardware, unless otherwise noted.
  - C. Aluminum items shall be finished to match predominant adjacent material. Seals to coordinate with frame color.

## 2.4 KEYS AND KEYING:

A. Provide keyed brass construction cores and keys during the construction period. Construction control and operating keys and core shall not be part of the Owner's permanent keying system or furnished in the same keyway (or key section) as the Owner's permanent keying system. Permanent cores and keys (prepared according to the accepted keying schedule) will be furnished to the Owner.

## B. Cylinders, removable and interchangeable core system:

MATCH EXISTING BUILDING KEYING SYSTEM AS FOLLOWS;

COMMERCIAL GRADE, 'SCHLAGE' RESTRICTED KEYWAY, 6-PIN, A1 STANDARD FORMAT CYLINDER.

SCHOOL DISTRICT FINAL KEYING SYSTEM IS PROPRIETARY, CONTACT FOR FINAL KEYING:

LOCK PRO CORVALLIS, OR PH: 1-541-752-5625

- C. Permanent keys and cores: Stamped with the applicable key mark for identification. These visual key control marks or codes will not include the actual key cuts. Permanent keys will also be stamped "Do Not Duplicate."
- D. Transmit Grand Masterkeys, Masterkeys and other Security keys to Owner in person.
- E. Furnish keys in the following quantities:
  - 1. 1 each Grand Masterkeys
  - 2. 1 each Masterkeys
  - 3. 1 each Change keys each keyed core
  - 4. 15 each Construction masterkeys
  - 5. 1 each Control keys
- F. The contractor will install permanent cores and return the construction cores to the Hardware Supplier. Construction cores and keys remain the property of the Hardware Supplier.
- G. Keying Schedule: Contractor shall arrange for a keying meeting, and programming meeting with Owner, installer, and / or hardware supplier, and other involved parties to ensure locksets and locking hardware, are functionally correct and keying and programming complies with project requirements. Coordinate keying and programming schedule with owner.

## PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Verification of conditions: Examine doors, frames, related items and conditions under which Work is to be performed and identify conditions detrimental to proper and or timely completion.
  - 1. Do not proceed until unsatisfactory conditions have been corrected.

## 3.2 HARDWARE LOCATIONS:

- A. Mount hardware units at heights indicated in the following publications except as specifically indicated or required to comply with the governing regulations.
  - 1. Recommended Locations for Builder's Hardware for Standard Steel Doors and Frames, by the Door and Hardware Institute (DHI).
  - 2. Recommended locations for Architectural Hardware for flush wood doors (DHI).
  - 3. WDMA Industry Standard I.S.-1A-04, Industry Standard for Architectural wood flush doors.
- 3.3 INSTALLATION:
  - A. Install each hardware item per manufacturer's instructions and recommendations. Do not install surface mounted items until finishes have been completed on the substrate. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
  - B. Conform to local governing agency security ordinance.
  - C. Install Conforming to ICC/ANSI A117.1 Accessible and Usable Building and Facilities.
    - 1. Adjust door closer sweep periods so that from the open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the landing side of the door.
  - D. Installed hardware using the manufacturers fasteners provided. Drill and tap all screw holes located in metallic materials. Do not use "Riv-Nuts" or similar products.

## 3.4 FIELD QUALITY CONTROL AND FINAL ADJUSTMENT

A. Contractor/Installers, Field Services: After installation is complete, contractor shall inspect the completed door openings on site to verify installation of hardware is complete and properly adjusted, in accordance with both the Contract Documents and final shop drawings.

- 1. Check and adjust closers to ensure proper operation.
- 2. Check latchset, lockset, and exit devices are properly installed and adjusted to ensure proper operation.
  - a. Verify levers are free from binding.
  - b. Ensure latchbolts and dead bolts are engaged into strike and hardware is functioning.
- 3. Report findings, in writing, to architect indicating that all hardware is installed and functioning properly. Include recommendations outlining corrective actions for improperly functioning hardware if required.
- 3.5 SCHEDULE OF FINISH HARDWARE: SEE PLANS
  - A. At Doors indicated with access control keyed note 'DS2' on the hardware schedule, provide the following;

d108b	Alarm Lock Trilogy Networx	Model PDL8200, Wireless network lock with built in Keypad and HID Reader.
d116	Alarm Lock Trilogy Networx	Model PDL8200, Wireless network lock with built in Keypad and HID Reader.

Alarm Lock Oregon Distributor; PB Walker & Associates Peter Walker 206-499-1586 pbwalkerassociates@comcast.net

Alarm Lock 345 Bayview Avenue Amityville, NY 11701 Customer Service: **1-800-ALA-LOCK** Tech Support: **1-800-645-9440** Fax: 631-789-3383

## END OF SECTION 087100

## SECTION 092900 - GYPSUM BOARD

## 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.

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Interior gypsum board.
  - 2. Control Joints and Trim accessories.

#### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For the following products:

## 1.4 QUALITY ASSURANCE

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. Mockups: Before beginning gypsum board installation, install mockups of at least 100 sq. ft. (9 sq. m) in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.
  - 1. Install mockups for the following:
    - a. Each level of gypsum board finish indicated for use in exposed locations.
  - 2. Simulate finished lighting conditions for review of mockups.
  - 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

## 1.5 STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

## 1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install interior products until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
  - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

## PART 2 - PRODUCTS

## 2.1 PANELS, GENERAL

A. Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

## 2.2 INTERIOR GYPSUM BOARD

- A. General: Complying with ASTM C 36/C 36M or ASTM C 1396/C 1396M, as applicable to type of gypsum board indicated and whichever is more stringent.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. G-P Gypsum.
    - b. National Gypsum Company.
    - c. USG Corporation.
- B. Products by other manufacturers are subject to approval by Architect prior to bidding.
- C. Type X:

**GYPSUM BOARD** 

- 1. Thickness: 5/8 inch (15.9 mm).
- 2. Long Edges: Tapered.
- D. Moisture- and Mold-Resistant Type: With moisture- and mold-resistant core and surfaces.
  - 1. Core: 5/8 inch (15.9 mm), Type X.
  - 2. Long Edges: Tapered.

## 2.3 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
  - 1. Material: Galvanized or aluminum-coated steel sheet.
  - 2. Shapes:
    - a. Cornerbead.
    - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
    - c. L-Bead: L-shaped; exposed long flange receives joint compound.
    - d. Zip-Strip: See window details

# NOTE: ALL EXPOSED UNFINISHED EDGES AND CORNERS SHALL BE FACED WITH TRIM NOTATED ABOVE PRIOR TO TAPE, TEXTURE, & PAINT.

## 2.4 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
  - 1. Interior Gypsum Wallboard: Paper.
- C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
  - 1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
  - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.
    - a. Use setting-type compound for installing paper-faced metal trim accessories.
  - 3. Fill Coat: For second coat, use drying-type, all-purpose compound.

4. Finish Coat: For third coat, use drying-type, all-purpose compound.

## 2.5 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
  - 1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
  - 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
  - 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

## PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollowmetal frames and framing, for compliance with requirements and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.
- 3.2 APPLYING AND FINISHING PANELS, GENERAL
  - A. Comply with ASTM C 840.
  - B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.
- Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints.
   Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
  - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
  - 2. Fit gypsum panels around ducts, pipes, and conduits.
  - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.
- F. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- G. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

# 3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
  - 1. Type X: As indicated on Drawings.
  - 2. Moisture- and Mold-Resistant Type: As indicated on Drawings.
- B. Single-Layer Application:
  - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
  - 2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

- a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
- b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.
- 3. Attach gypsum board to framing with screws at 6 inches o.c. at perimeter and 8 inches o.c. in field.
- 4. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
- 5. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- C. Multilayer Application (if indicated):
  - 1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints 1 framing member, 16 inches (400 mm) minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
  - 2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
  - 3. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
  - 4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.
- D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

# 3.4 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Interior Trim: Install in the following locations:
  - 1. Cornerbead: Use at outside corners.
  - 2. LC-Bead: Use at exposed panel edges.

3. L-Bead: Use only where indicated.

## 3.5 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
  - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
  - 2. Level 2: Panels that are substrate for tile and Panels that are substrate for acoustical tile.
  - 3. Level 4: At panel surfaces that will be exposed to view and are substrate for wall coverings, including FRP panels.
  - 4. AT ALL FINISH LEVELS PROVIDE A LIGHT ORANGE PEEL, PROVIDE ARCHITECT SAMPLE OF FINISH FOR APPROVAL PRIOR TO APPLICATION.
    - a. Primer and its application to surfaces are specified in other Division 09 Sections.

## 3.6 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, and mold damaged.
  - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

## SECTION 096513 - RESILIENT BASE AND ACCESSORIES

## 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.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Resilient base.

#### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Color Selection: No samples required

## 1.4 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
  - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

## 1.5 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C).

## 1.6 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive resilient products during the following time periods:

- 1. 48 hours before installation.
- 2. During installation.
- 3. 48 hours after installation.
- B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).
- C. Install resilient products after other finishing operations, including painting, have been completed.

## 1.7 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Furnish not less than 10 linear feet (3 linear m) for every 500 linear feet (150 linear m) or fraction thereof, of each type, color, pattern, and size of resilient product installed.

## PART 2 - PRODUCTS

## 2.1 RESILIENT BASE (RB-x)

A. RESILIENT BASE - Basis-of-Design Products: Subject to compliance with requirements, provide following:

1.	MANUFACTURER	Roppe Corporation, or equal
	PRODUCT LINE	700 Series Wall Base
	PRODUCT TYPE	Standard Toe (Coved) Wall Base
	COLORS & PATTERNS	To be selected from Manufacturers Full range of colors & patterns
	'RB-1'	Locate as per Room Finish Schedule
	'RB-2'	Locate as per Room Finish Schedule

- 2. 'Or equal' products by other manufacturers are allowed
- B. Resilient Base Standard: ASTM F 1861.

- 1. Material Requirement: Type TS (rubber, vulcanized thermoset).
- 2. Manufacturing Method: Group I (solid, homogeneous).
- 3. Style: Cove (base with toe).
- C. Minimum Thickness: 0.125 inch
- D. Height: As indicated on Drawings and as per application, 4" or 6".
- E. Lengths: Cut lengths 48 inches (1219 mm) long or coils in manufacturer's standard length.
- F. Outside Corners: Job formed.
- G. Inside Corners: Job formed.
- H. Finish: As selected by Architect from manufacturer's full range.
- I. Colors and Patterns: As selected by Architect from manufacturer's full range.
- 2.2 RESILIENT MOLDING ACCESSORY
  - A. Resilient Molding Accessory:
    - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - a. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
      - b. Flexco, Inc.
      - c. Johnsonite.
      - d. Roppe Corporation, USA.
    - 2. 'Or equal' products by other manufacturers are allowed
  - B. Description: Carpet edge for glue-down applications, Nosing for carpet, Nosing for resilient floor covering, Reducer strip for resilient floor covering, Joiner for tile and carpet, Transition strips, etc.
  - C. Material: Rubber.
  - D. Colors and Patterns: As selected by Architect from manufacturer's full range.

## 2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
  - 1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
    - a. Cove Base Adhesives: Not more than 50 g/L.
    - b. Rubber Floor Adhesives: Not more than 60 g/L.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- C. Do not install resilient products until they are same temperature as the space where they are to be installed.
  - 1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- D. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

## 3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Job-Formed Corners:
  - 1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends.
  - 2. Inside Corners: Use straight pieces of maximum lengths possible.

## 3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.
- B. Perform the following operations immediately after completing resilient product installation:
  - 1. Remove adhesive and other blemishes from exposed surfaces.
  - 2. Sweep and vacuum surfaces thoroughly.
  - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover resilient products until Substantial Completion.

END OF SECTION 096513

## SECTION 096516 - RESILIENT SHEET FLOORING

## 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.

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Vinyl sheet floor covering.

## 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Color Selection: For each type of floor covering indicated.
- C. Qualification Data: For qualified Installer.

## 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor covering installation and seaming methods indicated.
- B. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
  - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

## 1.5 DELIVERY, STORAGE, AND HANDLING

A. Store floor coverings and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C). Store rolls upright.

## 1.6 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 85 deg F (29 deg C), in spaces to receive floor coverings during the following time periods:
  - 1. 48 hours before installation.
  - 2. During installation.
  - 3. 48 hours after installation.
- B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).
- C. Close spaces to traffic during floor covering installation.
- D. Close spaces to traffic for 48 hours after floor covering installation.
- E. Install floor coverings after other finishing operations, including painting, have been completed.

## 1.7 WARRANTEES

- A. Special Warranty for Resilient Sheet Flooring: Manufacturer's standard form in which manufacturer agrees to repair or replace components of installation that fail in materials or workmanship within specified warranty period.
  - 1. Warranty does not include deterioration or failure due to unusual traffic, failure of substrate, vandalism, or abuse.
  - 2. Warranty Period: 5 years.
- B. Contractors Warranty: Contractors warranty agreeing to repair or replace defective materials and workmanship occurring within two (2) years from the date of installation, without cost to Owners.

## 1.8 EXTRA MATERIALS

- C. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - Floor Covering: Furnish quantity not less than 10 linear feet (3 linear m) for every 500 linear feet (150 linear m) or fraction thereof, in roll form and in full roll width for each color, pattern, and type of floor covering installed.

## PART 2 - PRODUCTS

## 2.1 VINYL SHEET FLOOR COVERING (SV-1)

A. Basis-of-Design Products: Subject to compliance with requirements, provide following:

1.	MANUFACTURER	Armstrong Commercial Flooring.
	PRODUCT LINE	Connection Corlon
	PRODUCT TYPE	Vinyl Sheet Flooring
	COLOR & PATTERN	To be selected from Manufacturers Full range of colors & patterns
	'SV-1'	Locate as per Room Finish Schedule

- B. 'Or approved equal,' products by other manufacturers are allowed.
- C. Vinyl Sheet Floor Covering with Backing: ASTM F 1303.
  - 1. Type (Binder Content): Type II, minimum binder content of 34 percent.
  - 2. Wear-Layer Thickness: Grade 1.
  - 3. Overall Thickness: 0.080 inch nominal with 50 mil minimum wear layer
  - 4. Backing Class: Class A (fibrous).
- D. Wearing Surface: Smooth.
- E. Sheet Width: As standard with manufacturer 6 feet (1.8 m).
- F. Seaming Method: Heat welded.
- G. Colors and Patterns: Full manuf. Selection.

## 2.2 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit floor covering and substrate conditions indicated.
- C. Seamless-Installation Accessories:

- 1. Heat-Welding Bead: Manufacturer's solid-strand product for heat welding seams.
  - a. Color: Match floor covering.
- D. Floor Polish: Provide protective liquid floor polish products as recommended by manufacturer.

## PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor coverings.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of floor coverings.
- B. Concrete Substrates: Prepare according to ASTM F 710.
  - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
  - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
  - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
  - 4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.
    - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.

- b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor coverings until they are same temperature as space where they are to be installed.
  - 1. Move floor coverings and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- E. Sweep and vacuum clean substrates to be covered by floor coverings immediately before installation.

# 3.3 FLOOR COVERING INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor coverings.
- B. Unroll floor coverings and allow them to stabilize before cutting and fitting.
- C. Lay out floor coverings as follows:
  - 1. Maintain uniformity of floor covering direction.
  - 2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches (152 mm) away from parallel joints in floor covering substrates.
  - 3. Match edges of floor coverings for color shading at seams.
  - 4. Avoid cross seams.
- D. Scribe and cut floor coverings to butt neatly and tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, and door frames.
- E. Extend floor coverings into toe spaces, door reveals, closets, and similar openings.
- F. Maintain reference markers, holes, or openings that are in place or marked for future cutting by repeating on floor coverings as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Install floor coverings on covers for telephone and electrical ducts and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of floor coverings installed on covers and adjoining floor covering. Tightly adhere floor covering edges to substrates that abut covers and to cover perimeters.

- H. Adhere floor coverings to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- I. Seamless Installation:
  - 1. Heat-Welded Seams: Comply with ASTM F 1516. Rout joints and use welding bead to permanently fuse sections into a seamless floor covering. Prepare, weld, and finish seams to produce surfaces flush with adjoining floor covering surfaces.
- J. Face edges, transitions, and wall intersections with Tamper Resistant security sealant. See room finish schedule and section 079200 of this project manual. DO NOT USE Metal Edge Strips.

## 3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of floor coverings.
- B. Perform the following operations immediately after completing floor covering installation:
  - 1. Remove adhesive and other blemishes from floor covering surfaces.
  - 2. Sweep and vacuum floor coverings thoroughly.
  - 3. Damp-mop floor coverings to remove marks and soil.
- C. Protect floor coverings from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Floor Polish: Remove soil, visible adhesive, and surface blemishes from floor covering before applying liquid floor polish.
  - 1. Apply one coat.
- E. Cover floor coverings until Substantial Completion.

## END OF SECTION 096516

## SECTION 099113 - EXTERIOR PAINTING

## 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.

## 1.2 SUMMARY

- A. This Section includes surface preparation and the application of paint systems on the following exterior substrates:
  - 1. Steel.
  - 2. Galvanized metal.
  - 3. Hollow metal Doors & Frames.
  - 4. Bollards.
  - 5. Support brackets.
  - 6. Access doors.
  - 7. Misc. mechanical vents, pipes, protrusions.
  - 8. Fiber Cement Siding, Trim & Soffit

## 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Verification: For each type of paint system and each color and gloss of topcoat indicated.
  - 1. Submit Samples on rigid backing, 8 inches (200 mm) square.
  - 2. Step coats on Samples to show each coat required for system.
  - 3. Label each coat of each Sample.
  - 4. Label each Sample for location and application area.
- C. Product List: For each product indicated, include the following:
  - 1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
  - 2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

## 1.4 QUALITY ASSURANCE

- A. MPI Standards:
  - 1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
  - 2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
  - 1. Maintain containers in clean condition, free of foreign materials and residue.
  - 2. Remove rags and waste from storage areas daily.

## 1.6 PROJECT CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).
- B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

## 1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.
  - 1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

## PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Rodda
  - 2. Benjamin Moore & Co.
  - 3. Columbia Paint & Coatings.
  - 4. ICI Paints.
  - 5. Kelly-Moore Paints.
  - 6. Kwal-Howells Paint.
  - 7. PPG Architectural Finishes, Inc.
  - 8. Sherwin-Williams Company (The).

# C. Consult Manufactures website for approved paint over pre-primed surfaces at engineered siding materials.

- 2.2 PAINT, GENERAL
  - A. Material Compatibility:
    - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
    - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
  - B. Colors: As selected by Architect from manufacturer's full range.

# 2.3 EXTERIOR ALKYD PAINTS

- A. Exterior Alkyd Enamel (Semigloss): MPI #94 (Gloss Level 5).
  - 1. VOC Content: E Range of E1.

#### PART 3 - EXECUTION

- 3.1 EXAMINATION
  - A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

- B. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- C. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
  - 1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

# 3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
  - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
  - 2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- C. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.
- D. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

# 3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions.
  - 1. Use applicators and techniques suited for paint and substrate indicated.
  - 2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat

but provide sufficient difference in shade of undercoats to distinguish each separate coat.

- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

# 3.4 FIELD QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when paints are being applied:
  - 1. Owner will engage the services of a qualified testing agency to sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
  - 2. Testing agency will perform tests for compliance of paint materials with product requirements.
  - 3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

# 3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

# 3.6 EXTERIOR PAINTING SCHEDULE

- A. Steel Substrates:
  - 1. Alkyd System: MPI EXT 5.1D.
    - a. Prime Coat: Alkyd anticorrosive metal primer (over shop primer).
    - b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
    - c. Topcoat: Exterior alkyd enamel (semigloss).
    - d. Colors to be selected based upon adjacent colors.
- B. Galvanized-Metal Substrates:
  - 1. Alkyd System: MPI EXT 5.3B.
    - a. Prime Coat: Cementitious galvanized-metal primer.
    - b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
    - c. Topcoat: Exterior alkyd enamel (semigloss).
    - d. Colors to be selected based upon adjacent colors.
- C. Fiber Cement Products:
  - 1. Latex System:
    - a. Prime coat: Not required if products are pre-primed
    - b. Intermediate Coat: Exterior acrylic latex enamel matching topcoat.
    - c. Topcoat: Exterior acrylic latex enamel (semi-gloss)
    - d. Colors to be selected based upon adjacent colors.
  - 2. Thickness of each coat: 2 mils minimum

#### EXTERIOR PAINT COLOR SCHEDULE;

Shall be selected by Architect from manufactures full range of colors, including custom, dark, or premium.

(SEE EXTERIOR ELEVATIONS FOR APPLICATION AND LOCATION)

- COLOR LOCATION / SUBSTRATE
- P-1 SIDING TRIM
- P-2 EXTERIOR SIDING
- P-3 EXTERIOR HOLLOW METAL DOORS & FRAMES

END OF SECTION 099113

## SECTION 099123 - INTERIOR PAINTING

#### 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.

#### 1.2 SUMMARY

- A. This Section includes surface preparation and the application of paint systems on the following interior substrates:
  - 1. Steel
  - 2. Wood.
  - 3. Gypsum board.

#### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Color Selections: For each type of topcoat product indicated.

#### 1.4 QUALITY ASSURANCE

- A. MPI Standards:
  - 1. Products: Complying with Master Painters Institute (MPI) standards indicated and listed in "MPI Approved Products List."
  - 2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
  - 1. Maintain containers in clean condition, free of foreign materials and residue.

2. Remove rags and waste from storage areas daily.

# 1.6 PROJECT CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

# 1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.
  - 1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

## PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Basis-of-Design: Subject to compliance with requirements, provide the following:
  - 1. Walls, ceilings, etc. in applications over gypsum board and Plaster substrates:
    - a. PAINT Rodda, "Master Painter Ultra Low VOC", Semi-Gloss. #543601X
    - b. PRIMER Rodda, "Roseal II Primer / Sealer", Acrylic #502701X
  - 2. Metals, Steel Doors, and Steel Frames:
    - a. PAINT Rodda, "Multi-Master DTM", Water Borne, Semi-Gloss, #54891
    - b. PRIMER Rodda, "Metal Master Primer", #50891. (At ALL new, existing, and retrofitted metal doors and frames)
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Benjamin Moore & Co.
  - 2. Columbia Paint & Coatings.
  - 3. Kelly-Moore Paints.

- 4. Kwal-Howells Paint.
- 5. PPG Architectural Finishes, Inc.
- 6. Sherwin-Williams Company (The).

## 2.2 PAINT, GENERAL

- A. Material Compatibility:
  - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
  - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- B. Typical Paint Colors: See Section 3.6 of this specification section for color schedule.

## 2.3 PRIMERS/SEALERS

A. Interior Latex Primer/Sealer: MPI #50.

#### 2.4 METAL PRIMERS

A. Rust-Inhibitive Primer (water based): MPI #107.

#### 2.5 WOOD FILLER

A. Solvent Based Wood Filler: MPI #91.

#### 2.6 LATEX PAINTS

- A. Interior Latex (Eggshell): MPI #44 (Gloss Level 3).
- B. Interior Latex (Semigloss): MPI #54 (Gloss Level 5).
- C. High-Performance Architectural Latex (Semigloss): MPI #141 (Gloss Level 5).

## PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
  - 1. Concrete: 12 percent.
  - 2. Masonry (Clay and CMU): 12 percent.
  - 3. Wood: 15 percent.
  - 4. Gypsum Board: 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
  - 1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

#### 3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
  - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
  - 2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
  - 1. Remove incompatible primers and re-prime substrate with compatible primers as required to produce paint systems indicated.

- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Concrete Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- F. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.
- G. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- H. Wood Substrates:
  - 1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
  - 2. Sand surfaces that will be exposed to view, and dust off.
  - 3. Prime edges, ends, faces, undersides, and backsides of wood.
  - 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.
- I. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.

# 3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions.
  - 1. Use applicators and techniques suited for paint and substrate indicated.
  - 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
  - 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting Mechanical and Electrical Work: Paint items exposed in equipment rooms and occupied spaces including, but not limited to, the following:
  - 1. Mechanical Work:
    - a. Uninsulated metal piping.
    - b. Uninsulated plastic piping.
    - c. Pipe hangers and supports.
    - d. Tanks that do not have factory-applied final finishes.
    - e. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
    - f. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
    - g. Mechanical equipment that is indicated to have a factory-primed finish for field painting.
  - 2. Electrical Work:
    - a. Switchgear (Exterior, that does not have factory applied finish)
    - b. Panelboards (Interior, that does not have factory applied finish)
    - c. Electrical equipment that is indicated to have a factory-primed finish for field painting.
- F. Follow paint application direction as per Room finish schedule & interior elevations per requirements of the drawings.

# 3.4 FIELD QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when paints are being applied:
  - 1. Owner will engage the services of a qualified testing agency to sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
  - 2. Testing agency will perform tests for compliance with product requirements.
  - 3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to

remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

## 3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

## 3.6 INTERIOR PAINTING SCHEDULE

- A. See Room finish schedule, interior room finish schedule, and interior elevations in the project drawings for paint color and finish applications, coordinate keyed materials and colors as per described below:
- B. Color Schedule:

'Pi-1' – INTERIOR SEMI-GLOSS, GYPSUM BOARD, COLOR: WHITE

'Pi-2' – INTERIOR HIGH-GLOSS, HOLLOW METAL DOORS & FRAMES, COLOR: ACCENT

- C. CMU and Concrete Substrates:
  - 1. High-Performance Architectural Latex System: MPI INT 4.2D.
    - a. Prime Coat: Interior/exterior latex block filler. (No filler required at existing, painted CMU & Concrete)
    - b. Intermediate Coat: High-performance architectural latex matching topcoat.
    - c. Topcoat: High-performance architectural latex
- D. Steel Substrates and galvanized metal substrates:
  - 1. High-Performance Architectural Latex System.

- a. Prime Coat: Interior latex primer / sealer. (at ALL new, existing, & metal Surfaces)
- b. Intermediate Coat: High-performance architectural latex matching top coat.
- c. Topcoat: High-performance architectural latex matching top coat.
- E. Gypsum Board and Plaster Substrates:
  - 1. High-Performance Architectural Latex System: MPI INT 9.2B.
    - a. Pre-Prime Coat: (Pre-Texture) Interior latex primer/sealer. (No primer required at existing painted gypsum board and plasterboard).
    - b. Prime Coat: (Post Texture) Interior latex primer / Sealer.
    - c. Intermediate Coat: High-performance architectural latex matching topcoat.
    - d. Topcoat: High-performance architectural latex.

END OF SECTION 099123

# SECTION 102600 – STAINLESS STEEL CORNER GUARDS

# PART 1 - GENERAL

# 1.01 SUMMARY

A. Corner Guard Stainless Steel system for wall protection:

## **1.02** SECTION INCLUDES

A. Stainless Steel Corner Guard Systems

## 1.03 SUBMITTALS

- A. Product data for each type of Corner Guard specified.
- B. (1) each full-size profile, 6" long samples of each type Corner Guard indicated.
- C. Cleaning and maintenance instructions.

#### 1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in unopened factory packaging to the jobsite and store in original packaging in a climate-controlled location away from direct sunlight.

#### 1.05 PROJECT CONDITIONS

A. Products must be installed in an interior climate-controlled environment.

#### 1.06 WARRANTY

A. Standard CornerGuard.net Limited Lifetime Warranty against material and manufacturing defects.

## PART 2 - PRODUCTS

#### 2.01 MANUFACTURER

- A. Provide a product that meets or exceeds performance specified herein.
- B. Provide all Corner Guards from a single source.

## 2.02 MATERIALS, SIZE, & APPLICATION

A. Stainless Steel: Corner Guards shall be manufactured from Type 304, 16-gauge Stainless Steel and shall be measured 4' long with 2" legs, provide both 90 degree profile and 45 degree profile at all walls finished with gypsum board.

# 2.04 COMPONENTS

A. Attachment options;

- 1. Field applied heavy duty construction adhesive.
- 2. Factory applied two-sided tape.

#### 2.05 FINISHES

A. Stainless Steel: No. 4 brushed vertical finish.

# PART 3 - EXECUTION

# 3.01 EXAMINATION

- A. Examine areas and conditions in which the corner guard systems will be installed.
  - 1. Complete all finishing operations, including painting, before beginning installation of corner guards.
  - 2. Wall surface shall be dry and free from dirt, grease and loose paint.

# 3.02 PREPARATION

A. General: Prior to installation, clean substrate to remove dust, debris and loose particles.

# 3.03 INSTALLATION

- A. General: Locate the Corner Guard as indicated on the approved detail drawing for the appropriate substrate and Install corner guard level and plumb at the height indicated on the drawings.
- B. Installation of Stainless Steel Corner Guards:
  - 1. Surface must be dry, clean and properly sealed.
  - 2. Two-sided tape: Peel paper from the factory applied tape and apply pressure until a tight fit is achieved.
  - 3. Cement on: Apply a bead of Premium Heavy-Duty Construction Adhesive in a zigzag pattern over the back of each wing of the corner guard. Position corner guard on the wall and apply pressure until a tight fit is achieved.
  - 4. Remove the protective plastic covering from the exposed surface of the corner guard.

# 3.04 CLEANING

A. At completion of the installation, clean surfaces with a neutral based, non-abrasive cleaner. Ammonia and alcohol-based cleaners may be used.

# END OF SECTION 102600

# SECTION 104413 - FIRE EXTINGUISHER CABINETS

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.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Fire protection cabinets for portable fire extinguishers.
    - a. Provide fire extinguisher cabinets where indicated on the Drawings

#### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire protection cabinets.
  - 1. Fire Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.

#### 1.4 COORDINATION

A. Coordinate size of fire protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

#### PART 2 - PRODUCTS

#### 2.1 FIRE EXTINGUISHER CABINETS

- A. Cabinet Type: Suitable for fire extinguisher.
  - 1. Products: Subject to compliance with requirements, provide following:
    - a. Larsen's Manufacturing Company; Architectural Series with Larsen Loc.

- 2. Products by other manufacturers are subject to approval by Architect prior to bidding.
- B. Cabinet Construction: Nonrated.
- C. Cabinet Material: Steel sheet
  - 1. Shelf: Same metal and finish as cabinet.
- D. AT CONCRETE & MASONRY SURFACES Provide Surface-Mounted Cabinet: Cabinet box fully exposed and mounted directly on wall with no trim.
- E. AT FRAMED WALLS, Provide Semi-Recessed / fully recessed as shown on plans, mounted cabinet
- F. Cabinet Trim Material: Steel sheet.
- G. Door Material: Steel sheet.
- H. Door Style: Vertical duo panel with frame.
- I. Door Glazing: Acrylic sheet.
  - 1. Acrylic Sheet Color: Clear transparent acrylic sheet.
- J. Door Hardware: Manufacturer's door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
  - 1. Provide projecting door handle.
  - 2. Provide manufacturer's standard hinge permitting door to open 180 degrees.

#### K. Accessories:

- 1. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.
- L. Finishes:

#### 1. Manufacturer's stainless steel

M. Size: (Inside Dimensions) 24 inches high x 9 inches wide x 6 inches deep.

#### PART 3 - EXECUTION

#### 3.1 INSTALLATION

A. General: Install fire protection cabinets in locations and at mounting heights indicated below:

- 1. Fire Extinguisher Cabinets: 54 inches (1372 mm) above finished floor to top of cabinet.
- B. Fire Extinguisher Cabinets: Fasten cabinets to structure, square and plumb.

# 3.2 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of fire protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes or replace fire protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire protection cabinet and mounting bracket manufacturers.
- E. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 104413

# Alsea School District Electrical Service Entrance - Phase 1B.7 Alsea, Oregon

#### **DIVISION 260000 – ELECTRICAL SPECIFICATION**

- 260100 ELECTRICAL GENERAL PROVISIONS
- 260500 COMMON WORK RESULTS FOR ELECTRICAL
- 260519 LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
- 260526 GROUNDING AND BONDING
- 260529 HANGERS AND SUPPORTS
- 260533 RACEWAY AND BOXES
- 260548 VIBRATION AND SEISMIC CONTROLS
- 260553 ELECTRICAL IDENTIFICATION
- 262413 SWITCHBOARDS
- 262416 PANELBOARDS
- 262726 WIRING DEVICES
- 265119 INTERIOR LIGHTING
- 265600 EXTERIOR LIGHTING

## SECTION 260100 - ELECTRICAL GENERAL PROVISIONS

## PART 1 - GENERAL

#### 1.1 CONDITIONS AND REQUIREMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Provisions of this Section shall apply to all Sections of Division 26, 27, AND 28.

#### 1.2 SCOPE OF WORK

- A. Furnish and install all materials and equipment and provide all labor required and necessary to complete the work shown on the drawings and/or specified in all Sections of Division 26, 27, AND 28 and all other work and miscellaneous items, not specifically mentioned, but reasonably inferred for a complete installation, including all accessories required for testing the system. It is the intent of the drawings and specifications that all systems be complete and ready for operation.
- B. All systems installed in the facility shall be functional and in good working order prior to owner training and use. Any system installed that is not in good working order shall be repaired or replaced to the complete satisfaction of the owner at no additional cost to the owner.

#### 1.3 CODE COMPLIANCE

- A. All work and materials shall comply with the latest rules, codes and regulations, including, but not limited to, the following:
  - 1. Occupational Safety and Health Act Standards (OSHA)
  - 2. NFPA #70 National Electric Code (NEC)
  - 3. ADA Standards Americans with Disabilities Act
  - 4. ANSI/IEEE C-2 National Electrical Safety Code
  - 5. NECA Standard of Installation
  - 6. International Building Code
  - 7. International Fire Code
  - 8. International Energy Conservation Code
  - 9. NFPA #72 Fire Code
  - 10. NFPA #101 Life Safety Code
  - 11. All other applicable Federal, State and local laws and regulations.
- B. Work to be executed and inspected in accordance with local codes and ordinances. Permits, fees or charges for inspection or other services shall be paid for by the contractor. Local codes and ordinances are to be considered as minimum requirements and must be properly executed without expense to the owner; but do not relieve the contractor from work shown that exceeds minimum requirements.

#### 1.4 CONDITIONS AT SITE

- A. Visit to site is required of all bidders prior to submission of bid. All will be held to have familiarized themselves with all discernible conditions and no extra payment will be allowed for work required because of these conditions, whether specifically mentioned or not.
- B. Lines of other service that are damaged as a result of this work shall be promptly repaired at no expense to the owner to the complete satisfaction of the owner.

#### 1.5 DRAWINGS AND SPECIFICATIONS

- A. All drawings and all specifications shall be considered as a whole and work of this Division shown anywhere therein shall be furnished under this Division.
- B. Drawings are diagrammatic and indicate the general arrangement of equipment and wiring. Most direct routing of conduits and wiring is not assured. Exact requirements shall be governed by architectural, structural and mechanical conditions of the job. Consult all other drawings in preparation of the bid. Extra lengths of wiring or addition of pull or junction boxes, etc., necessitated by such conditions shall be included in the bid. Check all information and report any apparent discrepancies before submitting bid.
- C. Change to location, type, function, brand name, finish, etc., shall not be made without permission of owner.
- D. Some equipment is specifically designated on the drawings. It is not the intent to sole source any item unless explicitly stated. Items have been specified based upon design requirements. All bidders are encouraged to submit products for approval. Prior approval must be obtained as required by these contract documents. Bids submitted with non-approved items will be considered invalid and bid will be forfeit. Submittals received by the engineer after award of contract on non-approved equipment will not be reviewed nor will they be returned.

#### 1.6 SAFETY AND INDEMNITY

- A. Safety: The contractor shall be solely and completely responsible for conditions of the job site, including safety of all persons and property during performance of the work. This requirement will apply continuously and not be limited to normal working hours.
- B. No act, service, drawing review or construction review by the owner or owner's representative is intended to include review of the adequacy of the contractor's safety measures in, on, or near the construction site.

#### 1.7 CONSTRUCTION OBSERVATION BY THE OWNER

A. Prior to covering: any major portion of the materials installed under this section, notify the owner so that an observation can be made. Notification shall be made at least three (3) working days in advance of the date the items will be covered.

#### 1.8 INSTRUCTION OF OWNER'S PERSONNEL

- A. The contractor shall conduct an on-site instructional tour of the entire project. The personnel designated by the owner shall be instructed in: operation of all electrical systems, trouble-shooting procedures, preventative maintenance procedures, uses of Operation and Maintenance manuals, and cleaning of lighting fixtures and operation of all special systems including data, cctv, access control, and fire alarm.
- B. Contractor will include in his bid 8 hours of instruction time to be held at the project location after substantial completion for instruction of owner's personnel. Coordinate time and number of owner personnel to be present and provide schedule to engineer.

## 1.9 PROJECT COMPLETION

- A. Upon completion of all work and operational checks on all systems, the contractor shall request that a final construction observation be performed.
- B. The owner or owner's representative shall compile a punch list of items to be completed or corrected. The contractor shall notify the owner upon completion of the items.

#### 1.10 GUARANTEE

- A. All work under this section shall be guaranteed in writing to be free of defective work, materials, or parts for a period of one (1) year, except lamps, which shall be guaranteed for thirty (30) days after final acceptance of the work under the contract.
- B. Repair, revision or replacement of any and all defects, failure or inoperativeness shall be done by the contractor at no cost to the owner.

#### PART 2 - PRODUCTS

## 2.1 MATERIAL APPROVAL

- A. The design, manufacturer and testing of electrical equipment and materials shall conform to or exceed latest applicable NEMA, IEEE or ANSI standards.
- B. All materials must be new and UL listed. Materials that are not covered by UL testing standards shall be tested and approved by an independent testing laboratory or a governmental agency, which laboratory shall be acceptable to the owner and code enforcing agency.

# 2.2 SHOP DRAWINGS AND MATERIALS LIST

A. Submit shop drawings and materials lists as specified for review. Four (4) copies of submittals shall be presented to the owner.

#### ELECTRICAL GENERAL PROVISIONS

#### 2.3 OPERATION AND MAINTENANCE MANUALS

A. Submit four (4) sets of Operation and Maintenance Manuals of equipment to owner.

#### 2.4 RECORD DRAWINGS

A. Submit record drawings to owner.

#### 2.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, and handle materials in a manner to prevent damage.
- B. Protect equipment from weather and dampness.

## PART 3 - EXECUTION

## 3.1 WORKMANSHIP AND CONTRACTOR'S QUALIFICATIONS

- A. Only quality workmanship will be accepted. Haphazard or poor installation practice will be cause for rejection of work.
- B. Provide experienced foreman with a minimum of three years experience working on this type of building placed in charge of this work at all times.

#### 3.2 COORDINATION

- A. Coordinate work with other trades to avoid conflict and to provide correct rough-in and connection for equipment furnished under trades that require electrical connections. Inform contractors of other trades of the required access to and clearances around electrical equipment to maintain serviceability and code compliance.
- B. Verify equipment dimensions and requirements with provisions specified under this Section. Check actual job conditions before fabricating work. Report necessary changes in time to prevent needless work. Changes or additions subject to additional compensation, which are made without the authorization of the owner, shall be at contractor's risk and expense.

# 3.3 MANUFACTURER'S INSTRUCTIONS

A. Where the specifications call for an installation to be made in accordance with manufacturer's recommendations, a copy of such recommendations shall be included with the equipment submittal at all times be kept in the job superintendent's office and shall be available to the owner.

B. Follow manufacturer's instructions where they cover points not specifically indicated on drawings and specifications. If they are in conflict with the drawings and specifications obtain clarification from the owner before starting work.

#### 3.4 QUALITY ASSURANCE

- A. The contractor shall insure that all workmanship, all materials employed, all required equipment and the manner and method of installation conforms to accepted construction and engineering practices, and that each piece of equipment is in satisfactory working condition to satisfactorily perform its functional operation.
- B. Provide quality assurance tests and operational check on all components of the electrical distribution system, all lighting fixtures, and special systems.

## 3.5 CUTTING AND PATCHING

- A. Perform all cutting and fittings required for work of this section in rough construction of the building.
- B. All patching of finished construction of building shall be performed under the sections of specifications covering these materials.
- C. No joists, beams, girders or columns shall be cut by any contractor without obtaining written permission from the owner.

#### 3.6 EXCAVATION AND BACKFILL

- A. Excavation: the contractor shall do all necessary excavation of whatever substances encountered for proper laying of all raceways or cables except as noted on the drawings. Excavated materials not required for fill shall be removed from the site as directed by the owner.
- B. Excavation shall be carried low enough to allow minimum coverage over raceways. Excess excavation below required level shall be backfilled at the contractor's expense with earth, sand or gravel as directed by the owner. Ground adjacent to all excavations shall be graded to prevent water running in.
- C. The contractor shall remove, by pumping or other means approved by the owner, any water accumulated in excavation.
- D. Backfilling: perform all backfilling in accordance with Division 31 Earthwork.
- E. No backfilling shall be done until installation has been approved by the owner.

END OF SECTION 260100

## SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL

## 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. Electrical equipment coordination and installation.
  - 2. Sleeves for raceways and cables.
  - 3. Sleeve seals.
  - 4. Common electrical installation requirements.

#### 1.3 DEFINITIONS

- A. ATS: Acceptance Testing Specifications.
- B. EPDM: Ethylene-propylene-diene terpolymer rubber.
- C. NBR: Acrylonitrile-butadiene rubber.

#### 1.4 QUALITY ASSURANCE

A. Test Equipment Suitability and Calibration: Comply with NETA ATS, "Suitability of Test Equipment" and "Test Instrument Calibration."

#### 1.5 COORDINATION

- A. Coordinate arrangement, mounting, and support of electrical equipment:
  - 1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
  - 2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
  - 3. To allow right of way for piping and conduit installed at required slope.
  - 4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

- B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
- C. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed.
- D. Coordinate electrical testing of electrical, mechanical, and architectural items, so equipment and systems that are functionally interdependent are tested to demonstrate successful interoperability.

#### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

#### 2.2 SLEEVES FOR RACEWAYS AND CABLES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.138-inch thickness as indicated and of length to suit application.
- D. Coordinate sleeve selection and application with selection and application of firestopping.

## 2.3 SLEEVE SEALS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
  - 1. Available Manufacturers:
    - a. Advance Products & Systems, Inc.
    - b. Calpico, Inc.
    - c. Metraflex Co.
    - d. Pipeline Seal and Insulator, Inc.

- 2. Sealing Elements: EPDM or NBR interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
- 3. Pressure Plates: Stainless steel. Include two for each sealing element.
- 4. Connecting Bolts and Nuts Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

## PART 3 - EXECUTION

#### 3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

- A. Comply with NECA 1.
- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- E. Right of Way: Give to raceways and piping systems installed at a required slope.

#### 3.2 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.
- B. Coordinate sleeve selection and application with selection and application of firestopping.
- C. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- D. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- E. Rectangular Sleeve Minimum Metal Thickness:
  - 1. For sleeve cross-section rectangle perimeter less than 50 inches and no side greater than 16 inches, thickness shall be 0.052 inch.
  - 2. For sleeve cross-section rectangle perimeter equal to, or greater than, 50 inches and 1 or more sides equal to, or greater than, 16 inches, thickness shall be 0.138 inch.
- F. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- G. Cut sleeves to length for mounting flush with both surfaces of walls.

- H. Extend sleeves installed in floors 2 inches above finished floor level unless specified on plans.
- I. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed or unless seismic criteria require a different clearance.
- J. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.
- K. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials.
- L. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- M. Aboveground, Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- N. Underground, Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

#### 3.3 SLEEVE-SEAL INSTALLATION

- A. Install to seal underground, exterior wall penetrations.
- B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

#### 3.4 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly.

#### 3.5 FIELD QUALITY CONTROL

A. Inspect installed sleeve and sleeve-seal installations and associated firestopping for damage and faulty work.

#### END OF SECTION 260500

## SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

## 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.

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Building wires and cables rated 600 V and less.
  - 2. Connectors, splices, and terminations rated 600 V and less.
  - 3. Sleeves and sleeve seals for cables.
- B. Related Sections include the following:
  - 1. Division 27 Section "Communications Cabling" for cabling used for voice and data circuits.

#### 1.3 DEFINITIONS

- A. EPDM: Ethylene-propylene-diene terpolymer rubber.
- B. NBR: Acrylonitrile-butadiene rubber.

#### 1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

#### 1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

#### 1.6 COORDINATION

A. Set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

#### PART 2 - PRODUCTS

#### 2.1 CONDUCTORS AND CABLES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. American Insulated Wire Corp.; a Leviton Company.
  - 2. General Cable Corporation.
  - 3. Senator Wire & Cable Company.
  - 4. Southwire Company.
- B. Copper Conductors: Comply with NEMA WC 70.
- C. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN.

## 2.2 CONNECTORS AND SPLICES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. AFC Cable Systems, Inc.
  - 2. Hubbell Power Systems, Inc.
  - 3. O-Z/Gedney; EGS Electrical Group LLC.
  - 4. 3M; Electrical Products Division.
  - 5. Tyco Electronics Corp.
- C. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

#### 2.3 SLEEVES FOR CABLES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052- or 0.138-inch (1.3- or 3.5-mm) thickness as indicated and of length to suit application.

C. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

#### 2.4 SLEEVE SEALS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide a comparable product by one of the following:
  - 1. Advance Products & Systems, Inc.
  - 2. Calpico, Inc.
  - 3. Metraflex Co.
  - 4. Pipeline Seal and Insulator, Inc.
- C. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.
  - 1. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
  - 2. Pressure Plates: Stainless steel. Include two for each sealing element.
  - 3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

#### PART 3 - EXECUTION

#### 3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders:

Aluminum or Copper. stranded for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. stranded for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

# 3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type THHN-THWN, single conductors in raceway.
- B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN-THWN, single conductors in raceway.

- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.
- E. Exposed Branch Circuits, Including in Crawlspaces: Type THHN-THWN, single conductors in raceway.
- F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway or MC type cable assembly.
- G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.
- H. Branch Circuits in Cable Tray: Type THHN-THWN, single conductors in raceway.
- I. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainlesssteel, wire-mesh, strain relief device at terminations to suit application.
- J. Class 1 Control Circuits: Type THHN-THWN, in raceway.
- K. Class 2 Control Circuits: Type THHN-THWN, in raceway, or Power-limited tray cable, in cable tray.

#### 3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in conduit within finished walls, ceilings, and floors, unless otherwise indicated.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- D. Install exposed conduits parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- E. Support cables according to Division 26 Section "Hangers and Supports for Electrical Systems."
- F. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems."

#### 3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torquetightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

- B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
  - 1. Use oxide inhibitor in each splice and tap conductor for aluminum conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches (300 mm) of slack.

#### 3.5 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- D. Rectangular Sleeve Minimum Metal Thickness:
  - 1. For sleeve rectangle perimeter less than 50 inches (1270 mm) and no side greater than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
  - 2. For sleeve rectangle perimeter equal to, or greater than, 50 inches (1270 mm) and 1 or more sides equal to, or greater than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).
- E. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- F. Cut sleeves to length for mounting flush with both wall surfaces.
- G. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.
- H. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.
- I. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.
- J. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and cable, using joint sealant appropriate for size, depth, and location of joint according to Division 07 Section "Joint Sealants."
- K. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at cable penetrations. Install sleeves and seal with firestop materials according to Division 07 Section "Penetration Firestopping."
- L. Roof-Penetration Sleeves: Seal penetration of individual cables with flexible boot-type flashing units applied in coordination with roofing work.

- M. Aboveground Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeves to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- N. Underground Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between cable and sleeve for installing mechanical sleeve seals.

## 3.6 SLEEVE-SEAL INSTALLATION

- A. Install to seal underground exterior-wall penetrations.
- B. Use type and number of sealing elements recommended by manufacturer for cable material and size. Position cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

## 3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Division 07 Section "Penetration Firestopping."

## END OF SECTION 260519

## SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

## 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.

#### 1.2 SUMMARY

A. This Section includes methods and materials for grounding systems and equipment.

#### 1.3 SUBMITTALS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

#### PART 2 - PRODUCTS

#### 2.1 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
  - 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 conductor, 1/4 inch (6 mm) 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 (41 mm) wide and 1/16 inch (1.6 mm) thick.
- C. Grounding Bus: Rectangular bars of annealed copper, 1/4 by 2 inches (6 by 50 mm) in cross section, unless otherwise indicated; with insulators.

#### 2.2 CONNECTORS

- A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.
  - 1. Pipe Connectors: Clamp type, sized for pipe.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

#### 2.3 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad 5/8 by 96 inches (16 by 2400 mm) in diameter or as noted on drawings.
- B. Ufer ground: bare copper as noted on drawings.
- C. All underground connections to the grounding electrode system shall be cad welded connections.

#### PART 3 - EXECUTION

#### 3.1 APPLICATIONS

- A. Conductors: Install stranded conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.
- B. Underground Grounding Conductors: Install bare copper conductor, No. 3/0 AWG minimum.
  - 1. Bury at least 24 inches (600 mm) below grade.
- C. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
  - 1. Install bus on insulated spacers 1 inch (25 mm), minimum, from wall 6 inches (150 mm) above finished floor, unless otherwise indicated.
  - 2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, down to specified height above floor, and connect to horizontal bus.
- D. Conductor Terminations and Connections:
  - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
  - 2. Underground Connections: Welded connectors are required, except at test wells and as otherwise indicated.
  - 3. Connections to Structural Steel (red iron): Welded connectors.

# 3.2 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
  - 1. Feeders and branch circuits.
  - 2. Lighting circuits.
  - 3. Receptacle circuits.
  - 4. Single-phase motor and appliance branch circuits.
  - 5. Three-phase motor and appliance branch circuits.
  - 6. Flexible raceway runs.
  - 7. Armored and metal-clad cable runs.
  - 8. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power-distribution units.
- C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to ductmounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.
- D. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.
- E. Signal and Communication Equipment: For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
  - 1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch (6-by-50-by-300-mm) grounding bus.
  - 2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

# 3.3 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. 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 so vibration is not transmitted to rigidly mounted equipment.

- 3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.
- C. 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, using a bolted clamp connector or by bolting a lug-type connector to a pipe flange, 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.
  - 2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
  - 3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.
- D. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.
- E. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet (18 m) apart.
- F. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to NFPA 70, using a minimum of 20 feet (6 m) of bare copper conductor not smaller than No. 4 AWG or as noted on drawings.
  - 1. If concrete foundation is less than 20 feet (6 m) long, coil excess conductor within base of foundation.
  - 2. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building grounding grid or to grounding electrode external to concrete.

END OF SECTION 260526

# SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

# 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.

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Hangers and supports for electrical equipment and systems.
  - 2. Construction requirements for concrete bases.
- B. Related Sections include the following:
  - 1. Division 26 Section "Vibration And Seismic Controls For Electrical Systems" for products and installation requirements necessary for compliance with seismic criteria.

#### 1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. IMC: Intermediate metal conduit.
- C. RMC: Rigid metal conduit.

#### 1.4 SUBMITTALS

- A. Product Data: For the following:
  - 1. Steel slotted support systems.
  - 2. Nonmetallic slotted support systems.
- B. Shop Drawings: Show fabrication and installation details for the following:
  - 1. Trapeze hangers. Include Product Data for components.
  - 2. Steel slotted channel systems. Include Product Data for components.
  - 3. Nonmetallic slotted channel systems. Include Product Data for components.
  - 4. Equipment supports.

# 1.5 QUALITY ASSURANCE

A. Comply with NFPA 70.

## 1.6 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.
- B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

# PART 2 - PRODUCTS

# 2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Allied Tube & Conduit.
    - b. Cooper B-Line, Inc.; a division of Cooper Industries.
    - c. ERICO International Corporation.
    - d. GS Metals Corp.
    - e. Thomas & Betts Corporation.
    - f. Unistrut; Tyco International, Ltd.
    - g. Wesanco, Inc.
  - 2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
  - 3. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
  - 4. Channel Dimensions: Selected for applicable load criteria.
- B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
- E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

- F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
  - 1. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
    - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - b. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) Cooper B-Line, Inc.; a division of Cooper Industries.
      - 2) Empire Tool and Manufacturing Co., Inc.
      - 3) Hilti Inc.
      - 4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
      - 5) MKT Fastening, LLC.
  - 2. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
  - 3. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
  - 4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
  - 5. Toggle Bolts: All-steel springhead type.
  - 6. Hanger Rods: Threaded steel.

# 2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Comply with requirements in Division 05 Section "Metal Fabrications" for steel shapes and plates.

# PART 3 - EXECUTION

# 3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.

- C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
  - 1. Secure raceways and cables to these supports with two-bolt conduit clamps Retain paragraph below for projects where seismic design requirements do not apply. Consider retaining for light-commercial projects only.
- D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch (38-mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

# 3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Strength of 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 (90 kg).
- C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
  - 1. To Wood: Fasten with lag screws or through bolts.
  - 2. To New Concrete: Bolt to concrete inserts.
  - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
  - 4. To Existing Concrete: Expansion anchor fasteners.
  - 5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.
  - 6. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
  - 7. To Light Steel: Sheet metal screws.
  - 8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.
- D. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

# 3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Division 05 Section "Metal Fabrications" for site-fabricated metal supports.

- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

# 3.4 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated but not less than 4 inches (100 mm) larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete. Anchor equipment to concrete base.
  - 1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
  - 3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

# 3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
  - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

# SECTION 260533 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

# 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.

## 1.2 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.
- B. Related Sections include the following:
  - 1. Division 26 Section "Underground Ducts and Raceways for Electrical Systems" for exterior ductbanks, manholes, and underground utility construction.

#### 1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. ENT: Electrical nonmetallic tubing.
- C. EPDM: Ethylene-propylene-diene terpolymer rubber.
- D. FMC: Flexible metal conduit.
- E. IMC: Intermediate metal conduit.
- F. LFMC: Liquidtight flexible metal conduit.
- G. LFNC: Liquidtight flexible nonmetallic conduit.
- H. NBR: Acrylonitrile-butadiene rubber.
- I. RNC: Rigid nonmetallic conduit.

#### 1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

# RACEWAY AND BOXES

# PART 2 - PRODUCTS

## 2.1 METAL CONDUIT AND TUBING

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. AFC Cable Systems, Inc.
  - 2. Alflex Inc.
  - 3. Allied Tube & Conduit; a Tyco International Ltd. Co.
  - 4. Anamet Electrical, Inc.; Anaconda Metal Hose.
  - 5. Electri-Flex Co.
  - 6. Manhattan/CDT/Cole-Flex.
  - 7. Maverick Tube Corporation.
  - 8. O-Z Gedney; a unit of General Signal.
  - 9. Wheatland Tube Company.
- B. Rigid Steel Conduit: ANSI C80.1.
- C. Aluminum Rigid Conduit: ANSI C80.5.
- D. IMC: ANSI C80.6.
- E. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.
  - 1. Comply with NEMA RN 1.
  - 2. Coating Thickness: 0.040 inch (1 mm), minimum.
- F. EMT: ANSI C80.3.
- G. FMC: Zinc-coated steel or aluminum.
- H. LFMC: Flexible steel conduit with PVC jacket.
- I. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.
  - 1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.
  - 2. Fittings for EMT: Steel type.
  - 3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness, 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.
- J. Joint Compound for Rigid Steel Conduit or IMC: Listed for use in cable connector assemblies, and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

# 2.2 NONMETALLIC CONDUIT AND TUBING

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. AFC Cable Systems, Inc.
  - 2. Anamet Electrical, Inc.; Anaconda Metal Hose.
  - 3. Arnco Corporation.
  - 4. CANTEX Inc.
  - 5. CertainTeed Corp.; Pipe & Plastics Group.
  - 6. Condux International, Inc.
  - 7. ElecSYS, Inc.
  - 8. Electri-Flex Co.
  - 9. Lamson & Sessions; Carlon Electrical Products.
  - 10. Manhattan/CDT/Cole-Flex.
  - 11. RACO; a Hubbell Company.
  - 12. Thomas & Betts Corporation.
- B. RNC: NEMA TC 2, Type EPC-40-PVC, unless otherwise indicated.

## 2.3 OPTICAL FIBER/COMMUNICATIONS CABLE RACEWAY AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Arnco Corporation.
  - 2. Endot Industries Inc.
  - 3. IPEX Inc.
  - 4. Lamson & Sessions; Carlon Electrical Products.
- B. Description: Comply with UL 2024; flexible type, approved for plenum, riser installation.

#### 2.4 METAL WIREWAYS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Cooper B-Line, Inc.
  - 2. Hoffman.
  - 3. Square D; Schneider Electric.
- C. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 1, unless otherwise indicated.

- D. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, holddown straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- E. Wireway Covers: Hinged type.
- F. Finish: Manufacturer's standard enamel finish.

# 2.5 SURFACE RACEWAYS

- A. Surface Metal Raceways: Galvanized steel with snap-on covers. Prime coating, ready for field painting, painted to match conditions.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Hubbell
    - b. Walker Systems, Inc.; Wiremold Company (The).
    - c. Wiremold Company (The); Electrical Sales Division.
- B. Surface Nonmetallic Raceways: Two-piece construction, manufactured of rigid PVC with texture and color selected by Architect from manufacturer's standardcolors.
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Hubbell Incorporated; Wiring Device-Kellems Division.
    - b. Walker Systems, Inc.; Wiremold Company (The).
    - c. Wiremold Company (The); Electrical Sales Division.

# 2.6 BOXES, ENCLOSURES, AND CABINETS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
  - 2. EGS/Appleton Electric.
  - 3. Erickson Electrical Equipment Company.
  - 4. Hoffman.
  - 5. Hubbell Incorporated; Killark Electric Manufacturing Co. Division.
  - 6. RACO; a Hubbell Company.
  - 7. Thomas & Betts Corporation.
  - 8. Walker Systems, Inc.; Wiremold Company (The).

- 9. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.
- C. Sheet Metal Outlet and Device Boxes: NEMA OS 1.
- D. Cast-Metal Outlet and Device Boxes: NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.
- E. Nonmetallic Outlet and Device Boxes: NEMA OS 2.
- F. Metal Floor Boxes: Cast metal, rectangular.
- G. Nonmetallic Floor Boxes: Nonadjustable, round.
- H. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- I. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, galvanized, cast iron with gasketed cover.
- J. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.
  - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
- K. Cabinets:
  - 1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
  - 2. Hinged door in front cover with flush latch and concealed hinge.
  - 3. Key latch to match panelboards.
  - 4. Metal barriers to separate wiring of different systems and voltage.
  - 5. Accessory feet where required for freestanding equipment.

# 2.7 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

- A. Description: Comply with SCTE 77.
  - 1. Color of Frame and Cover: Green.
  - 2. Configuration: Units shall be designed for flush burial and have open bottom, unless otherwise indicated.
  - 3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
  - 4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
  - 5. Cover Legend: Molded lettering, "ELECTRIC." or "TELEPHONE." as indicated for each service.
  - 6. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
  - 7. Handholes 12 inches wide by 24 inches long (300 mm wide by 600 mm long) and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.

- B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel or fiberglass or a combination of the two.
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Armorcast Products Company.
    - b. Carson Industries LLC.
    - c. CDR Systems Corporation.
    - d. NewBasis.
- C. Fiberglass Handholes and Boxes with Polymer-Concrete Frame and Cover: Sheet-molded, fiberglass-reinforced, polyester-resin enclosure joined to polymer-concrete top ring or frame.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Armorcast Products Company.
    - b. Carson Industries LLC.
    - c. Christy Concrete Products.
    - d. Synertech Moulded Products, Inc.; a division of Oldcastle Precast.
- D. Fiberglass Handholes and Boxes: Molded of fiberglass-reinforced polyester resin, with covers of fiberglass.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Carson Industries LLC.
    - b. Christy Concrete Products.
    - c. Nordic Fiberglass, Inc.

# 2.8 SLEEVES FOR RACEWAYS

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052- or 0.138-inch (1.3- or 3.5-mm) thickness as indicated and of length to suit application.
- D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

# 2.9 SLEEVE SEALS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Advance Products & Systems, Inc.
  - 2. Calpico, Inc.
  - 3. Metraflex Co.
  - 4. Pipeline Seal and Insulator, Inc.
- B. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.
  - 1. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
  - 2. Pressure Plates: Stainless steel. Include two for each sealing element.
  - 3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

# PART 3 - EXECUTION

# 3.1 PRODUCTION INSPECTIONS

- A. Installation approval by owner is required at each phase of construction as noted below. Proceeding without owner approval may result in rejection of work and/or installation and result in the contractor removing newly installed raceway, boxes, cables, racks, and etc (all system components).
  - 1. Submittal documents (shop drawings).
  - 2. Substitution requests.
  - 3. Raceway Rough-in.
  - 4. Equipment location and installation.

# 3.2 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:
  - 1. Exposed Conduit: Rigid steel conduit.
  - 2. Concealed Conduit, Aboveground: Rigid steel conduit.
  - 3. Underground Conduit: RNC, Type EPC-40 -PVC, direct buried.
  - 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
  - 5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
  - 6. Application of Handholes and Boxes for Underground Wiring:
    - a. Handholes and Pull Boxes in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Polymer concrete, SCTE 77, Tier 15 structural load rating.

- b. Handholes and Pull Boxes in Sidewalk and Similar Applications with a Safety Factor for Nondeliberate Loading by Vehicles: Polymer-concrete units, SCTE 77, Tier 8 structural load rating.
- c. Handholes and Pull Boxes Subject to Light-Duty Pedestrian Traffic Only: Fiberglass-reinforced polyester resin, structurally tested according to SCTE 77 with 3000-lbf (13 345-N) vertical loading.
- B. Comply with the following indoor applications, unless otherwise indicated:
  - 1. Exposed, Not Subject to Physical Damage: EMT.
  - 2. Exposed, Not Subject to Severe Physical Damage: EMT
  - 3. Exposed and Subject to Severe Physical Damage: Rigid steel conduit. Includes raceways in the following locations:
    - a. Loading dock.
    - b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
    - c. Mechanical rooms.
  - 4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
  - 5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
  - 6. Damp or Wet Locations: Rigid steel conduit.
  - 7. Raceways for Optical Fiber or Communications Cable in Spaces Used for Environmental Air: Plenum-type, optical fiber/communications cable raceway
  - 8. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, stainless steel in damp or wet locations.
- C. Minimum Raceway Size: 3/4-inch (21-mm) trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
  - 1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
  - 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with that material. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer.
- E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.
- F. Do not install aluminum conduits in contact with concrete.

# 3.3 INSTALLATION

- A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.
- B. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hotwater pipes. Install horizontal raceway runs above water and steam piping.

- C. Complete raceway installation before starting conductor installation.
- D. Support raceways as specified in Division 26 Section "Hangers and Supports for Electrical Systems."
- E. Arrange stub-ups so curved portions of bends are not visible above the finished slab.
- F. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.
- G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
- H. Raceways Embedded in Slabs:
  - 1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
  - 2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
  - 3. Change from ENT to RNC, Type EPC-40-PVC, rigid steel conduit, or IMC before rising above the floor.
- I. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- J. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.
- K. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire.
- L. Raceways for Optical Fiber and Communications Cable: Install raceways, metallic and nonmetallic, rigid and flexible, as follows:
  - 1. 3/4-Inch (19-mm) Trade Size and Smaller: Install raceways in maximum lengths of 50 feet (15 m).
  - 2. 1-Inch (25-mm) Trade Size and Larger: Install raceways in maximum lengths of 75 feet (23 m).
  - 3. Install with a maximum of two 90-degree bends or equivalent for each length of raceway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.
- M. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:

- 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
- 2. Where otherwise required by NFPA 70.
- N. Flexible Conduit Connections: Use maximum of 72 inches (1830 mm) of flexible conduit for recessed and semirecessed lighting fixtures, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
  - 1. Use LFMC in damp or wet locations subject to severe physical damage.
  - 2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.
- O. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall.
- P. Set metal floor boxes level and flush with finished floor surface.
- Q. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

# 3.4 INSTALLATION OF UNDERGROUND CONDUIT

- A. Direct-Buried Conduit:
  - 1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Division 31 Section "Earth Moving" for pipe less than 6 inches (150 mm) in nominal diameter.
  - 2. Install backfill as specified in Division 31 Section "Earth Moving."
  - 3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Division 31 Section "Earth Moving."
  - 4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through the floor, unless otherwise indicated. Encase elbows for stub-up ducts throughout the length of the elbow.
  - 5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.
    - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete.
    - b. For stub-ups at equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.
  - 6. Warning Planks: Bury warning planks approximately 12 inches (300 mm) above directburied conduits, placing them 24 inches (600 mm) o.c. Align planks along the width and along the centerline of conduit.

# 3.5 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch (25 mm) above finished grade.
- D. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

# 3.6 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- D. Rectangular Sleeve Minimum Metal Thickness:
  - 1. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and no side greater than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
  - 2. For sleeve cross-section rectangle perimeter equal to, or greater than, 50 inches (1270 mm) and 1 or more sides equal to, or greater than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).
- E. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- F. Cut sleeves to length for mounting flush with both surfaces of walls.
- G. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.
- H. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway unless sleeve seal is to be installed.
- I. Seal space outside of sleeves with grout for penetrations of concrete and masonry.
- J. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway, using joint sealant appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.

- K. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway penetrations. Install sleeves and seal with firestop materials. Comply with Division 07 Section "Penetration Firestopping."
- L. Roof-Penetration Sleeves: Seal penetration of individual raceways with flexible, boot-type flashing units applied in coordination with roofing work.
- M. Aboveground, Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- N. Underground, Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway and sleeve for installing mechanical sleeve seals.

# 3.7 SLEEVE-SEAL INSTALLATION

- A. Install to seal underground, exterior wall penetrations.
- B. Use type and number of sealing elements recommended by manufacturer for raceway material and size. Position raceway in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

# 3.8 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

# 3.9 **PROTECTION**

- A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
  - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
  - 2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

# END OF SECTION 260533

# SECTION 260548 - VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

# 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.

## 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Isolation pads.
  - 2. Spring isolators.
  - 3. Restrained spring isolators.
  - 4. Channel support systems.
  - 5. Restraint cables.
  - 6. Hanger rod stiffeners.
  - 7. Anchorage bushings and washers.
- B. Related Sections include the following:
  - 1. Division 26 Section "Hangers And Supports For Electrical Systems" for commonly used electrical supports and installation requirements.

# 1.3 DEFINITIONS

- A. The IBC: International Building Code.
- B. ICC-ES: ICC-Evaluation Service.
- C. OSHPD: Office of Statewide Health Planning and Development for the State of California.

# 1.4 PERFORMANCE REQUIREMENTS

- A. Seismic-Restraint Loading:
  - 1. Site Class as Defined in the IBC:
  - 2. Assigned Seismic Use Group or Building Category as Defined in the IBC:

# 1.5 QUALITY ASSURANCE

A. Comply with NFPA 70.

# VIBRATION AND SEISMIC CONTROLS

# PART 2 - PRODUCTS

## 2.1 SEISMIC-RESTRAINT DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Amber/Booth Company, Inc.
  - 2. California Dynamics Corporation.
  - 3. Cooper B-Line, Inc.; a division of Cooper Industries.
  - 4. Hilti Inc.
  - 5. Loos & Co.; Seismic Earthquake Division.
  - 6. Mason Industries.
  - 7. TOLCO Incorporated; a brand of NIBCO INC.
  - 8. Unistrut; Tyco International, Ltd.
- B. General Requirements for Restraint Components: Rated strengths, features, and application requirements shall be as defined in reports by an agency acceptable to authorities having jurisdiction.
  - 1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.
- C. Channel Support System: MFMA-3, shop- or field-fabricated support assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; and rated in tension, compression, and torsion forces.
- D. Restraint Cables: ASTM A 603 galvanized-steel cables with end connections made of steel assemblies with thimbles, brackets, swivels, and bolts designed for restraining cable service; and with a minimum of two clamping bolts for cable engagement.
- E. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod. Do not weld stiffeners to rods.
- F. Bushings for Floor-Mounted Equipment Anchor: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchors and studs.
- G. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices.
- H. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.
- I. Mechanical Anchor: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchors with strength required for anchor and as tested according to ASTM E 488. Minimum length of eight times diameter.

J. Adhesive Anchor: Drilled-in and capsule anchor system containing polyvinyl or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Examine areas and equipment to receive seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 APPLICATIONS

- A. Multiple Raceways or Cables: Secure raceways and cables to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.
- B. Hanger Rod Stiffeners: Install hanger rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.
- C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

#### 3.3 SEISMIC-RESTRAINT DEVICE INSTALLATION

- A. Equipment and Hanger Restraints:
  - 1. Install restrained isolators on electrical equipment.
  - 2. Install resilient, bolt-isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch (3.2 mm).
  - 3. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction providing required submittals for component.
- B. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.
- C. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.
- D. Drilled-in Anchors:

- 1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
- 2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
- 3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
- 4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
- 5. Set anchors to manufacturer's recommended torque, using a torque wrench.
- 6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

# 3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where they terminate with connection to equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

# 3.5 ADJUSTING

- A. Adjust isolators after isolated equipment is at operating weight.
- B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.
- C. Adjust active height of spring isolators.
- D. Adjust restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION 260548

# SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

# 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.

# 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Identification for raceway and metal-clad cable.
  - 2. Identification for conductors and communication and control cable.
  - 3. Underground-line warning tape.
  - 4. Warning labels and signs.
  - 5. Instruction signs.
  - 6. Equipment identification labels.
  - 7. Miscellaneous identification products.

# 1.3 SUBMITTALS

- A. Product Data: For each electrical identification product indicated.
- B. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.
- C. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.

# 1.4 QUALITY ASSURANCE

- A. Comply with ANSI A13.1 and ANSI C2.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.145.

#### 1.5 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual, and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

## IDENTIFICATION FOR ELECTRICAL SYSTEMS

- B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- C. Coordinate installation of identifying devices with location of access panels and doors.
- D. Install identifying devices before installing acoustical ceilings and similar concealment.

# PART 2 - PRODUCTS

# 2.1 RACEWAY AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
- B. Color for Printed Legend:
  - 1. Power Circuits: Black letters on an orange field.
  - 2. Legend: Indicate system or service and voltage, if applicable.
- C. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- D. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- E. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inches (50 mm) long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- F. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches (50 mm) wide; compounded for outdoor use.

# 2.2 CONDUCTOR AND COMMUNICATION- AND CONTROL-CABLE IDENTIFICATION MATERIALS

- A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide.
- B. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
- C. Aluminum Wraparound Marker Labels: Cut from 0.014-inch- (0.35-mm-) thick aluminum sheet, with stamped, embossed, or scribed legend, and fitted with tabs and matching slots for permanently securing around wire or cable jacket or around groups of conductors.
- D. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch (50 by 50 by 1.3 mm), with stamped legend, punched for use with self-locking nylon tie fastener.

- E. Write-On Tags: Polyester tag, 0.015 inch (0.38 mm) thick, with corrosion-resistant grommet and polyester or nylon tie for attachment to conductor or cable.
  - 1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

# 2.3 UNDERGROUND-LINE WARNING TAPE

- A. Description: Permanent, bright-colored, continuous-printed, polyethylene tape.
  - 1. Not less than 6 inches (150 mm) wide by 4 mils (0.102 mm) thick.
  - 2. Compounded for permanent direct-burial service.
  - 3. Embedded continuous metallic strip or core.
  - 4. Printed legend shall indicate type of underground line.

## 2.4 WARNING LABELS AND SIGNS

- A. Comply with NFPA 70 and 29 CFR 1910.145.
- B. Self-Adhesive Warning Labels: Factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.
- C. Baked-Enamel Warning Signs: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application. 1/4-inch (6.4-mm) grommets in corners for mounting. Nominal size, 7 by 10 inches (180 by 250 mm).
- D. Metal-Backed, Butyrate Warning Signs: Weather-resistant, nonfading, preprinted, celluloseacetate butyrate signs with 0.0396-inch (1-mm) galvanized-steel backing; and with colors, legend, and size required for application. 1/4-inch (6.4-mm) grommets in corners for mounting. Nominal size, 10 by 14 inches (250 by 360 mm).
- E. Warning label and sign shall include, but are not limited to, the following legends:
  - 1. Multiple Power Source Warning: "DANGER ELECTRICAL SHOCK HAZARD EQUIPMENT HAS MULTIPLE POWER SOURCES."
  - 2. Workspace Clearance Warning: "WARNING OSHA REGULATION AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM)."

# 2.5 INSTRUCTION SIGNS

- A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch (1.6 mm) thick for signs up to 20 sq. in. (129 sq. cm) and 1/8 inch (3.2 mm) thick for larger sizes.
  - 1. Engraved legend with black letters on white face.
  - 2. Punched or drilled for mechanical fasteners.
  - 3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

# 2.6 EQUIPMENT IDENTIFICATION LABELS

- A. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm).
- B. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm). Overlay shall provide a weatherproof and ultraviolet-resistant seal for label.
- C. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).
- D. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).
- E. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch (25 mm).

# 2.7 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Cable Ties: Fungus-inert, self-extinguishing, 1-piece, self-locking, Type 6/6 nylon cable ties.
  - 1. Minimum Width: 3/16 inch (5 mm).
  - 2. Tensile Strength: 50 lb (22.6 kg), minimum.
  - 3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
  - 4. Color: Black, except where used for color-coding.
- B. Paint: Paint materials and application requirements are specified in Division 09 painting Sections.
  - 1. Exterior Concrete, Stucco, and Masonry (Other Than Concrete Unit Masonry):
    - a. Semigloss Acrylic-Enamel Finish: Two finish coat(s) over a primer.
      - 1) Primer: Exterior concrete and masonry primer.
      - 2) Finish Coats: Exterior semigloss acrylic enamel.
  - 2. Exterior Concrete Unit Masonry:
    - a. Semigloss Acrylic-Enamel Finish: Two finish coat(s) over a block filler.
      - 1) Block Filler: Concrete unit masonry block filler.
      - 2) Finish Coats: Exterior semigloss acrylic enamel.
  - 3. Exterior Ferrous Metal:
    - a. Semigloss Alkyd-Enamel Finish: Two finish coat(s) over a primer.
      - 1) Primer: Exterior ferrous-metal primer.
      - 2) Finish Coats: Exterior semigloss alkyd enamel.

- 4. Exterior Zinc-Coated Metal (except Raceways):
  - a. Semigloss Alkyd-Enamel Finish: Two finish coat(s) over a primer.
    - 1) Primer: Exterior zinc-coated metal primer.
    - 2) Finish Coats: Exterior semigloss alkyd enamel.
- 5. Interior Concrete and Masonry (Other Than Concrete Unit Masonry):
  - a. Semigloss Alkyd-Enamel Finish: Two finish coat(s) over a primer.
    - 1) Primer: Interior concrete and masonry primer.
    - 2) Finish Coats: Interior semigloss alkyd enamel.
- 6. Interior Concrete Unit Masonry:
  - a. Semigloss Acrylic-Enamel Finish: Two finish coat(s) over a block filler.
    - 1) Block Filler: Concrete unit masonry block filler.
    - 2) Finish Coats: Interior semigloss acrylic enamel.
- 7. Interior Gypsum Board:
  - a. Semigloss Acrylic-Enamel Finish: Two finish coat(s) over a primer.
    - 1) Primer: Interior gypsum board primer.
    - 2) Finish Coats: Interior semigloss acrylic enamel.
- 8. Interior Ferrous Metal:
  - a. Semigloss Acrylic-Enamel Finish: Two finish coat(s) over a primer.
    - 1) Primer: Interior ferrous-metal primer.
    - 2) Finish Coats: Interior semigloss acrylic enamel.
- 9. Interior Zinc-Coated Metal (except Raceways):
  - a. Semigloss Acrylic-Enamel Finish: Two finish coat(s) over a primer.
    - 1) Primer: Interior zinc-coated metal primer.
    - 2) Finish Coats: Interior semigloss acrylic enamel.
- C. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

# PART 3 - EXECUTION

# 3.1 APPLICATION

- A. Accessible Raceways and Cables of Auxiliary Systems: Identify the following systems with color-coded, snap-around, color-coding bands:
  - 1. Fire Alarm System: Red.
  - 2. Fire-Suppression Supervisory and Control System: Red and yellow.
  - 3. Combined Fire Alarm and Security System: Red and blue.
  - 4. Security System: Blue and yellow.
  - 5. Mechanical and Electrical Supervisory System: Green and blue.
  - 6. Telecommunication System: Green and yellow.
  - 7. Control Wiring: Green and red.
- B. Power-Circuit Conductor Identification: For secondary conductors No. 1/0AWG and larger in vaults, pull and junction boxes, manholes, and handholes use color-coding conductor tape Identify source and circuit number of each set of conductors. For single conductor cables, identify phase in addition to the above.
- C. Branch-Circuit Conductor Identification: Where there are conductors for more than three branch circuits in same junction or pull box, use color-coding conductor tape. Identify each ungrounded conductor according to source and circuit number.
- D. Conductors to Be Extended in the Future: Attach marker tape to conductors and list source and circuit number.
- E. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, signal, sound, intercommunications, voice, and data connections.
  - 1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
  - 2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
  - 3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and Operation and Maintenance Manual.
- F. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable. Install underground-line warning tape for both direct-buried cables and cables in raceway.
- G. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply self-adhesive warning labels Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.
  - 1. Equipment with Multiple Power or Control Sources: Apply to door or cover of equipment including, but not limited to, the following:
    - a. Power transfer switches.
    - b. Controls with external control power connections.

- 2. Equipment Requiring Workspace Clearance According to NFPA 70: Unless otherwise indicated, apply to door or cover of equipment but not on flush panelboards and similar equipment in finished spaces.
- H. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
  - 1. Labeling Instructions:
    - a. Indoor Equipment: Self-adhesive, engraved, laminated acrylic or melamine label]. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where 2 lines of text are required, use labels 2 inches (50 mm) high.
    - b. Outdoor Equipment: Engraved, laminated acrylic or melamine label Stenciled legend 4 inches (100 mm) high.
    - c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
  - 2. Equipment to Be Labeled:
    - a. Panelboards, electrical cabinets, and enclosures.
    - b. Access doors and panels for concealed electrical items.
    - c. Electrical switchgear and switchboards.
    - d. Transformers.
    - e. Electrical substations.
    - f. Emergency system boxes and enclosures.
    - g. Motor-control centers.
    - h. Disconnect switches.
    - i. Enclosed circuit breakers.
    - j. Motor starters.
    - k. Push-button stations.
    - 1. Power transfer equipment.
    - m. Contactors.
    - n. Remote-controlled switches, dimmer modules, and control devices.
    - o. Battery inverter units.
    - p. Battery racks.
    - q. Power-generating units.
    - r. Voice and data cable terminal equipment.
    - s. Master clock and program equipment.
    - t. Intercommunication and call system master and staff stations.
    - u. Television/audio components, racks, and controls.
    - v. Fire-alarm control panel and annunciators.
    - w. Security and intrusion-detection control stations, control panels, terminal cabinets, and racks.
    - x. Monitoring and control equipment.
    - y. Uninterruptible power supply equipment.

z. Terminals, racks, and patch panels for voice and data communication and for signal and control functions.

# 3.2 INSTALLATION

- A. Verify identity of each item before installing identification products.
- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Apply identification devices to surfaces that require finish after completing finish work.
- D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- E. Attach nonadhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.
- F. System Identification Color Banding for Raceways and Cables: Each color band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.
- G. Color-Coding for Phase and Voltage Level Identification, 600 V and Less: Use the colors listed below for ungrounded service, feeder, and branch-circuit conductors.
  - 1. Color shall be factory applied.
  - 2. Colors for 208/120-V Circuits:
    - a. Phase A: Black.
    - b. Phase B: Red.
    - c. Phase C: Blue.
  - 3. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
- H. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.
- I. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches (150 to 200 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches (400 mm) overall.

# END OF SECTION 260553

# SECTION 265119 - INTERIOR LIGHTING

# PART 1 - 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.

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Interior solid-state luminaires that use LED technology.
  - 2. Lighting fixture supports.
- B. Related Requirements:
  - 1. Division 26 Section "Low Voltage Electrical Power Conductors and Cables" for conductor requirements.
  - 2. Division 26 Section "Raceway and Boxes" for conduit/raceway requirements.
  - 3. Division 26 Section "Vibration and Seismic Controls" for seismic requirements.

#### 1.3 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color Rendering Index.
- C. Fixture: See "Luminaire."
- D. IP: International Protection or Ingress Protection Rating.
- E. LED: Light-emitting diode.
- F. Lumen: Measured output of lamp and luminaire, or both.
- G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

#### 1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated on fixture schedule and any assessor equipment required.

#### INTERIOR LIGHTING

- 1. Arrange in order of luminaire designation.
- 2. Include data on features, accessories, and finishes.
- 3. Include physical description and dimensions of luminaires.
- 4. Include emergency lighting units, including batteries and chargers.
- 5. Include life, output (lumens, CCT, and CRI), and energy efficiency data.
- 6. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing and Calculation Guides, of each lighting fixture type. The adjustment factors shall be for lamps and accessories identical to those indicated for the lighting fixture as applied in this Project IES LM-79 and IES LM-80.
  - a. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
  - b. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.
- B. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

## 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing laboratory providing photometric data for luminaires.
- B. Seismic Qualification Certificates: For luminaires, accessories, and components, from manufacturer.
  - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
- C. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- D. Product Certificates: For each type of luminaire.
- E. Product Test Reports: For each luminaire, for tests performed by manufacturer and witnessed by a qualified testing agency.
- F. Sample warranty.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.
  - 1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

# 1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.
  - 2. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

# 1.8 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.
- B. Provide luminaires from a single manufacturer for each luminaire type.
- C. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

# 1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

# 1.10 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
- B. Warranty Period: Five year(s) from date of Substantial Completion.

# PART 2 - PRODUCTS

# 2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7
- B. Seismic Performance: Luminaires and lamps shall be labeled vibration and shock resistant.
  - 1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified.

# 2.2 LUMINAIRE REQUIREMENTS

- 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. Recessed Fixtures: Comply with NEMA LE 4.
- C. Bulb shape complying with ANSI C79.1.
- D. Lamp base complying with ANSI C81.61.
- E. CRI of 80. CCT of 3000 K.
- F. Rated lamp life of 50,000 hours.
- G. Lamps dimmable from 100 percent to 0 percent of maximum light output.
- H. Internal driver.
- I. Nominal Operating Voltage: 120 V ac.
  - 1. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless otherwise indicated.
- J. Housings:
  - 1. Extruded-aluminum housing and heat sink.
  - 2. Clear (Color as noted on fixture schedule) anodized powder-coat finish.

# 2.3 MATERIALS

- A. Metal Parts:
  - 1. Free of burrs and sharp corners and edges.
  - 2. Sheet metal components shall be steel unless otherwise indicated.
  - 3. Form and support to prevent warping and sagging.
- B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- C. Diffusers and Globes:
  - 1. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
  - 2. Glass: Annealed crystal glass unless otherwise indicated.
  - 3. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless otherwise indicated.

- D. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
  - 1. Label shall include the following lamp characteristics:
    - a. "USE ONLY" and include specific lamp type.
    - b. Lamp diameter, shape, size, wattage, and coating.
    - c. CCT and CRI for all luminaires.

# 2.4 METAL FINISHES

A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

# 2.5 LUMINAIRE FIXTURE SUPPORT COMPONENTS

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch (13-mm) steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.
- C. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gage (2.68 mm).
- D. Rod Hangers: 3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod.
- E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

# PART 3 - EXECUTION

# 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before fixture installation. Proceed with installation only after unsatisfactory conditions have been corrected.

# 3.2 INSTALLATION

- A. Comply with NECA 1.
- B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

#### INTERIOR LIGHTING

- C. Install lamps in each luminaire.
- D. Supports:
  - 1. Sized and rated for luminaire weight.
  - 2. Able to maintain luminaire position after cleaning and relamping.
  - 3. Provide support for luminaire without causing deflection of ceiling or wall.
  - 4. Luminaire mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and vertical force of 400 percent of luminaire weight.
- E. Flush-Mounted Luminaire Support:
  - 1. Secured to outlet box.
  - 2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
  - 3. Trim ring flush with finished surface.
- F. Wall-Mounted Luminaire Support:
  - 1. Attached to structural members in walls or Attached to a minimum 20 gauge backing plate attached to wall structural members.
  - 2. Do not attach luminaires directly to gypsum board.
- G. Ceiling-Mounted Luminaire Support:
  - 1. Ceiling mount with four 5/32-inch- (4-mm-) diameter aircraft cable supports adjustable to 120 inches (6 m) in length. Do not cut cable, coil cable above fixture.
- H. Suspended Luminaire Support:
  - 1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
  - 2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
  - 3. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point wire support for suspension for each unit length of luminaire chassis, including one at each end.
  - 4. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.
- I. Ceiling-Grid-Mounted Luminaires:
  - 1. Secure to any required outlet box.
  - 2. Secure luminaire to the luminaire opening using approved fasteners in a minimum of four locations, spaced near corners of luminaire.
  - 3. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.
- J. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

#### 3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

#### 3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
  - 1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
  - 2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.
- B. Luminaire will be considered defective if it does not pass operation tests and inspections. Luminaires considered to be defective are to be replaced with new.
- C. Prepare test and inspection reports.

#### 3.5 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.
  - 1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
  - 2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
  - 3. Adjust the aim of luminaires in the presence of the owner.

END OF SECTION 265119

#### SECTION 265600 - EXTERIOR LIGHTING

#### 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.

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Exterior luminaires with LED and drivers (LED).
  - 2. Luminaire-mounted photoelectric relays.
- B. Related Sections include the following:
  - 1. Division 26 Section "Interior Lighting" for exterior luminaires normally mounted on exterior surfaces of buildings.

#### 1.3 DEFINITIONS

- A. CRI: Color-rendering index.
- B. HID: High-intensity discharge.
- C. Luminaire: Complete lighting fixture.
- D. Pole: Luminaire support structure, including tower used for large area illumination.
- E. Standard: Same definition as "Pole" above.

#### 1.4 SUBMITTALS

- A. Product Data: For each luminaire, and support component, arranged in order of lighting unit designation. Include data on features, accessories, finishes, and the following:
  - 1. Physical description of luminaire, including materials, dimensions, effective projected area, and verification of indicated parameters.
  - 2. Details of attaching luminaires and accessories.
  - 3. Details of installation and construction.
  - 4. Luminaire materials.
  - 5. Photometric data based on laboratory tests of each luminaire type, complete with indicated LED light source, drivers, and accessories.

- a. For indicated luminaires, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.
- b. Photometric data shall be certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
- 6. Photoelectric relays.
- 7. LED light source, including life, output, and energy-efficiency data.
- 8. Materials, dimensions, and finishes of poles.
- 9. Means of attaching luminaires to supports, and indication that attachment is suitable for components involved.

#### 1.5 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with IEEE C2, "National Electrical Safety Code."
- D. Comply with NFPA 70.

#### 1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace products that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs or alterations from special warranty coverage.
  - 1. Warranty Period for Luminaires: Five years from date of Substantial Completion.
  - 2. Warranty Period for Metal Corrosion: Five years from date of Substantial Completion.
  - 3. Warranty Period for Color Retention: Five years from date of Substantial Completion.
  - 4. Warranty Period for LED: Replace led light source and associated drivers that fail within 12 months from date of Substantial Completion; furnish replacement led light source and drivers that fail within the second 12 months from date of Substantial Completion.

#### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

A. In Lighting Fixture Schedule where titles below are column or row headings that introduce lists, the following requirements apply to product selection:

#### EXTERIOR LIGHTING

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

#### 2.2 LUMINAIRES, GENERAL REQUIREMENTS

- A. Luminaires shall comply with UL 1598 and be listed and labeled for installation in wet locations by an NRTL acceptable to authorities having jurisdiction.
- B. Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.
- C. Metal Parts: Free of burrs and sharp corners and edges.
- D. Sheet Metal Components: Corrosion-resistant aluminum, unless otherwise indicated. Form and support to prevent warping and sagging.
- E. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.
- F. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit access into fixture without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally when accessing fixture and when secured in operating position. Doors shall be removable for cleaning or replacing lenses.
- G. Exposed Hardware Material: Stainless steel.
- H. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
- I. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:
  - 1. White Surfaces: 85 percent.
  - 2. Specular Surfaces: 83 percent.
  - 3. Diffusing Specular Surfaces: 75 percent.
- J. Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.
- K. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.
- L. Factory-Applied Finish for Steel Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
  - 1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if

present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."

- 2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.
  - a. Color: As selected from manufacturer's standard catalog of colors.
  - b. Color: Match Architect's sample of [manufacturer's standard] [custom] color.
  - c. Color: As selected by Architect from manufacturer's full range.
- M. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
  - 1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
  - 2. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20; and seal aluminum surfaces with clear, hard-coat wax.
  - 3. Class I, Clear Anodic Finish: AA-M32C22A41 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.
  - 4. Class I, Color Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA 611.
    - a. Color: Dark bronze or as noted on drawings (drawings take presidence).

#### 2.3 LED LIGHT SOURCE

A. LED light source as noted in the fixture schedule.

#### PART 3 - EXECUTION

- 3.1 LUMINAIRE INSTALLATION
  - A. LED light source to be installed in each luminaire.
  - B. Fasten luminaire to indicated structural supports.
    - 1. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.

#### 3.2 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: Comply with Division 26 Section "Raceway and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch- (0.254-mm-) thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

#### 3.3 FIELD QUALITY CONTROL

- A. Inspect each installed fixture for damage. Replace damaged fixtures and components.
- B. Illumination Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source.
  - 1. Verify operation of photoelectric controls.

END OF SECTION 265600

### SECTION 311000 - SITE CLEARING

### 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.** Protection of improvements indicated to remain.
  - 2. Removal of grass turf and other vegetation.
- 1.3. PROJECT CONDITIONS
- A. Traffic: Conduct site-clearing operations to ensure minimum interference with driveways, roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct roads, streets, walks, or other occupied or used facilities without permission from authorities having jurisdiction.
- B. Protection of Existing Improvements: Provide protections necessary to prevent damage to existing improvements indicated to remain in place, if any.
  - 1. Protect improvements on adjoining properties and on Owner's property.
  - 2. Restore damaged improvements to their original condition, as acceptable to property owners.

#### 1.4. EXISTING SERVICES

- A. General: Indicated locations are approximate; determine exact locations before commencing Work.
- B. Place markers to indicate location of disconnected services. Identify service lines and capping locations on Project Record Documents.

### PART 2 - PRODUCTS (Not Applicable.)

### PART 3 - EXECUTION

### 3.1. SITE CLEARING

- A. Remove any existing site features indicated on Drawings and as described below.
- B. Remove all grass turf and other vegetation as required for construction activities.
   Removal includes all organic material to whatever depth encountered.
- C. Surface Soil Removal and Stockpiling: Remove surface soil, material as follows.
  - 1. At building and at locations to receive new concrete paving, remove surface soil to a depth of no less than 8", and stockpile clean surface soil and Sandy Silt material as needed for re-use as topsoil.
  - 2. At areas to be landscaped, remove a minimum of 4" of surface soil and stockpile clean surface soil and Sandy Silt material as needed for re-use as topsoil.
  - 3. Stockpile clean surface soil to be re-used as topsoil in storage piles in areas convenient for re-use. Construct storage piles in heights not to exceed five feet and to provide free drainage of surface water. Cover storage piles to minimize dust and prevent wind erosion until screening and placement as topsoil.
  - 4. Dispose of unsuitable or excess surface soil as specified for disposal of waste material.
- 3.2. DISPOSAL OF WASTE MATERIALS
- A. Burning on Owner's Property: Burning is not permitted on Owner's property.
- B. Removal from Owner's Property: Remove all organic material, waste materials, and unsuitable topsoil from Owner's property.

END OF SECTION 311000

#### SECTION 312300 - EARTHWORK

#### PART 1 - GENERAL

#### 1.1. RELATED DOCUMENTS

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

#### 1.2. SUMMARY

- A. This Section includes excavation, backfill, and fill for the following:
  - 1. General grading and preparing of subgrade for foundations, slabs, and paving.
  - 2. Removal and stockpiling and/or off-site disposal of existing on-site soils materials not suitable for general fill or topsoil.
  - 3. General on-site grading, cutting, and filling.
  - 4. Excavation for foundations and slabs and subsequent backfilling.
  - 5. Structural fill under paving, under slabs, and under building footings.
  - 6. Drainage fill course for support of building slabs.
  - 7. Paving base course for support of concrete flatwork.
  - 8. Excavating and backfilling of trenches.
  - 9. Excavating and backfilling for underground mechanical and electrical utilities and buried mechanical and electrical appurtenances.
  - 10. Hydronic Heated Exterior Slabs 'Snow melt system'
- B. See Site plans & Civil Sheet for specific site requirements.

#### 1.3. DEFINITIONS

- A. Excavation consists of removal of material encountered to subgrade elevations indicated and subsequent disposal or stockpiling of materials removed.
- B. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of the Architect. Unauthorized excavation, as well as remedial work directed by the Architect shall be at Contractor's expense.
  - 1. Under footings, foundation bases, or other structures, fill unauthorized excavation by extending indicated bottom elevation of footing or base to excavation bottom, without altering required top elevation. Compacted imported structural fill shall be used to bring elevations to proper position.

Softening of bottoms of footing trenches by teeth on backhoe bucket shall be considered unauthorized excavation. Final excavation at bottom of footing trenches shall be done in a manner to leave smooth, undisturbed native material at bottom of trench.

- 2. In locations other than those above, backfill and compact unauthorized excavations as specified for authorized excavations of same classification.
- C. Additional Excavation: When excavation has reached required subgrade elevations, notify the Architect who will make an inspection of conditions. If the Architect determines that bearing materials at required subgrade elevations are unsuitable, continue excavation until suitable bearing materials are encountered and replace excavated material as directed by the Architect. The Contract Sum shall be adjusted by an appropriate modification.
- D. Subgrade: The undisturbed earth or the compacted soil layer immediately below structural fill, drain rock fill, general fill, drainage fill, paving base course, or topsoil materials.
- E. Structure: Buildings, foundations, slabs, pavements, tanks, curbs, or other man-made stationary features occurring above or below ground surface.

### 1.4. QUALITY ASSURANCE

- A. Codes and Standards: Perform excavation work in compliance with applicable requirements of authorities having jurisdiction.
- B. Testing and Inspection Service: The Owner will employ and pay for a qualified independent geotechnical testing laboratory, hereinafter referred to as the Testing Agency, to perform soil compaction testing and inspection service during earthwork operations.

1. The Contractor shall notify the Testing Agency at least 24 hours in advance of each required test. Every soils lift may be tested (at the Owner's discretion). Do not proceed with additional fill work until compaction tests have been completed on the previous lift and accepted.

### 1.5. PROJECT CONDITIONS

A. Site Information: The Owner has removed portions of existing grass and other vegetation. The Contractor shall inspect the existing condition of the site and submit any questions related to the site in conformance with the Project Documents prior to bid.

- B. Existing Utilities: Locate existing underground utilities in areas of excavation work. If utilities are indicated to remain in place, provide adequate means of support and protection during earthwork operations.
  - 1. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.
  - 2. Do not interrupt existing utilities serving facilities occupied by Owner or others, during occupied hours, except when permitted in writing by Owner and then only after acceptable temporary utility services have been provided.
    - a. Provide minimum of 48-hour notice to Owner and receive written notice to proceed before interrupting any utility.
  - 3. Demolish and completely remove from site existing underground utilities specifically indicated to be removed. Coordinate with utility companies for shutoff of services if lines are active.
- C. Use of Explosives: Explosives shall not be used.
- D. Protection of Persons and Property: Barricade open excavations occurring as part of this work and post with warning lights.
- E. Cemented Soils: Excavation of existing cemented soils shall be considered as normal excavation. Such soils shall be excavated as required at no additional cost to the Owner.

### PART 2 - PRODUCTS

### 2.1. SOIL MATERIALS

- A. Existing On-Site Subsoil Materials: Existing on-site sub-soil materials may be used for general fill on site with the following limitations. Such materials shall <u>not</u> be used as fill under or within 5 feet of building or any structure. Such material shall also <u>not</u> be used as fill under areas of concrete paving. Such materials shall only be used as backfill for trenches <u>not</u> located under building or paved areas. On-site sub-soil fill materials shall be free from debris, large stones, etc.
- B. General Imported Fill: General imported fill shall consist of non-plastic soils materials from an approved source, free from debris, organic materials, contaminants, stones larger than 4" in maximum dimension, and other undesirable features. Such materials may be used for general fill on site but shall <u>not</u> be used under the building or where

pavements or slabs are to be constructed. Such materials may <u>not</u> be used under or within 5 feet of building or under slabs, structures, paving, or any foundations.

C. Imported Structural Fill: Imported Structural Fill shall be used for fill inside building area, for backfill of all utilities trenches under building and paved areas and / or as noted on Drawings, under all interior and exterior footings and structures, and for all fill and backfill within 5 feet of building, including backfill around foundations.

1. Imported Structural Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 per cent passing a 1 ½-inch (38-mm) sieve and not more than 5 percent passing a No. 200 (0.075-mm) sieve, maximum aggregate size 4 inches.

- D. Drainage fill for slabs: Well graded mixture sand/gravel mixture with 100 percent of the material passing a 3/4 inch sieve and with not more than 7 percent of the material passing a No. 200 sieve. Fines shall be non-plastic.
- F. Topsoil: Topsoil surface soil material from on-site excavation shall be stockpiled for Owner's use.
- G. Detectable Warning Tape: Acid-and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick minimum, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried.
  - 1. Tape Colors: Provide tape colors to utilities as follows:
    - a. Red: Electric.
    - b. Yellow: Gas, oil, steam, and dangerous materials.
    - c. Orange: Telephone and other communications.
    - d. Blue: Water systems.
    - e. Green: Sewer systems.

### PART 3 - EXECUTION

- 3.1. EXCAVATION, GENERAL
- A. Unclassified Excavation: Excavation is unclassified and includes excavation to required subgrade elevations regardless of the character of materials and obstructions encountered.

- B. Comply with local codes, ordinances, and requirements of all authorities having jurisdiction over the Work. Maintain stable excavations, properly shored, barricaded, and lighted.
- Excavate to indicated elevations and dimensions within a tolerance of plus or minus
   0.10 foot. Do not disturb bottom of excavations. Trim bottoms to required lines and grades to leave solid base to receive other work.
  - 1. Areas excavated deeper than elevations indicated shall be filled with compacted Imported Structural Fill, or concrete meeting the requirements of Specifications Section 033000 - Cast-In-Place Concrete.

### 3.2. STABILITY OF EXCAVATIONS

- A. General: Comply with local codes, ordinances, and requirements of agencies having jurisdiction.
- B. Slope sides of excavations to comply with local codes, ordinances, and requirements of agencies having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated. Maintain sides and slopes of excavations in safe condition until completion of backfilling.
- C. Shoring and Bracing: Provide materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross braces, in good serviceable condition. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Extend shoring and bracing as excavation progresses.

### 3.3. APPROVAL OF SUBGRADE

- A. Notify the Testing Agency and the Architect when excavations have reached required subgrade.
- B. When Testing Agency or Architect determines that unforeseen unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
- C. Reconstruct subgrades damaged by freezing temperatures, frost, rain, snow, surface water runoff from adjacent areas, accumulated water, or construction activities as directed by the Architect, at Contractor's expense.

### 3.4. DEWATERING

- A. Prevent rain, snow, surface water, construction water, and subsurface or groundwater from flowing into excavations and from flooding project site and surrounding area.
  - 1. Do not allow water from any source to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting of footings, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.
  - 2. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rainwater and water removed from excavations to collecting or runoff areas. Do not use trench excavations as temporary drainage ditches.
- B. Protect subgrades and foundation soils from softening and damage by rain, snow, or water runoff from adjacent areas.

#### 3.5. STORAGE OF EXCAVATED MATERIALS

- A. Stockpile excavated materials acceptable for backfill and fill on site. Place, grade, and shape stockpiles for proper drainage.
  - 1. Locate and retain soil materials well away from edges of excavations.
  - 2. Surface soils stockpiled for use as topsoil shall not be stored in piles exceeding five feet in height.
- B. Dispose of all excess excavated soil material and materials not needed for use as backfill, fill, or topsoil. Dispose of such material off of the Owner's property.

#### 3.6. EXCAVATION FOR STRUCTURES AND SLABS

- A. Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 foot, and extending a sufficient distance from footings and foundations to permit placing and removal of concrete form work, installation of services, other construction and for inspection.
  - 1. Excavations for footings and foundations: Do not disturb bottom of excavations. Excavate by hand where material is loosened by teeth of excavating equipment

and to final grade. Trim bottoms to required lines and grades to leave a solid base to receive other work.

2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Structures: Conform to elevations and dimensions indicated within a tolerance of plus or minus 0.10 foot, plus a sufficient distance to permit placing and removal of concrete form work, installation of services, and other construction, and for inspection. Do not disturb bottom of excavations intended for bearing surface.

### 3.7. TRENCH EXCAVATION FOR PIPES AND CONDUIT

- A. Excavate trenches to uniform width, sufficiently wide to provide ample working room and a minimum of 6 to 9 inches of clearance on both sides of pipe or conduit.
- B. Excavate trenches to depth indicated or required to establish indicated slope and invert elevations and to support bottom of pipe or conduit on undisturbed soil. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
  - All piping and conduit below grade and below building slabs and pavings which is contained in compacted imported structural fill, shall be bedded and covered in 6" minimum sand at bottom, both sides, and over top of piping and conduit.
  - 2. At each pipe joint, dig bell holes to relieve pipe bell of loads and to ensure continuous bearing of pipe barrel on bearing surface.

### 3.8. BACKFILL AND FILL

- A. General: Place soil material in layers to required subgrade elevations, for each area classification listed below, using materials specified in Part 2 of this Section.
  - 1. More than 5' outside building lines, use satisfactory on-site or general imported fill material except where pavements or slabs are to be constructed.
  - 2. Under exterior slabs and pavements, use Imported Structural Fill as required and Paving Base course materials with minimum structural section thicknesses specified.
  - 3. Under building slabs, footings, foundations, and under and around structures and foundations, and within 5 feet of building, use Imported Structural Fill, with Drainage Fill course under slabs. Do not use existing on-site subsoil materials under building slabs, footings, and foundations, under concrete or asphalt paving, or within 5 feet of building.

- 4. Under and for backfill over piping and conduit under paved areas and/or as noted on Drawings, use Imported Structural Fill. Bed all piping and conduit in sand, 6 inches below, to sides, and above piping or conduit.
- 5. Provide 4-inch-thick concrete base slab support for piping or conduit less than 2'-6" below surface of roadways. After installation and testing of piping or conduit, provide minimum 4-inch-thick encasement (sides and top) of concrete prior to backfilling or placement of roadway subbase.
- 6. The Contractor shall not "waste" materials into areas to receive backfill or fill, nor shall the Contractor use fill materials of a given type in an area intended to receive fill materials of another type. (Example: Do not use drain rock in general fill areas). The Contractor shall not dump excess concrete materials in an area to receive backfill or fill.
- 7. Do not mix existing on-site subsoil materials with Imported Structural Fill.
- B. Backfill excavations as promptly as work permits, but not until completion of the following:
  - 1. Acceptance of construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.
  - 2. Do not backfill trenches until tests and inspections have been made and backfilling is authorized by the Architect. Use care in backfilling to avoid damage or displacement of pipe systems.
  - 3. Inspection, testing, approval, and recording locations of underground utilities have been performed and recorded.
  - 4. Removal of concrete formwork.
  - 5. Removal of shoring and bracing, and backfilling of voids with satisfactory materials.
  - 6. Removal of trash and debris from excavation.
  - 7. Permanent or temporary horizontal bracing is in place on horizontally supported walls.

### 3.9. PROOF ROLLING, PLACEMENT, AND COMPACTION

- Ground Surface Preparation: Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills.
   Plow strip, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond with existing surface.
- B. Place backfill and fill materials in layers not more than 8 inches in loose depth for native material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers. Imported structural fill may be placed in layers up to 12 inches loose depth.

- C. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
- D. Place backfill and fill materials evenly adjacent to structures, piping, or conduit to required elevations. Prevent wedging action of backfill against structures or displacement of piping or conduit by carrying material uniformly around structure, piping, or conduit to approximately same elevation in each lift.
- E. Control soil and fill compaction, providing minimum percentage of density specified for each area classification indicated below. Correct improperly compacted areas or lifts immediately if soil density tests indicate inadequate compaction.
- F. Proof roll subgrade at areas to receive concrete paving, walks, and building slabs using a loaded ten-wheel dump truck or equivalent. Demonstrate absence of soft spots and / or pumping of soils by such proof rolling prior to placement of structural and/or drainage fill or paving base.
- G. Compact fill materials to not less than the following:
  - Geotechnical engineer shall visually inspect exposed surface (native material) of excavated areas under interior and exterior slabs, paving and footings. Testing of excavated areas shall only be required as determined necessary and directed by geotechnical engineer.
  - 2. Compact each layer of Imported Structural Fill material at building to not less than 95% of maximum density per ASTM D-698 and at paved areas outside building to not less than 95% of maximum dry density per ASTM D-698.
  - 3. Compact each layer of Drainage Fill Course within building to not less than 95% of maximum density per ASTM D-698 and Paving Base Course to 95% of maximum dry density per ASTM D-698.
  - 4. Compact each layer of existing on-site soils materials used for general or structural fill to not less than 95% of maximum density per ASTM D-698.
- H. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade or layer of soil material. Apply water in minimum quantity as necessary to prevent free water from appearing on surface during or subsequent to compaction operations.
  - 1. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.

- 2. Stockpile or spread soil material that has been removed because it is too wet to permit compaction. Assist drying by discing, harrowing, or pulverizing until moisture content is reduced to a satisfactory value.
- I. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

### 3.10. GRADING

- A. General: Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are indicated, or between such points and existing grades.
- B. Grading Outside Building Lines: Grade areas adjacent to building lines to drain away from structures and to prevent ponding. Finish surfaces free from irregular surface changes and as follows:
  - 1. Unpaved Areas: Finish areas to within not more than 0.05 foot above or below required subgrade elevations.
  - 2. Walks: Shape surface of areas under slabs to line, grade and cross-section, with finish surface not more than 0.05 foot above or below required elevation.
  - 3. Pavements: Shape surface of areas under pavement to line, grade, and cross-section, with finish surface not more than 0.05 foot above or below required subgrade elevation.
  - 4. Topsoil Areas: Place, rough grade, and lightly compact topsoil in lawns, playground, and all planted areas. Grade to tolerances as per Paragraph 3.11.B.1 above.
- C. Grading Surface of Fill Under Building Slabs: Grade smooth and even, free of voids, compacted as specified, and to required elevation, with finish surface not more than 0.05 foot above or below required subgrade elevation at any point. Surface grading shall provide for a slab with at least the average of the thickness indicated for the slab.
- D. Compaction: After grading, compact subgrade surfaces to the depth and indicated percentage of maximum or relative density for each area classification.

### 3.11. PAVING BASE COURSE

#### EARTHWORK

- A. General: Base course consists of placement of drainage fill material, in layers of indicated thickness, over subgrade surface to support pavements.
- B. Placing: Place base material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting material during placement operations.
  - 1. When a compacted base course is indicated to be 8 inches thick or less, place material in a single layer. When indicated to be more than 8 inches thick, place material in equal layers, except no single layer shall be more than 6 inches nor less than 4 inches in thickness when compacted.
- C. Compaction: Compact base course as per requirements of Paragraph 3.10.

#### 3.12. CONCRETE SLAB DRAINAGE FILL COURSE

- A. General: Drainage Fill course consists of placement of drainage fill material, in layers of indicated thickness, over subgrade surface to support concrete slabs and pavements.
- B. Placing: Place drainage fill material on prepared subgrade in layers of uniform thickness, conforming to indicate cross-sections and thicknesses. Maintain optimum moisture content for compacting material during placement operations.
  - 1. When a compacted drainage course is indicated to be 8 inches thick or less, place material in a single layer. When indicated to be more than 8 inches thick, place material in equal layers, except no single layer shall be more than 6 inches nor less than 4 inches in thickness when compacted
- C. Compaction: Compact slab Drainage Fill course as per requirements of Paragraph 3.10. for compacted imported structural fill.

#### 3.13. FIELD QUALITY CONTROL

- A. Quality Control Testing During Construction: The Testing Agency service shall inspect and approve excavations and each and every subgrade and fill layer before further backfill or construction work is performed. Costs for such testing will be paid directly to the Testing Agency by the Owner.
- 3.14. EROSION CONTROL
- A. Provide erosion control methods in accordance with requirements of authorities having jurisdiction.

#### 3.15. MAINTENANCE

- A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades in settled, eroded, and rutted areas to specified tolerances.
- C. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.
- D. Settling: Where settling is measurable or observable at filled areas during the general project warranty period, remove structure or surfacing, add backfill material, compact, and replace structure or surfacing. Restore appearance, quality, and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.
- 3.16. DISPOSAL OF EXCESS AND WASTE MATERIALS
- A. Removal from Owner's Property: Remove excess soils materials, including unacceptable excavated material, trash, and debris, and dispose of it off Owner's property at the Contractor's expense.

### 3.17. EARTHWORK REQUIREMENTS SCHEDULE

A. Excavation and fill for specific areas of the Work shall conform to the requirements of the Geotechnical Investigation and Seismic Hazard Survey Report attached as per an Exhibit of this project manual.

END OF SECTION 312300

EXHIBIT 1 - Page 1 of 51



# Geotechnical Investigation and Seismic Hazard Study

Alsea School District 7J Building Renovations & Additions

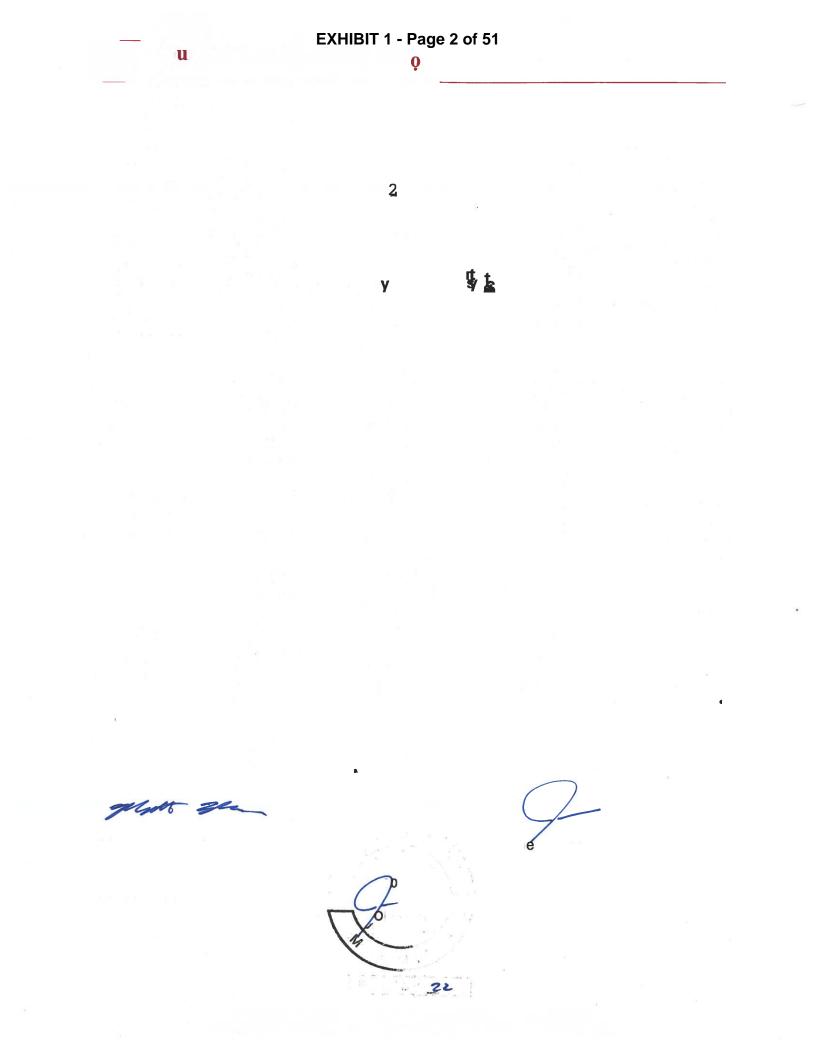
Alsea, Oregon

**Prepared for:** 

Straightline Architects Boise, Idaho

May 6, 2021

Professional Geotechnical Services Foundation Engineering, Inc.



# GEOTECHNICAL INVESTIGATION AND SEISMIC HAZARD STUDY ALSEA SCHOOL DISTRICT BUILDING RENOVATIONS & ADDITIONS ALSEA, OREGON

### BACKGROUND

The Alsea School District 7J (School District) is planning improvements to its school located at 301 S 3rd Street in Alsea, Oregon. The site location is shown in Figure 1A (Appendix A). The improvements include several building additions and a new shop building. The building additions include space for new classrooms, a community center, a new bus shelter, a new building entry, and a new hallway. New pavements will be limited to the area south of the new hallway. New hardscape areas and sidewalks are planned north of the school. A site layout and proposed improvements are shown in Figure 2A (Appendix A).

The Alsea School District is the owner and Straightline Architects (Straightline) is the project architect. Foundation Engineering, Inc. was retained by Straightline as the geotechnical consultant. Our scope of work was outlined in a proposal dated February 17, 2021, and authorized by a signed service agreement dated February 22, 2021.

### LOCAL GEOLOGY

Detailed discussions of the local and regional geology, tectonic setting, local faulting, historical seismicity, seismic hazards, and design earthquakes are included in the Site-Specific Seismic Hazard Study report (Appendix D). References cited in this section are found in Appendix D. An abbreviated discussion of the local geology is provided below.

Alsea is located within the central Coast Range, which is a north-south-trending low-lying range separating the Pacific Coast to the west from the Willamette Valley to the east. The site is within the Alsea River Valley and is located on a broad, flat terrace along the north bank of the North Fork of the Alsea River. Local geologic mapping indicates that alluvium associated with the North Fork of the Alsea River underlies the site (Baldwin, 1955; Walker and Duncan, 1989). The alluvium typically consists of silt, sand, and gravel. Middle Eocene Tyee Formation ( $\pm$ 49 to 41 million years old) is the dominant rock type underlying the alluvium. The Tyee Formation also underlies most of the hills surrounding Alsea (Baldwin, 1955; Schlicker et al., 1973; Bela, 1979; Walker and Duncan, 1989).

The soil profile encountered in the explorations consists of minor fill over alluvium followed by residual soil (i.e., bedrock decomposed to the consistency of soil) and silty sandstone with siltstone interbeds. The subsurface conditions encountered in our explorations are consistent with the mapped local geology. Based on the local geologic mapping, the bedrock is considered to be Tyee Formation. Details are

1.

provided in the Subsurface Conditions section below and on the exploration logs (Appendix B).

### FIELD EXPLORATION

The field exploration program consisted of one boring (BH-1) and four test pits (TP-1 through TP-4) as described below. The approximate exploration locations are shown in Figure 2A. The exploration locations were selected in consultation with Straightline and were located near planned improvements. Subsequent to our fieldwork, the proposed structures near TP-2 and TP-3 were deleted and new building additions were added near the west end of the existing school.

### Boring

BH-1 was drilled at the site on March 8, 2021, using a CME-75, truck-mounted drill rig utilizing mud-rotary drilling and HQ wireline coring methods. The boring was sited within the footprint of the new shop building. The purpose of the boring was to establish the deeper subsurface profile for the overall site and to help determine the seismic Site Class for the project.

The boring advanced to a maximum drilling depth of  $\pm 30$  feet. Samples were obtained at 2.5-foot intervals to  $\pm 20$  feet. Disturbed samples were obtained using a split-spoon sampler in conjunction with the Standard Penetration Test (SPT). The SPT indicates the relative stiffness or density of the foundation soils. A relatively undisturbed sample was obtained from  $\pm 5$  to 7 feet by pushing a thin-walled Shelby tube. HQ-sized, wireline coring was completed below  $\pm 20$  feet to obtain rock core samples.

The borehole was continually logged during drilling. The final log (Appendix B) was prepared based on a review of the field logs, the laboratory test results, and an examination of the soil and rock samples in our office.

# Test Pits

TP-1 through TP-4 were dug at the site on March 8, 2021, using a mini excavator. The test pits extended to depths of  $\pm 5$  to 6 feet. In each test pit, the soil profile was logged, and disturbed samples were obtained for possible laboratory testing. Groundwater infiltration was noted where present. A field vane shear device was used to estimate the undrained shear strength of the fine-grained soils exposed on the test pit sidewalls. Upon completion of the explorations, the test pits were backfilled with the excavated materials.

The test pit logs are provided in Appendix B. The final logs were prepared based on a review of the field logs, an examination of the soil samples in our office, and the laboratory test results.

### **DISCUSSION OF SITE CONDITIONS**

### Site Topography and Surface Conditions

The new structures are located on the school campus. A topographic site plan prepared by Cole Surveying, LLC indicates the ground surface elevation surrounding the school ranges from  $\pm$  El. 292 in the south to  $\pm$  El. 297 in the north. South of the school, the site slopes down to  $\pm$  El. 286 along the north end of the track.

The area north of the school is a grass-covered playfield with scattered trees lining the eastern edge of the field. Elsewhere, the site is covered by Portland cement concrete and asphaltic concrete (i.e., sidewalks and parking areas). Unpaved areas consist of maintained landscaped areas with lawns and scattered trees.

### Subsurface Conditions

A general discussion of the materials encountered in the explorations is presented below. The description of the upper  $\pm 6$  feet of the soil profile represents an average of the conditions in all the explorations. The deeper soil profile is based on BH-1. Detailed descriptions of the subsurface conditions encountered in each exploration are summarized on the exploration logs (Appendix B). Ground surface elevations shown on the exploration logs were estimated from a topographic site plan provided by Cole Surveying, LLC.

**Fill/Topsoil**. Fill or topsoil was encountered at the ground surface of all the explorations extending to depths ranging from  $\pm 1$  to 3 feet. This layer is variable and includes medium to high plasticity clayey silt, low to medium plasticity silt, and silty gravel. Scattered organics were typically present within  $\pm 6$  inches of the ground surface. Trace sand and gravel with scattered debris (i.e., glass, pottery, and clay pipe fragments) were present in TP-4. The consistency of fine-grained soil ranged from medium stiff to stiff and the coarse-grained soil was medium dense at the time of the investigation.

A  $\pm$  1.5-foot thick layer of granular fill was encountered at the surface of TP-2. The granular fill consists of dense,  $\pm$  1½-inch minus crushed rock.

**Fine-Grained Soil (alluvium)**. The topsoil or fill is underlain by fine-grained alluvium to  $\pm 4.5$  to 8 feet. TP-1, TP-2, and TP-4 terminated in the fine-grained soil at depths of  $\pm 5$  to 6 feet ( $\pm$ El. 287.5 to  $\pm$ El. 289.0). The fine-grained alluvium includes medium to high plasticity clayey silt, medium plasticity silt with some clay, and low plasticity silt. The fine-grained alluvium was generally stiff and moist at the time of the investigation.

<u>Silty Gravel (alluvium)</u>. In TP-3, the fine-grained alluvium is underlain by dense silty gravel from  $\pm 4.5$  feet to  $\pm 6$  feet, the limits of exploration. The fine-grained alluvium is also underlain by dense silty gravel with some sand from  $\pm 8$  to 16.5 feet ( $\pm$ EI. 289.0 to EI. 280.5).

<u>**Residual Soil.**</u> In BH-1, the silty gravel is underlain by residual soil consisting of very stiff, low plasticity silt with trace to some sand from  $\pm 16.5$  to 18 feet ( $\pm$ EI. 280.5 to  $\pm$ EI. 279.0). The residual soil represents bedrock that has weathered in place to the consistency of soil.

<u>Silty Sandstone (Tyee Formation)</u>. Silty sandstone of the Tyee Formation was encountered below the residual soil in BH-1 from  $\pm 18$  to 30 feet ( $\pm EI$ . 280.5 to  $\pm EI$ . 267.0), the limits of the exploration. The sandstone is highly weathered and extremely weak (R0) to very weak (R1) from  $\pm 18$  to 20 feet, and slightly weathered to fresh and weak (R2) with siltstone interbeds from  $\pm 20$  to 30 feet.

Two core runs were completed in the bedrock. The percent recovery was  $\pm 92\%$  and the Rock Quality Designation (RQD) values ranged from  $\pm 82$  to 88%. Photos of the rock core are provided in Appendix B.

### Groundwater

The use of mud-rotary drilling methods precluded the measurement of groundwater levels in the boring at the time of drilling. Slow seepage was observed in TP-1 at a depth of  $\pm$ 1-foot and in TP-2 at a depth of  $\pm$ 3 feet. No seepage or groundwater was encountered in TP-3 and TP-4. The seepage observed at shallow depths in the test pits likely represents water from seasonal rainfall that perches on the low permeability fine-grained soils.

The static groundwater elevation at the site is expected to closely follow the elevation of the Alsea River located  $\pm 400$  feet south of the school. Based on topographic information at school and at the riverbank to the south, we anticipate the static groundwater depth at the school will seasonally range from  $\pm 10$  to 15 feet. As a result, groundwater is not expected to be a significant geotechnical concern for shallow foundation excavations completed during dry weather.

# LABORATORY AND FIELD TESTING

# Laboratory Testing

The laboratory testing included moisture contents, percent fines, and Atterberg limits tests to help classify the soils and estimate their overall engineering properties. The results of these tests are summarized in Table 1C (Appendix C). The moisture contents are also shown on the boring log.

Atterberg limits tests were completed on fine-grained soil samples obtained within  $\pm 5.5$  feet of the ground surface. The test results indicate liquid limits (LL) ranging from 47 to 77 and plasticity indices (PI) ranging from 17 to 38. These limits correspond to Unified Soil Classification System (USCS) classifications ML and MH.

Field vane shear tests were performed on the test pit sidewalls near the anticipated foundation levels and on the Shelby tube sample from BH-1 (SH-1-2) to estimate the undrained shear strength of the fine-grained soils. Recorded shear strength values

ranged from  $\pm 0.4$  to greater than 1 tons/ft<sup>2</sup> (tsf). The recorded strength values and test depths are shown on the test pit logs.

# Infiltration Testing

Two infiltration tests were completed in conjunction with the exploratory test pits between March 8 and 9, 2021. The approximate locations are shown as P-1 and P-2 in Figure 2A and were selected in consultation with Straightline. P-1 was located next to TP-1 and P-2 was located next to TP-4. The tests were performed at a depth of  $\pm 3$  feet. The soil at the test depth consisted of medium plasticity clayey silt at P-1 and medium plasticity silt with some clay at P-2.

The infiltration test was performed using the Encased Falling Head Infiltration Test procedure outlined in Appendix D of the City of Corvallis Stormwater Design Standards (2015). At the test location, we excavated to the test depth, then installed a 6-inch diameter casing  $\pm 6$  inches into the soil. The pipe casing was filled with more than 12 inches of water (measured vertically) and the water level was maintained for at least 4 hours to presoak the soil. The infiltration rate was measured the following day after the soil had been allowed to saturate overnight. The infiltration rate was measured by pouring water into the casing to provide  $\pm 6$  inches of head and then monitoring the drop in the water level for 2 hours. This step was repeated one additional time for each of the locations because we obtained consistent readings.

No observable infiltration rate was recorded in P-1 during testing. A relatively slow infiltration rate of  $\pm 0.19$  inch/hour was recorded in P-2. The raw test data is provided in Appendix C. The very slow rate or absence of any measurable infiltration is typical for the fine-grained alluvium encountered at the site.

The deeper alluvial gravel stratum will have significantly higher permeability. But the depth to gravel was  $\pm 8$  feet in BH-1 and  $\pm 4.5$  feet in TP-3.

# SEISMIC ANALYSIS AND EVALUATION

# Seismic-Geologic Site Hazards

In accordance with OSSC Section 1803.6.1, we reviewed potential seismic and geologic site hazards including fault rupture, liquefaction, lateral spread, seismically-induced settlement, landslides, and flooding or inundation. The evaluation of local seismic hazards is provided in the Seismic Hazard Study Report (Appendix D). The findings of the study indicate there are no seismic hazards that would preclude site development or require mitigation.

# Site Response Spectrum

A site response spectrum was developed for the site in accordance with Section 1613 of the OSSC 2019, which is based on IBC 2018 and ASCE 7-16. The risk-targeted maximum considered earthquake (MCE<sub>R</sub>) ground motions were obtained

from modified USGS 2014 maps with a 2% probability of exceedance in 50 years (i.e., a  $\pm 2,475$ -year return period). The modifications include factors to adjust the spectral accelerations to account for directivity and risk.

The subsurface profile at the site predominantly consists of stiff fine-grained alluvium, dense coarse-grained alluvium, and relatively shallow bedrock. Therefore, we have concluded an OSSC Site Class C (very dense soil/soft rock) is appropriate for the design. The seismic design parameters and response spectrum are shown in Figure 3A (Appendix A).

# Liquefaction Hazard

Liquefaction is typically observed in saturated deposits of loose sand and non-plastic or low plasticity silt subjected to intense ground shaking. The deeper subsurface profile encountered in BH-1 consists of stiff, medium to high plasticity clayey silt to  $\pm 8$  feet, dense silty gravel with some sand to  $\pm 16.5$  feet, a thin layer of residual soil, and bedrock (at  $\pm 18$  feet). The soils overlying the bedrock are not considered liquefiable due to the plasticity and stiffness of the fine-grained soil and the density of the coarse-grained soil. Therefore, there is no liquefaction hazard at the site.

# DISCUSSION OF GEOTECHNICAL CONSIDERATIONS

The explorations encountered potentially expansive soil and moisture-sensitive soil near the ground surface. The following provides a discussion of the site soils as it relates to foundation design and construction. Additional details are provided in the Recommendations section of this report.

### Seasonal Issues/Construction Timing

We understand the site grading for the new shop building will begin in Summer 2021 while construction for the other structures will start in Fall 2021 or later. Appropriate earthwork methods will depend on the construction schedule. That is, site grading requirements will vary if the building pad and floor slab are completed during dry weather (typically mid-June to mid-October) or if the building pad is exposed to wet weather (typically after mid-October). Therefore, both wet and dry weather construction recommendations are provided herein.

The fine-grained soil underlying the site will be moisture-sensitive and will soften considerably when subjected to construction traffic during wet weather. Thickened building pads and base rock sections are required to support construction traffic during wet weather to mitigate the risk of severe rutting and subgrade pumping. A minimum of 24 inches of granular fill underlain by a separation geotextile is recommended during wet weather to protect the subgrade from disturbance due to construction traffic in the building and under construction staging areas.

### **Anticipated Foundation Conditions**

The explorations encountered a general subsurface profile that includes a thin layer of variable fill/topsoil underlain by relatively stiff/dense soils followed by bedrock. Based on these conditions, we have concluded conventional spread and continuous footings will be suitable to support the new buildings with the following site preparation.

**Existing Site Fill/Topsoil**. The explorations encountered a layer of variable fill/topsoil to a depth of  $\pm 1$  to 3 feet. This material is loosely structured and is not adequate to support the proposed buildings and additions. Therefore, this material should be removed from the foundation areas during site grading.

**Expansive Soil**. Medium to high plasticity clayey clay was encountered beneath the variable fill/topsoil in TP-1 and BH-1, located in the playfield north of the school. This material extends to a depth of  $\pm 6$  to 8 feet. Atterberg limits testing indicates the plasticity index (PI) of the soils ranges from 27 to 38, which is near the transition between medium and high plasticity soils. Based on the Atterberg limits test results, we anticipate this soil will have moderate potential to shrink and swell with seasonal changes in moisture content. Shrinkage and swelling can cause differential displacement or cracking in foundations and other deformation-sensitive structures if not properly mitigated.

Full mitigation of the presence of the expansive soil would require completely removing all the clayey silt beneath the foundations and replacing it with non-expansive material (e.g., Select Fill as defined in the Recommendations section). Considering the depth of the clayey silt, we assume full mitigation would be cost-prohibitive. Partial mitigation typically includes providing a minimum cover of 24 inches of non-expansive material between the expansive soil and the structural foundations and slab to provide a more rigid base and limit the expansive soil to a depth where seasonal fluctuations in moisture content are less severe. This approach should reduce (but not eliminate) seasonal shrinkage and swelling of the expansive soil. The construction recommendations provided in this report assume this partial mitigation approach will be used.

### ENGINEERING ANALYSIS

# **Bearing Capacity**

We estimated the bearing capacity of square column footings and continuous wall footings placed a minimum of 18 inches below the ground surface on a minimum of 6 inches of Select Fill. Based on the field explorations, we anticipate the foundation soils under the new footings will consist of predominantly stiff fine-grained alluvium.

Field vane measurements on the foundation soils indicate undrained shear strengths ranging from  $\pm 0.4$  to greater than 1 tsf. We assumed a value of 0.6 tsf for design to account for the variability in the soil conditions. Our calculations suggest an allowable bearing pressure of 2,500 lb/ft<sup>2</sup> (psf) for the foundation soil, assuming a

typical factor of safety of 3. A one-third increase in the allowable bearing pressure may be used for the evaluation of short-term seismic and wind loads.

# Settlement

For the design bearing pressure, we estimate total foundation settlement will be  $\frac{1}{2}$  inch or less provided the site is prepared as recommended herein. Differential settlement between adjacent footings may be assumed to be approximately half the total settlement (i.e.,  $\frac{1}{4}$  inch).

# Sliding Coefficient and Passive Resistance for Footings

For sliding analysis, we recommend assuming a coefficient of friction of 0.5 between the base of the footings and the Select Fill.

Passive resistance of the soil in front of the footings was calculated as an equivalent fluid density equal to  $\gamma_m * K_p$ , where  $\gamma_m$  is the moist unit weight of the soil and  $K_p$  is the passive earth pressure coefficient. We anticipate the footings will be backfilled with compacted Select Fill surrounded by native, fine-grained soil or existing granular fill. For these conditions, we calculated the passive pressure on the footings assuming a  $\phi$  of 30 degrees and a  $\gamma_m$  of 120 pcf. The calculations indicate the ultimate passive resistance may be modeled using an equivalent fluid density of  $\pm 360$  pcf.

The passive resistance may be combined with the sliding resistance at the base of the footings to evaluate the overall lateral resistance. However, the sliding and ultimate passive resistances will develop with different displacements. The sliding resistance will develop very small transitional movement. Development of the full passive resistance on the footings may require  $\pm 1$  inch of lateral movement. Assuming a modest displacement of up to  $\frac{1}{2}$  inch, the footings may be evaluated using the full sliding resistance combined with one-half of the passive resistance. Therefore, a coefficient of friction of 0.5 and an allowable passive resistance of  $\pm 180$  pcf are recommended for design.

# Slab-on-Grade Design

The reinforced concrete slab-on-grade will be supported on a minimum of 12 inches of compacted Select Fill underlain by stiff subgrade. Based on these conditions, we recommend using a modulus of subgrade reaction of 200 lbs/in<sup>3</sup> (pci) for design.

# Daylight Basement Wall

A daylight basement is planned for the new classroom addition located north of the track. An at-rest ( $k_0$ ) lateral earth pressure coefficient of 0.44 was used to estimate an equivalent fluid density for design of the restrained basement wall. Our calculations are based on the walls being backfilled with compacted Select Fill having a total unit weight ( $\gamma$ ) of 125 pcf and a friction angle ( $\phi$ ) of 34 degrees. Drained conditions were used assuming a wall drain will be provided. Based on these

conditions, an equivalent fluid density of 55 pcf is recommended for basement wall design. This value is also applicable for seismic design (if required) because the resulting seismic earth pressure would be less than 55 pcf for a restrained wall.

### Pavements

New pavements are limited to the area enclosed by the two building wings at the west end of the school. Based on its location, we anticipate vehicle traffic will be limited to an occasional passenger vehicle. No explorations were completed in the vicinity of the pavements. However, based on the conditions encountered in the explorations at the site, we anticipate the pavement subgrade will consist of stiff fine-grained alluvium. Given the anticipated subgrade conditions and limited traffic, we recommend providing a pavement section of 2½ inches of asphaltic concrete (AC) over 12 inches of base rock. If the pavement will be subjected to heavy vehicular traffic, we recommend increasing the AC thickness to 4 inches. We recommend providing a Separation Geotextile beneath the base rock to minimize subgrade intrusion into the base rock.

The minimum pavement section assumes the base rock will be placed on stiff finegrained alluvium. If the earthwork is completed during wet weather or when the subgrade is wet, the base rock thickness should be increased to  $\pm 18$  to 24 inches (to be confirmed during construction).

### RECOMMENDATIONS

### General Earthwork and Material Recommendations

- Select Fill, as defined in this report, should consist of <sup>3</sup>/<sub>4</sub> or 1-inch minus, clean (i.e., less than 5% passing the #200 U.S. Sieve), well-graded crushed gravel or rock. A material gradation sheet should be provided to us for approval prior to delivery to the site.
- Drain Rock as defined in this report should consist of clean, <sup>3</sup>/<sub>4</sub> to 1 <sup>1</sup>/<sub>2</sub> inch, open-graded crushed gravel or rock. Other gradation sizes may be appropriate. A material gradation sheet should be provided to us for approval prior to delivery to the site.
- 3. The Subsurface Drainage Geotextile should be a non-woven geotextile with Mean Average Roll Value (MARV) strength properties meeting the requirements of an AASHTO M 288-17 Class 2 geotextile (Subsurface Drainage Geotextile) with a maximum AOS of 0.3 mm (max average roll value) and a permittivity greater than 0.5 sec<sup>-1</sup>. We should be provided a specification sheet on the selected geotextile for approval prior to delivery to the site.

### EXHIBIT 1 - Page 12 of 51

4. The Separation Geotextile should be a woven geotextile with Mean Average Roll Value (MARV) strength properties meeting the requirements of an AASHTO M 288-17 Class 2 geotextile. The geotextile should have MARV hydraulic properties meeting the requirements of AASHTO M 288-17 with a minimum permittivity of 0.1 sec.<sup>-1</sup> and an Apparent Opening Size (AOS) less than 0.6 mm (max average roll value). We should be provided a specification sheet on the selected geotextile for approval prior to delivery to the site.

The Separation Geotextile should be laid smooth, without wrinkles or folds, in the direction of construction traffic. Overlap adjacent rolls a minimum of 2 feet. Pin fabric overlaps or places the Select Fill in a manner that will not separate the overlap during construction. Seams that have separated will require removal of the Select Fill to establish the required overlap.

5. Compact the Select Fill and Granular Site Fill in loose lifts not exceeding 12 inches. Thinner ( $\pm 6$  to 8-inch) lifts will be required where light or hand-operated equipment is used. Compact the fill and subgrade (during dry weather, if required) to a minimum of 95% relative compaction. The maximum dry density of ASTM D 698 should be used as the standard for estimating relative compaction. Subgrade compaction should not be attempted during wet weather.

Field density tests should be run frequently to confirm adequate compaction of the imported granular fill. Granular fill that contains aggregate too coarse for density testing should be proof-rolled using a loaded  $\pm 10$ -yd<sup>3</sup> dump truck or other approved vehicle or method. The efficient compaction of the section should be evaluated by a representative of Foundation Engineering. Areas of pumping or deflection observed beneath the truck wheels should be reworked or over excavated and replaced with additional compacted Select Fill and proof-rolled again.

- 6. Shoring should be provided in trenches according to OR-OSHA Standards to protect workers from sloughing or caving soils. The stiff, fine-grained soil that underlies the site corresponds to an OSHA Type B soil. This soil may degrade to an OSHA Type C soil when exposed to sustained wet weather or in the presence of groundwater. The deeper, coarse-grained soil corresponds to an OSHA Type C soil. Worker's safety in trenches or excavations is the sole responsibility of the contractor.
- 7. Overexcavate all test pits that extend under buildings. Replace the test pit backfill with compacted Select Fill. The approximate test pit locations are shown in Figure 2A.

### Foundation Design and Construction

We recommend designing the foundations as follows:

- 8. Design the structures using the seismic parameters shown in Figure 3A (Appendix A).
- 9. Design all footings using an allowable bearing pressure of 2,500 psf. This value assumes all footings will be supported on a minimum of 6 inches of Select Fill underlain by stiff, low to medium plasticity fine-grained soil having a minimum undrained shear strength of 0.6 tsf. The minimum soil strength should be confirmed by Foundation Engineering during construction.
- 10. Assume a total settlement of  $\pm \frac{1}{2}$  inch or less if the footings are designed and built as recommended herein. Differential settlement between adjacent footings may be assumed to be approximately half of the estimated total settlement.
- 11. Use of coefficient of friction of 0.5 at the base of the footing for analysis of sliding resistance, assuming all footings bear on a minimum of 6 inches of compacted Select Fill. This coefficient may be used with an allowable passive resistance of 180 pcf, assuming the foundations are backfilled with compacted Select Fill.
- 12. Place the base of all footings at least 18 inches below the finished grade. Provide at least 6 inches of compacted Select Fill under all footings. Where high plasticity clayey silt is encountered, increase the Select Fill thickness to 24 inches. This requirement should be confirmed by Foundation Engineering during construction. The fill should extend at least 6 inches beyond the edges of all footings.
- Use a modulus of subgrade reaction, k<sub>s</sub>, of 200 pci for floor slab design. This value assumes the slabs will be supported on at least 12 inches of compacted Select Fill over stiff fine-grained alluvium. Reinforce all floor slabs to reduce the risk of cracking and warping.
- 14. Provide a suitable vapor barrier under the floor slab that is compatible with the proposed floor covering (if any) and the method of slab curing.
- 15. Design the daylight basement wall using an equivalent fluid density of 55 pcf. This value assumes the walls will be backfilled with Select Fill compacted using only hand-operated equipment. In addition, we have assumed there will be an appropriate drainage system behind the basement wall to prevent the buildup of hydrostatic pressure.

16. Provide a minimum of 4 inches of compacted Select Fill under all other isolated concrete slabs and sidewalks. All isolated slabs and sidewalks should be reinforced with rebar to help control cracking and crowning.

### Site Preparation for Buildings

Construction of the various buildings may occur during dry or wet weather. Therefore, site preparation recommendations are provided below for both dry and wet weather.

- 17. Strip the foundation areas  $\pm 4$  inches or as required to remove existing sod, roots, AC, concrete slabs, and any construction debris. Haul all strippings and debris from the site.
- 18. If construction is conducted during dry weather, excavate the floor slab areas to a depth required to accommodate a 12-inch thick building pad consisting of Select Fill. Complete the excavation using an excavator equipped with a smooth-edged bucket to minimize subgrade disturbance.
- 19. Increase the building pad thickness to 24 inches where expansive soil is encountered or if construction occurs during wet weather.
- 20. Moisture-condition and compact the subgrade as recommended above (assuming dry weather construction). Subgrade compaction is not required where a Foundation Engineering representative confirms the presence of stiff fine-grained alluvium or during wet weather.
- 21. During dry weather, the subgrade should not be allowed to dry out excessively prior to backfilling. During wet weather, the subgrade should be excavated and immediately backfilled to limit the subgrade's exposure to moisture and reduce the risk of subgrade pumping.
- 22. Cover the prepared subgrade with a Separation Geotextile as recommended above (during wet weather). A Separation Geotextile should be placed if the building pad is to be subjected to sustained wet weather and/or construction traffic.
- 23. Place and compact a minimum of 12 inches of Select Fill (during dry weather) to construct the building pads.

During wet weather, the Select Fill should be end-dumped outside the building pad excavation and pushed over the geotextile. Place the Select Fill in a  $\pm 18$ -inch thick initial lift and spread the material using a low ground-pressure dozer to reduce the risk of subgrade pumping. Do not permit construction equipment on the subgrade unless they are supported on a minimum of 18 inches of compacted Select Fill. Do not expose more subgrade than can be covered with a Separation Geotextile and Select Fill the same day.

- 24. Cut temporary slopes for the daylight basement excavation no steeper than 1½:1 (H:V) in the alluvial gravel. For the soils above the gravel surface, cut temporary slopes no steeper than 1:1 (H:V). Immediately cover cut slopes with plastic sheeting to maintain the moisture content and protect the slopes from erosion.
- 25. Excavate for the footings using an excavator equipped with a smooth bucket to minimize subgrade disturbance. The excavation depth should accommodate a minimum of 6 inches of compacted Select Fill beneath the footings. Where expansive soil is present, the excavation depth should accommodate a minimum of 24 inches of compacted Select Fill. The required excavation depths will need to be confirmed at the time of construction. All footing excavations should be evaluated by a Foundation Engineering representative prior to backfilling.
- 26. Place and compact the Select Fill in the footing excavations as recommended in Item 5.
- 27. Before the placement of rebar for the floor slab, proof-roll the completed building pads using a loaded truck (or other heavy equipment approved by Foundation Engineering) to identify any soft or pumping areas that may have developed over the construction period. Overexcavate any pumping base rock or subgrade and replace it with compacted Select Fill.
- 28. Grade the finished ground surface surrounding the buildings and additions to promote runoff away from the building areas and the foundations.

# Foundation Drainage

- 29. Install a foundation drain along the perimeter of the new buildings and additions. The drain should consist of 3 or 4-inch diameter, perforated or slotted PVC pipe and the flow line of the pipe should be set at the base of the perimeter foundation. The pipe should be bedded in at least 4 inches of Drain Rock and backfilled to within 6 inches of the ground surface with Drain Rock. The entire mass of Drain Rock should be wrapped in Subsurface Drainage Geotextile that laps at least 12 inches at the top.
- 30. Provide clean-outs at appropriate locations for future maintenance of the drainage systems.
- 31. Discharge the foundation drain by gravity flow into the school's drainage system (if available) or into the nearest storm drain.

### Subgrade Preparation and Pavement Construction

The subgrade should be prepared during dry weather and the pavement constructed as follows:

- 32. Strip the pavement area as required to remove existing AC, concrete slabs, and any construction debris. Haul all debris from the site.
- 33. Excavate as required to accommodate the minimum pavement section. The excavation depth should accommodate a base rock section consisting of 12 inches of Select Fill. Overexcavate any soft subgrade and replace it with compacted Select Fill or Granular Site Fill. The excavation should be completed using an excavator equipped with a smooth-edged bucket to minimize disturbance to the fine-grained subgrade.

Increase the base rock section to 24 inches if new pavements are constructed during wet weather or if used for staging.

- 34. Moisture-condition and compact the subgrade as recommended above (assuming dry weather construction). Subgrade compaction is not required where stiff subgrade conditions are confirmed by Foundation Engineering or during wet weather.
- 35. Place a Separation Geotextile over the completed subgrade as specified.
- 36. Place and compact 12 inches of Select Fill over the Separation Geotextile to construct the base rock section.
- 37. Maintain the moisture in the subgrade to prevent excessive drying and cracking. If necessary, excavate and cover the subgrade in sections to avoid soil desiccation.
- 38. Proof-roll the prepared base rock section prior to paving. Overexcavate and replace any areas of pumping base rock and/or subgrade with additional Select Fill.
- 39. Provide 2½ inches of AC for all paved areas not subjected to heavy vehicular traffic. Increase the AC thickness to 4 inches for all areas subjected to heavy vehicular traffic. Compact the AC to a minimum of 91% relative compaction per the theoretical maximum density calculated from the Rice specific gravity.

#### DESIGN REVIEW/CONSTRUCTION OBSERVATION/TESTING

Foundation Engineering should be provided the opportunity to review all drawings and specifications that pertain to site grading, foundation construction, and pavements. Preparation of the building pads and footing excavations will require field confirmation of the depth of any required overexcavation and the soil conditions in the bottom of the footing excavation. Similarly, pavement construction will require confirmation of the subgrade conditions. Mitigation of any unsuitable fill or high plasticity soils, soft soils, groundwater infiltration, or subgrade pumping will also require engineering review and judgment. That judgment should be provided by one of our representatives. Frequent field density tests should be run on all engineered fill, subgrade, and base rock. We recommend that we be retained to provide the necessary construction observation.

#### VARIATION OF SUBSURFACE CONDITIONS, USE OF THIS REPORT, AND WARRANTY

The analyses, conclusions, and recommendations contained herein assume the subsurface profiles encountered in the explorations are representative of the overall site conditions. The above recommendations assume we will have the opportunity to review final drawings and be present during construction to confirm the assumed foundation conditions. No changes in the enclosed recommendations should be made without our approval. We will assume no responsibility or liability for any engineering judgment, inspection, or testing performed by others.

This report was prepared for the exclusive use of Straightline Architects, the Alsea School District 7J, and other design consultants for the Alsea School District Building Renovations and Additions project in Alsea, Oregon. Information contained herein should not be used for other sites or unanticipated construction without our written consent. This report is intended for planning and design purposes. Contractors using this information to estimate construction quantities or costs do so at their own risk. Our services do not include any survey or assessment of potential surface contamination or contamination of the soil or groundwater by hazardous or toxic materials. We assume those services if needed, have been completed by others.

Climate conditions in western Oregon typically consist of wet weather for almost half of the year (typically between mid-October and late May). The recommendations for site preparation and foundation drainage are not intended to represent any warranty (expressed or implied) against the growth of mold, mildew, or other organisms that grow in a humid or moist environment.

Our work was done in accordance with generally accepted soil and foundation engineering practices. No other warranty, expressed or implied, is made.

We hope this memorandum meets your current needs. Please do not hesitate to call with any questions.

#### REFERENCES

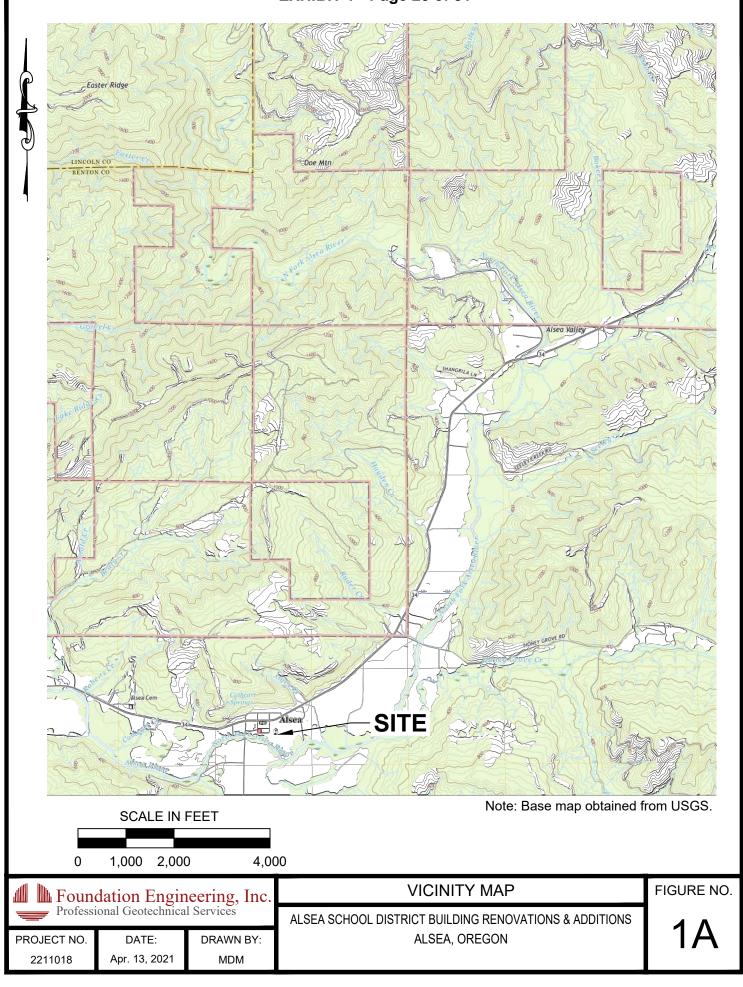
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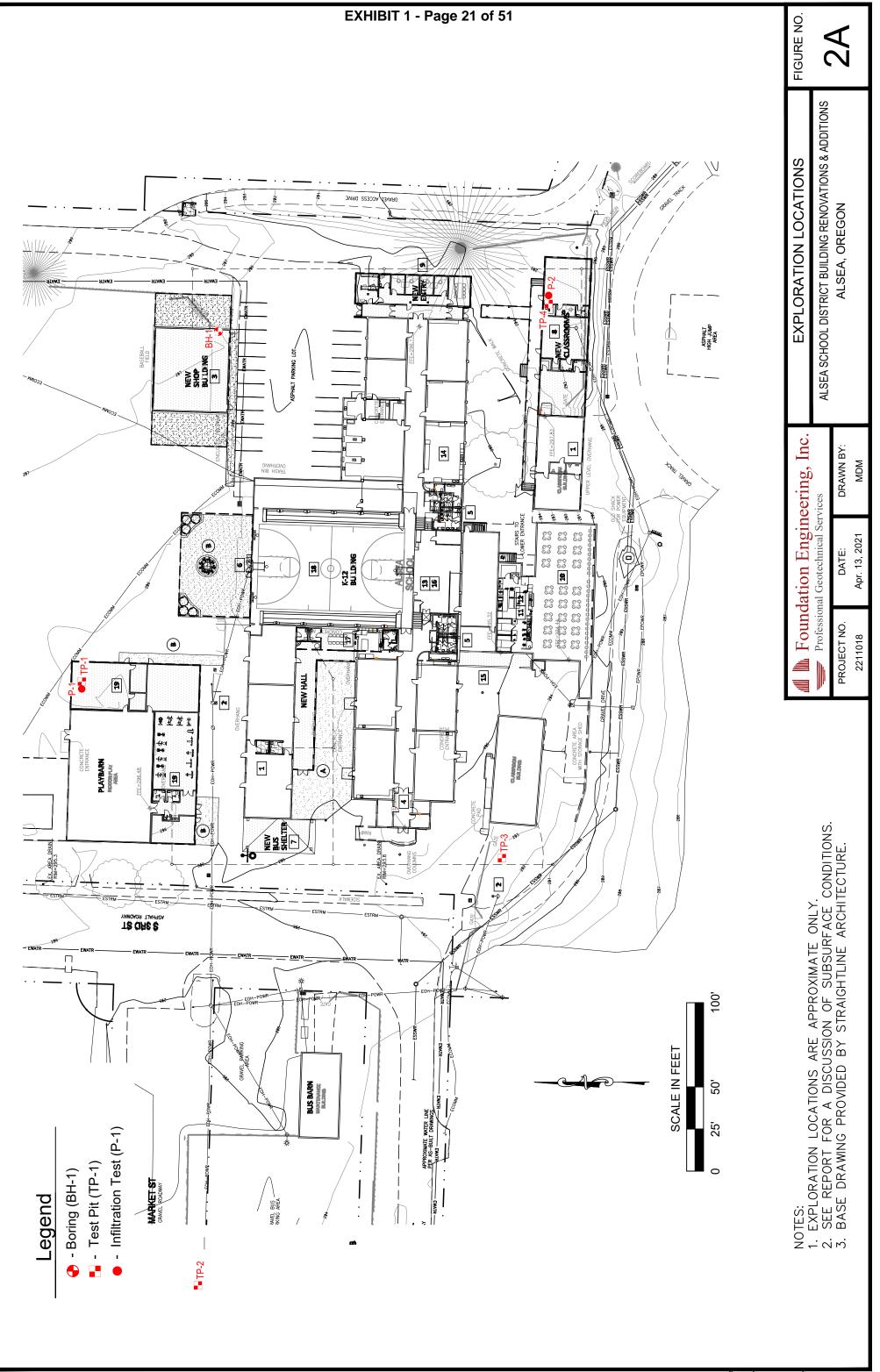


# Appendix A

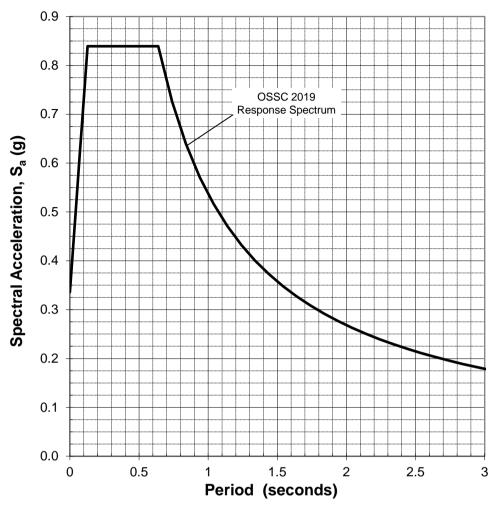
Figures

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#### Notes:

- 1. The Design Response Spectrum is based on OSSC 2019 Section 1613.
- 2. The following parameters are based on the modified USGS 2014 maps provided in OSSC 2019:

Site Class= C	Damping = 5%			
S <sub>S</sub> = 1.05	F <sub>a</sub> = 1.20	S <sub>MS</sub> = 1.26	$S_{DS} =$	0.84
$S_1 = 0.56$	$F_v = 1.44$	S <sub>M1</sub> = 0.80	S <sub>D1</sub> =	0.54

- 3. S<sub>S</sub> and S<sub>1</sub> values indicated in Note 2 are the mapped, risk-targeted maximum considered earthquake spectral acclerations for 2% probability of exceedence in 50 years.
- 4.  $F_a$  and  $F_v$  were established based on OSSC 2019 Tables 1613.2.3(1) and 1613.2.3(2) using the selected  $S_S$  and  $S_1$  values.  $S_{DS}$  and  $S_{D1}$  values include a 2/3 reduction on  $S_{MS}$  and  $S_{M1}$  as discussed in OSSC 2019 Section 1613.2.4.
- 5. Site location is: Latitude 44.3808, Longitude -123.5946.

FIGURE 3A ASCE 7-16/OSSC 2019 SITE RESPONSE SPECTRUM Alsea School Distrct Building Renovations & Additions Alsea, Oregon Project No.: 2211018



# Appendix B

**Explorations and Core Box Photos** 

## **Foundation Engineering, Inc.** Professional Geotechnical Services

#### DISTINCTION BETWEEN FIELD LOGS AND FINAL LOGS

A field log is prepared for each boring or test pit by our field representative. The log contains information concerning sampling depths and the presence of various materials such as gravel, cobbles, and fill, and observations of ground water. It also contains our interpretation of the soil conditions between samples. The final logs presented in this report represent our interpretation of the contents of the field logs and the results of the sample examinations and laboratory test results. Our recommendations are based on the contents of the final logs and the information contained therein and not on the field logs.

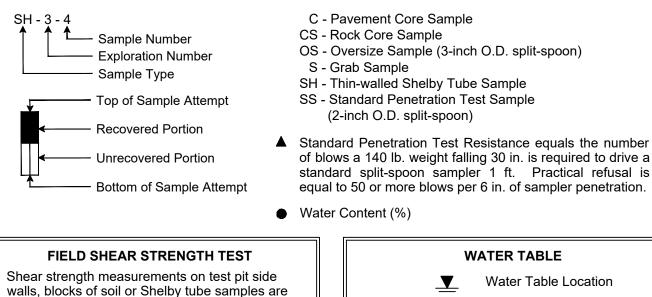
#### VARIATION IN SOILS BETWEEN TEST PITS AND BORINGS

The final log and related information depict subsurface conditions only at the specific location and on the date indicated. Those using the information contained herein should be aware that soil conditions at other locations or on other dates may differ. Actual foundation or subgrade conditions should be confirmed by us during construction.

#### TRANSITION BETWEEN SOIL OR ROCK TYPES

The lines designating the interface between soil, fill or rock on the final logs and on subsurface profiles presented in the report are determined by interpolation and are therefore approximate. The transition between the materials may be abrupt or gradual. Only at boring or test pit locations should profiles be considered as reasonably accurate and then only to the degree implied by the notes thereon.

SAMPLE OR TEST SYMBOLS



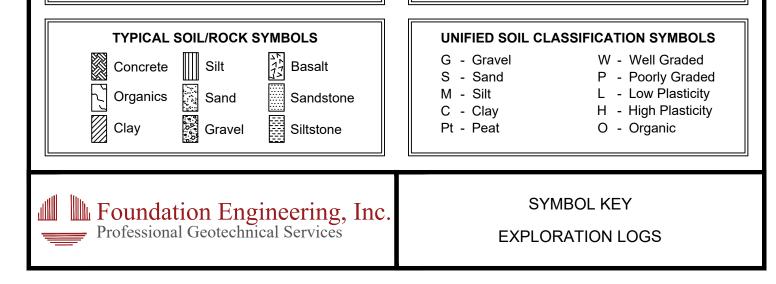
typically made with Torvane or Field Vane

shear devices.

WATER TABLE

Water Table Location

(1/31/16) Date of Measurement



#### поп

## **Explanation of Common Terms Used in Soil Descriptions**

Field Identification		Cohesive Soi	Granular Soils		
Field Identification	SPT*	S <sub>u</sub> ** (tsf)	Term	SPT*	Term
Easily penetrated several inches by fist.	0 - 2	< 0.125	Very Soft	0 - 4	Very Loose
Easily penetrated several inches by thumb.	2 - 4	0.125 - 0.25	Soft	4 - 10	Loose
Can be penetrated several inches by thumb with moderate effort.	4 - 8	0.25 - 0.50	Medium Stiff	10 - 30	Medium Dense
Readily indented by thumb but penetrated only with great effort.	8 - 15	0.50 - 1.0	Stiff	30 - 50	Dense
Readily indented by thumbnail.	15 - 30	1.0 - 2.0	Very Stiff	> 50	Very Dense
Indented with difficulty by thumbnail.	> 30	> 2.0	Hard		

\* SPT N-value in blows per foot (bpf)

\*\* Undrained shear strength

Term	Soil Moisture Field Description				
Dry	Absence of moisture. Dusty. Dry to the touch.				
Damp	Soil has moisture. Cohesive soils are below plastic limit and usually moldable.				
Moist	Grains appear darkened, but no visible water. Silt/clay will clump. Sand will bulk. Soils are often at or near plastic limit.				
Wet	Visible water on larger grain surfaces. Sand and cohesionless silt exhibit dilatancy. Cohesive soil can be readily remolded. Soil leaves wetness on the hand when squeezed. Soil is wetter than the optimum moisture content and above the plastic limit.				

Term	PI	Plasticity Field Test	
Non-plastic	0 - 3	Cannot be rolled into a thread at any moisture.	
Low Plasticity	3 - 15	Can be rolled into a thread with some difficulty.	
Medium Plasticity	15 - 30	Easily rolled into thread.	
High Plasticity	> 30	Easily rolled and re-rolled into thread.	

Term	Soil Structure Criteria
Stratified	Alternating layers at least ¼ inch thick.
Laminated	Alternating layers less than ¼ inch thick.
Fissured	Contains shears and partings along planes of weakness.
Slickensided	Partings appear glossy or striated.
Blocky	Breaks into small lumps that resist further breakdown.
Lensed	Contains pockets of different soils.

Term	Soil Cementation Criteria
Weak	Breaks under light finger pressure.
Moderate	Breaks under hard finger pressure.
Strong	Will not break with finger pressure.



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**COMMON TERMS** 

SOIL DESCRIPTIONS

Field Identification		UCS (psi)	Strength	Hardness (ODOT)
Indented by thumbnail.	R0	< 100	Extremely Weak	Extremely Soft
Crumbles under firm blows with geological hammer. Can be peeled by a pocket knife.	R1	100 - 1,000	Very Weak	Very Soft
Can be peeled by a pocket knife with difficulty, shallow indentations made by firm blow with geological hammer.	R2	1,000 - 4,000	Weak	Soft
Cannot be scraped or peeled with a pocket knife, specimen can be fractured with a single blow of geological hammer.	R3	4,000 - 8,000	Medium Strong	Medium Hard
Specimen requires more than one blow of geological hammer to fracture it.	R4	8,000 - 16,000	Strong	Hard
Specimen requires many blows of geological hammer to fracture it.		> 16,000	Very Strong	Very Hard

Term (ODOT)	Weathering Field Identification					
Fresh	Crystals are bright. Discontinuities may show some minor surface staining. No discoloration in rock fabric.					
Slightly Weathered	Rock mass is generally fresh. Discontinuities are stained and may contain clay. Some discoloration in rock fabric.					
Moderatedly Weathered	Significant portions of rock show discoloration and weathering effects. Crystals are dull and show visible chemical alteration. Discontinuities are stained and may contain secondary mineral deposits.					
Highly Weathered (Predominately Decomposed)	Rock can be excavated with geologist's pick. All discontinuities exhibit secondary mineralization. Complete discoloration of rock fabric. Surface of core is friable and usually pitted due to washing out of highly altered minerals by drilling water.					
Decomposed	Rock mass is completely decomposed. Original rock "fabric" may be evident (relict texture). May be reduced to soil with hand pressure.					

Spacing (metric)	Spacing (imperial)	Spacing Term	<b>Bedding/Foliation</b>
< 6 cm	< 2 in.	Very Close	Very Thin (Laminated)
6 cm - 30 cm	2 in 1 ft.	Close	Thin
30 cm - 90 cm	1 ft 3 ft.	Moderately Close	Medium
90 cm - 3.0 m	3 ft - 10 ft.	Wide	Thick
> 3.0 m	> 10 ft.	Very Wide	Very Thick (Massive)

			Description		
Vesicle Term	Volume		Stratification Term	Description	
	t olamo	4	Lamination	< 1 cm (0.4 in.) thick beds	
Some vesicles	5 - 25%			Preferred break along laminations	
Highly vesicular	25 - 50%		Fissile	Freierred Dreak along laminations	
	23 - 30 %	4	Parting	Preferred break parallel to bedding	
Scoriaceous	> 50%		<b>— — — —</b>		
		Foliation	Metamorpic layering and segregation of minerals		

RQD %	Designation	RQD %	Designation
0 - 25	Very Poor	75 - 90	Good
25 - 50	Poor	90 - 100	Excellent
50 - 75	Fair		

Rock Quality Designation (RQD) is the cumulative length of intact rock core pieces 4 inches or longer excluding breaks caused by drilling and handling divided by run length, expressed as a percentage.



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#### **ROCK DESCRIPTIONS**

**COMMON TERMS** 

## EXHIBIT 1 - Page 27 of 51

Depth	Soil and Rock Description		Elev.			SPT, •	Moisture, %	B	ackfill/
Feet	and Comments	Log	Depth	Samples	Ē	N-Value Recovery 🗄	RQD., %		allations/ ter Table
 1 2 3	Medium stiff clayey SILT, scattered organics (MH); brown, moist to wet, medium to high plasticity, organics consist of grass roots, (topsoil) Stiff clayey SILT, scattered organics (MH); brown, damp to moist, medium to high plasticity, organics consist of rootlets, (alluvium).	ŗ	297 0.0 296.0_ 1.0	SS-1-1	<u>0</u>	50	100		Capped with sod
4 5 - 6 7	Iron-stained below $\pm 5$ feet. Field vane on SH-1-2: S <sub>u</sub> = $\pm 1.0$ tsf at $\pm 6.6$ feet.			SH-1-2		• • • • • • • • • • • • • • • • • • •			Backfilled with bentonite chips
8 9 10- 11 12	Sandy (fine to medium sand) below ±7 feet. Dense silty GRAVEL, some sand (GM); brown to grey-brown and iron-stained, damp to moist, low plasticity silt, fine to coarse sand, fine to coarse subrounded gravel, (alluvium).		289.0_ 8.0	SS-1-3		11 • • • • • • • • • • • • • • • • • • •			
13 14 15 -	Dark grey and no iron staining below ±15 feet.			SS-1-5		<b>3</b> 4 <b>3</b> 6			
16 17 18 19	Very stiff SILT, trace to some sand (ML); brown and iron-stained, damp, low plasticity, fine sand, relict sandstone texture, (residual soil). Extremely weak to very weak (R0 to R1) silty SANDSTONE; brown and iron-stained, highly		280.5 16.5 279.0 18.0	SS-1-7			5	0/5#	
20- 21 22 23	Weak (R2) silty SANDSTONE with siltstone interbeds; grey, slightly weathered to fresh, medium to thin bedding is planar, smooth to rough, and closed, fine sand, scattered carboniferous material, micaceous, (Tyee Formation).		277.0_ 20.0	SS-1-8 CS-1-1			<b>1</b> 0/1	st 21/2"	
24 25 - 26 27				CS-1-2					
28 29 30-	BOTTOM OF BORING		267.0_ 30.0						
Projec			-	og: BH-1					
	ce Elevation: 297.0 feet (Approx.)	AIS	ea Sch	ool Distric	π				

Date of Boring: March 8, 2021

Foundation Engineering, Inc.

**Building Renovations & Additions** 

Alsea, Oregon

Page 1 of 1

		E	XI	<del>IIBIT 1</del>	- Pad	Page 28 <sub>1</sub> of 51					
Comments	Depth, Feet		Location	C, TSF	Elev. Depth	Symbol		Soil and Rock Description			
Surface: grass Slow seepage at ±12 inches.	1- 2- 3- 4-	S-1-1 S-1-2 S-1-3		0.40	295.6 0.4 295.0 1.0			Medium dense silty GRAVEL (GW); brown, wet, low plasticity silt, fine to coarse angular gravel, (fill). Stiff SILT, scattered organics (ML); dark brown, wet, medium plasticity, organics consist of roots, (topsoil/fill). Medium stiff clayey SILT (MH); grey-brown and iron-stained, wet, medium plasticity, (alluvium). Stiff below ±3.5 feet. Sandy below ±4.5 feet.			
Project No.: 2211018	6-				290.0 6.0						
Project No.: 2211018 Surface Elevation: 296.0 feet (Ap	prox	.)				Al	sea	Pit Log: TP-1 School District ing Renovations & Additions			
Date of Test Pit: March 8, 202	1							Alsea, Oregon			

Comments	Depth, Feet	Sample #	Location	C, TSF	Elev. Depth	Symbol	Soil and Rock Description
Slow seepage at ±3 feet.	1- 2- 3- 4- 5- 6-	S-2-1 S-2-2		>1	292.5 1.5 291.0 3.0 289.0 5.0		Dense silty CRUSHED ROCK (GP); grey, moist, low plasticity silt, ±1½-inch minus angular rock, (fill). Stiff SILT (ML); brown, damp, low plasticity, (alluvium). Stiff clayey SILT (MH); grey-brown and iron-stained, moist, medium plasticity, (alluvium).
Project No.: 2211018 Surface Elevation: 294.0 feet (A Date of Test Pit: March 8, 202		)				Alsea Build	Pit Log: TP-2 a School District ding Renovations & Additions a, Oregon

		E	XH	HIBIT 1 <sub>I</sub> - Page 29 <sub>I</sub> of 51							
	Feet										
Comments	Depth, Feet	Sample #	Location	C, TSF	Elev. Depth	Symbol	Soil and Rock Description				
Surface: grass		0		0			Stiff SILT, scattered organics (ML); brown, moist, low plasticity,				
					292.0		organics consist of fine roots, (topsoil/fill).				
	1-				1.0	4-6	Medium dense silty GRAVEL (GM); grey-brown, moist, low plasticity silt, fine to coarse rounded gravel, (fill).				
					291.0		plasticity slit, line to coarse rounded gravel, (iii).				
	2-	S-3-1			2.0		Stiff SILT (ML); brown, moist, low plasticity, (alluvium).				
				>1							
	3-										
	4-										
	4-				288.5						
	5-				4.5	0000	Dense silty GRAVEL, some sand (GM); brown, moist, low plasticity silt, fine to medium sand, fine to coarse subrounded to				
No seepage or groundwater encountered to the limit of exploration.	5	S-3-2				0000	rounded gravel, (alluvium).				
	6-				287.0						
					6.0		BOTTOM OF EXPLORATION				
Project No.: 2211018							Pit Log: TP-3				
Surface Elevation: 293.0 feet (Ap	oprox	.)					a School District				
Date of Test Pit: March 8, 202	1						ding Renovations & Additions				
Date of Test Pit:     March 8, 2021     Alsea, Oregon											
							I				
	Feet	# 0	u		epth	-					
Comments	Depth, Feet	Sample #	Location	C, TSF	Elev. Depth	Symbol	Soil and Rock Description				
Surface: grass		0,		0			Medium stiff SILT, scattered organics (ML); dark brown, moist,				
		S-4-1					low plasticity, blocky structure, organics consist of fine roots, (topsoil/fill).				
	1-				292.2						
					1.3		Stiff clayey SILT, trace sand and gravel, scattered debris (MH); brown, moist, medium plasticity, fine to coarse sand, fine				
	2-	S-4-2					rounded gravel, debris consists of glass, pottery and clay pipe fragments, (fill).				
					290.5						
	3-			0.80	3.0	╷┑┍╷┑┍	Stiff SILT, some clay (ML); brown, moist, medium plasticity, (alluvium).				
	4-	S-4-3									
	_										
No seepage or groundwater encountered to the limit of exploration.	5-										
	6				287.5						
	6-				6.0		BOTTOM OF EXPLORATION				
Project No.: 2211018							Pit Log: TP-4				
Surface Elevation: 293.5 feet (A)	oprox	.)					a School District				
		,				Building Renovations & Additions					
Date of Test Pit: March 8, 202	I					Alsea, Oregon					

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Foundation Engineering, Inc. Alsea School District Building Renovations & Additions Project No.: 2211018



Photo 2B. BH-1 from  $\pm 28.3$  to 30 feet - Box 2





# Appendix C

## Field and Laboratory Testing

## **Foundation Engineering, Inc.** Professional Geotechnical Services

#### EXHIBIT 1 - Page 32 of 51

Foundation Engineering, Inc. Alsea School District Building Renovations & Additions Project No.: 2211018

Fundametian	Sample	Sample	Moisture	Percent	Att	erberg Lir	nits	USCS
Exploration	Number	Depth (ft)	Content (%)	Fines (%)	LL	PL	PI	Classification
	SS-1-1	2.5 – 4.0	32.6		77	39	38	МН
BH-1	SH-1-2	5.0 - 7.0	40.6					
	SS-1-3	7.0 – 8.5	37.9					
TP-1	S-1-2	1.5 – 3.0	31.3					
IP-I	S-1-3	4.5 - 5.5	37.4	56.9	58	31	27	МН
	S-2-1	1.5 – 2.5	30.3					
TP-2	S-2-2	3.0 - 4.0	37.2					
	S-3-1	2.0 - 3.0	29.9					
TP-3	S-3-2	5.0 - 6.0	25.4					
 TD 4	S-4-2	2.0 - 3.0	28.5					
TP-4	S-4-3	4.0 - 5.0	30.9		47	30	17	ML

#### Table 1C. Moisture Contents (ASTM D 2216), Percent Fines (ASTM D 1140), and Atterberg Limits (ASTM D 4318)

**Encased Falling Head Infiltration Test** 

Project No.: 2211018	3/8/2021	See Figure 3A
Project No.	Date	Location
Alsea School District Building Renovations & Additions	Matt Mason	P-1
Project	Recorded By:	Test Number

# Subsurface Conditions:

0 to 1' Profile:

Topsoil/fill Stiff clayey SILT (MH); grey-brown and iron statined, wet, medium plasticity, (alluvium) 1' to 6'

n/a ±3' Ground Water:

Test Depth:

 $\pm$ 53 inches to bottom of casing,  $\pm$ 47 inches to top of 6" of water ( $\pm$ 11 inches of stick-up) Notes: 6" diamter casing with ±6" of embedment Measments taken from top of casing.

Trial #1

Time	Elapsed	Depth to	Depth to Drop in water	Infiltration	Remarks
	Time	Water	level	Rate	
	(min.)	(in)	(in)	(in/hr)	
8:15 AM	0	41.0			Filled with 6"
	20	41.0	0.00	0.00	of water
	40	41.0	0.00	0.00	
	60	41.0	0.00	0.00	
	80	41.0	0.00	0.00	
	100	41.0	0.00	0.00	
10:15 AM	120	41.0	0.00	0.00	

Trial #2

-	-			-
ō	Depth to	Drop in water	Intiltration	Remarks
Time	Water	level	Rate	
(min.)	(in)	(in)	(in/hr)	
	41.0	-		Filled with 6"
	41.0	0.00	0.00	of water
	41.0	0.00	0.00	
	41.0	0.00	0.00	
	41.0	0.00	0.00	
	41.0	0.00	0.00	
	41.0	0.00	0.00	

0.00

Selected Value

0.00

Selected Value

EXHIBIT 1 - Page 33 of 51

**Encased Falling Head Infiltration Test** 

Project No.: 2211018	Date 3/8/2021	Location See Figure 3A
Proj	Date	Focs
Alsea School District Building Renovations & Additions	Matt Mason	P-2
Project	Recorded By:	Test Number

# Subsurface Conditions:

Profile: 0 to 1.3' Medium stiff SILT, scattered organics (ML); dark brown, moist, low plasticity, (topsoil)	1' to 3' Stiff clayey SILT, trace sand & gravel, scattered fill debris (MH); brown, moist,	medium plasticity, fine to coarse sand, fine to coarse angular to rounded gravel,	
0 to 1.3'	1' to 3'		
Profile:			

fill consists of scattered glass, pottery and clay pipe fragments, (fill). Stiff clayey SILT (MH); brown, moist, medium plasticity, (alluvium) 3' to 6'

Ground Water: Test Depth:

n/a ±3'

Notes: 6" diamter casing with ±6" of embedment

Measments taken from top of casing. ±54 inches to bottom of casing, ±48 inches to top of 6" of water (±12 inches of stick-up)

Trial #1

Remarks			Filled with 6"	of water					
Infiltration	Rate	(in/hr)	-	0.19	0.19	0.19	0.19	0.19	0.19
Depth to Drop in water	level	(in)		0.06	0.06	0.06	0.06	0.06	0.06
Depth to	Water	(in)	41.4	41.5	41.6	41.6	41.7	41.8	41.8
Elapsed	Time	(min.)	0	20	40	60	80	100	120
Time			8:20 AM						10:20 AM

Trial #2

Remarks			illed with 6"	of water					
R			Fille	ō					
Infiltration	Rate	(in/hr)	-	0.19	0.19	0.19	0.19	0.19	0.19
Drop in water	level	(in)	-	0.06	0.06	0.06	0.06	0.06	0.06
Depth to	Water	(in)	41.8	41.9	41.9	42.0	42.1	42.1	42.2
Elapsed	Time	(min.)	0	20	40	60	80	100	120
Time			10:20 AM						12:20 PM

0.19

Selected Value

0.19

Selected Value

## EXHIBIT 1 - Page 34 of 51



# Appendix D

## Seismic Hazard Study

## **Foundation Engineering, Inc.** Professional Geotechnical Services

## SEISMIC HAZARD STUDY

#### ALSEA SCHOOL DISTRICT BUILDING RENOVATIONS & ADDITIONS ALSEA, OREGON

#### INTRODUCTION

This seismic hazard study was completed to identify potential geologic and seismic hazards and evaluate the effect those hazards may have on the proposed project. The study fulfills the requirements presented in the 2019 Oregon Structural Specialty Code (OSSC), Section 1803 for site-specific seismic hazard reports for essential and hazardous facilities and major and special-occupancy structures (OSSC, 2019).

The following sections provide a discussion of the local and regional geology, seismic and tectonic setting, earthquakes, and seismic hazards. A detailed discussion of the subsurface conditions at the project location, including exploration logs, is provided in the main report.

#### LITERATURE REVIEW

We reviewed available geologic, seismic, and hazard publications and maps to characterize the local and regional geology and evaluate relative seismic hazards at the site. The literature review included geologic and hazard studies completed in the Alsea area by the Oregon Department of Geology and Mineral Industries (DOGAMI) and the U.S. Geological Survey (USGS) (Baldwin, 1955; Schlicker et al., 1973; Bela, 1979; Walker and Duncan, 1989; Yeats et al., 1996; Wang et al., 2001). We also reviewed local water-well logs available from the Oregon Water Resources Department (OWRD) website and logs from our previous geotechnical investigations in the project vicinity.

#### **Regional Geology**

Alsea is located within the central Coast Range, which is a north-south-trending low-lying range separating the Pacific Coast to the west from the Willamette Valley to the east. The site is located within the Alsea River Valley.

At the western margin of Oregon is the Cascadia Subduction Zone (CSZ). The CSZ is a converging, oblique plate boundary where the Juan de Fuca oceanic plate is being subducted beneath the western edge of the North American continental plate (Geomatrix Consultants, 1995). The CSZ extends from central Vancouver Island, in British Columbia, Canada, through Washington and Oregon to Northern California in the United States (Atwater, 1970). The movement of the subduction zone has resulted in accretion, folding, faulting, and uplift of oceanic and other sediments on the western margin of the North American plate.

During the late Cretaceous ( $\pm 66$  million years ago), the Oregon Coast Range was nonexistent and the shoreline crossed eastern Washington and Idaho. To the west, volcanic seamounts were newly forming, outpouring basaltic pillow lava and breccia of the Siletz River Volcanics (early to middle Eocene;  $\pm 44$  to 58 million years ago). These seamounts were created on top of the eastward-moving Gorda and Juan de Fuca plates and eventually accreted to the North American Plate (early Eocene) due to the subducting convergent plate margin (CSZ). As subduction continued, the

## EXHIBIT 1 - Page 37 of 51

seamounts subsided creating a forearc basin which was infilled with thick deposits of Eocene to Miocene marine sediments primarily derived from the Klamath Mountains to the south and Idaho Batholith to the northeast, including the Tyee Formation. The sediments typically overlie, but are also interbedded with basalt and volcanics of the Siletz River Volcanics. Volumes of ash and pyroclastics from the Western Cascades to the east covered the marine sediments during the Oligocene ( $\pm 24$  to 37 million years ago). (Orr and Orr, 1999)

The Coast Range block was slowly uplifted and this resulted in a westward retreat of the sea during the Miocene. Some isolated basins along the shelf were deepened and infilled with mud, silt, and fossiliferous sandstone. Continuing subduction resulted in the folding and faulting of the North American plate, which also included the Alsea Syncline. Columbia River Basalt flows originating from the east eventually reached the coast and invaded the soft, wet coastal sediments during the middle Miocene. Erosion and stream valleys carved the landscape and exposed some of the resistant, intrusive rocks along the shoreline. (Orr and Orr, 1999)

### Local Geology

Alsea is set on a broad, flat terrace along the north bank of the North Fork of the Alsea River. Local geologic mapping indicates alluvium associated with the North Fork of the Alsea River underlies the site (Baldwin, 1955; Walker and Duncan, 1989). The alluvium typically consists of silt, sand, and gravel. Middle Eocene Tyee Formation ( $\pm$ 49 to 41 million years old) is the dominant rock type underlying the alluvium. The Tyee Formation also underlies most of the hills surrounding Alsea (Baldwin, 1955; Schlicker et al., 1973; Bela, 1979; Walker and Duncan, 1989).

The soil profile encountered in the explorations consists of minor fill over alluvium followed by residual soil (i.e., bedrock decomposed to the consistency of soil) and silty sandstone with siltstone interbeds. The subsurface conditions encountered in our explorations are consistent with the mapped local geology. Based on the local geologic mapping, the bedrock is considered to be Tyee Formation. Details are provided in the Subsurface Conditions section of the main report and on the exploration logs in Appendix B.

#### Seismic Setting and Local Faulting

We completed a literature review of nearby faults to evaluate the seismic setting and identify the potential seismic sources. The USGS website includes an interactive deaggregation tool, which allows evaluation of the contribution of the various seismic sources to the overall seismic hazard (USGS, 2014). The USGS interactive deaggregation indicates the seismic hazard at the site is dominated by the CSZ (USGS, 2014). Crustal faults also represent a potential seismic hazard. A discussion of these earthquake sources is provided below.

<u>Cascadia Subduction Zone (CSZ)</u>. The site is  $\pm 86$  miles east of the surface expression of the CSZ. The CSZ is a converging, oblique plate boundary where the Juan de Fuca plate is being subducted beneath the western edge of the North American plate. It is estimated the average rate of subduction of the Juan de Fuca plate under the North American plate is  $\pm 37$  mm/year northeast, based on Pacific and Mid-Ocean Ridge

velocities, geodetic studies of convergence, and magnetic anomalies of the Juan de Fuca plate (Personius and Nelson, 2006; DeMets et al., 2010). The CSZ extends  $\pm$  700 miles from central Vancouver Island in British Columbia, Canada, through Washington and Oregon to Northern California (Atwater, 1970).

<u>*Crustal Faults*</u>. Crustal faults are fractures within the North American plate. Numerous faults are presented on local and regional geologic maps. However, not all faults are considered to be active. Because the historical earthquake record is so short, active faults are identified by geologic mapping and seismic surveys.

The USGS has defined four fault classifications based on evidence for displacement within the Quaternary (<1.6 million years) in their US fault database (Palmer, 1983; Personius et al., 2003). The fault classes are defined as follows:

- <u>Class A</u> Faults with geologic evidence supporting tectonic movement in the Quaternary known or presumed to be associated with large-magnitude earthquakes.
- <u>Class B</u> Faults with geologic evidence that demonstrates the existence of a fault or suggests Quaternary deformation, but either: 1) the fault might not extend deep enough to be a potential source of significant earthquakes or 2) the current evidence is too strong to confidently classify the fault as a Class C but not strong enough to classify it as a Class A.
- <u>Class C</u> Faults with insufficient evidence to demonstrate 1) the existence of a tectonic fault, or 2) Quaternary movement or deformation associated with the feature.
- <u>Class D</u> Geologic evidence indicates the feature is not a tectonic fault or feature.

Class A and B faults are included in the USGS fault database and interactive fault map. USGS considers 17 features in Oregon to be Class C faults (USGS, 2006a). The closest Class C fault is the Harrisburg anticline,  $\pm 22$  miles southeast of the site. The USGS does not consider any features in Oregon as Class D (USGS, 2006a).

Local geologic maps indicate no faults are mapped beneath the site (Baldwin, 1955; Walker and Duncan, 1989). A few inferred crustal faults have been mapped within  $\pm$  10 miles of the site, including the Corvallis fault; however, none of these crustal faults show any evidence of movement in the last  $\pm$  1.6 million years (Palmer, 1983; Geomatrix Consultants, 1995; Personius et al., 2003; USGS, 2006a).

Nine potentially active Quaternary Class A and B crustal fault zones have been mapped by the USGS within  $\pm 40$  miles of the site (Palmer, 1983; Geomatrix Consultants, 1995; Personius et al., 2003; USGS, 2006a). These faults are listed in Table 1D. Figure 1D shows the approximate surface projection locations of these faults.

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Fault Name and Class	Fault Number	Approximate Length (miles)	Approximate Distance and Direction from Site (miles) <sup>(2)</sup>	Last Known Deformation (years) <sup>(3)</sup>	Slip Rate (mm/yr)
Corvallis (B)	869	±25	$\pm$ 1.5 NW <sup>(4)</sup>	<1.6 million	<0.20
Owl Creek (A)	870	±9	±19 NE	<750,000	<0.20
Waldport (A)	886	±9	±23 W	<130,000	0.16
Unnamed Offshore (A)	785	vary	$\pm25$ to 31 W to 39 SW	<15,000	1.0 to 5.0
Yaquina (A)	885	± 5	±26 NW	<130,000	0.69
Cascadia Fold and Fault Belt (A)	784	vary	±28 W-SW to 31 to 39 NW	< 15,000	1.0 to 5.0
Cape Foulweather (A)	884	± 6	±39 NW	<130,000	<0.20
Siletz Bay (A)	883	± 6	$\pm 39$ to 42 NW	<130,000	<0.20
Turner and Mill Creek (A)	871	±12	±40 NE	<1.6 million	0.01

## Table 1D. USGS Class A and Class B Crustal Faults within a $\pm$ 40-mile Radius of the Site <sup>(1)</sup>

<sup>(1)</sup> Fault data based on Personius et al., 2003 and USGS, 2006a and b and 2014.

<sup>(2)</sup> Distance and direction from site to nearest surface projection of the fault.

<sup>(3)</sup> Quaternary time period defined at <1.6 million years based on the 1983 Geologic Time Scale (Palmer, 1983).

<sup>(4)</sup> Corvallis fault location based on Baldwin, 1955.

#### **Historic Earthquakes**

Available information indicates the CSZ is capable of generating earthquakes along the inclined interface between the two plates (interface) and within the descending Juan de Fuca plate (intraplate) (Weaver and Shedlock, 1996). The fault rupture may occur along a portion or the entire length of the CSZ (Weaver and Shedlock, 1996).

<u>CSZ Interface Earthquakes</u>. The estimated maximum magnitude of a CSZ interface earthquake is up to a moment magnitude ( $M_w$ ) 9.3 (Petersen et al., 2014). No significant interface (subduction zone) earthquakes have occurred on the CSZ in historic times. However, several large-magnitude (>M ~8.0, M = unspecified magnitude scale) subduction zone earthquakes are thought to have occurred in the past few thousand years. This is evidenced by tsunami inundation deposits, combined with evidence for episodic subsidence along the Oregon and Washington coasts (Peterson et al., 1993; Atwater et al., 1995).

Numerous detailed studies of coastal subsidence, tsunami, and turbidite deposits have been conducted to develop a better understanding of CSZ earthquakes. The studies include investigations of turbidite deposits in the offshore Cascadia Basin that were used to help develop a paleoseismic record for the CSZ and estimate recurrence intervals for interface earthquakes (Adams, 1990; Goldfinger et al., 2012). A study of offshore turbidites from the last  $\pm$  10,000 years suggests the return period for interface earthquakes varies with location and rupture length. That study estimated an average recurrence interval of  $\pm 220$  to 380 years for an interface earthquake on the southern portion of the CSZ, and an average recurrence interval of  $\pm 500$  to 530 years for an interface earthquake extending the entire length of the CSZ (Goldfinger et al., 2012). Older, deep-sea cores have been re-examined more recently, and the findings may indicate greater Holocene stratigraphy variability along the Washington coast (Atwater et al., 2014). Additional research by Goldfinger for the northern portion of the CSZ suggests a recurrence interval of  $\pm 340$  years for the northern Oregon Coast (Goldfinger et al., 2016). The most recent CSZ interface earthquake occurred  $\pm 321$  years ago (January 26, 1700) (Nelson et al., 1995; Satake et al., 1996).

<u>**CSZ Intraplate Earthquakes**</u>. Intraplate (Intraslab or Wadati-Benioff Zone) earthquakes occur within the Juan de Fuca plate at depths of  $\pm 28$  to 37 miles (Weaver and Shedlock, 1996). The maximum estimated magnitude of an intraplate earthquake is about M<sub>w</sub> 7.5 (Petersen et al., 2014). The available record for intraplate earthquakes in Oregon is limited. The available data indicates a M<sub>b</sub> = 4.6 (compressional body wave magnitude) event occurred in 1963, located  $\pm 23$  miles east of Salem at a depth of  $\pm 29$  miles (Barnett et al., 2009). Based on its depth, this earthquake may be considered an intraplate event. The Puget Sound region of Washington State has experienced three intraplate events in the last  $\pm 72$  years, including a surface wave magnitude (M<sub>s</sub>) 7.1 event in 1949 (Olympia), a M<sub>s</sub> 6.5 event in 1965 (Seattle/Tacoma) (Wong and Silva, 1998), and a M<sub>w</sub> 6.8 event in 2001 (Nisqually) (Dewey et al., 2002).

<u>**Crustal Earthquakes**</u>. Crustal earthquakes dominate Oregon's seismic history. Crustal earthquakes occur within the North American plate, typically at depths of  $\pm 6$  to 12 miles. The estimated maximum magnitude of a crustal earthquake in Oregon is about M<sub>w</sub> 7.0 (Petersen et al., 2014). Only two historic crustal events in Oregon have reached Richter local magnitude (M<sub>L</sub>) 6 (the 1936 Milton-Freewater M<sub>L</sub> 6.1 earthquake and the 1993 Klamath Falls M<sub>L</sub> 6.0 earthquake) (Wong and Bott, 1995). The majority of Oregon's larger crustal earthquakes are in the M<sub>L</sub> 4 to 5 range (Wong and Bott, 1995).

Table 2D summarizes earthquakes with a M of 4.0 or greater or Modified Mercalli Intensity (MMI) of V or greater, that have occurred within a  $\pm$  50-mile radius of Alsea in the last  $\pm$  188 years (Johnson et al., 1994; USGS, 2013; NCEDC, 2014). Note that the referenced earthquake catalogs are a composite of different earthquake catalogs and seismic networks; therefore, data errors may exist. Complete historic earthquake records may not yet be included in the referenced earthquake catalogs. Therefore, it is possible some earthquakes may not be included in Table 2D.

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Year	Month	Day	Hour	Minute	Latitude	Longitude	Depth (miles)	Magnitude or Intensity <sup>(2)</sup>
1921	02	25	20	00	44.4	-122.4	unknown	MMI = V
1930	07	19	02	38	45.0	-123.2	unknown	MMI = VI
1942	05	13	01	52	44.5	-123.3	unknown	MMI = V
1944	03	05	13	00	45.0	-123.4	unknown	MMI = V
1959	07	23	08	15	44.5	-124.5	unknown	M = 4.3
1959	08	21	00	28	44.8	-124.7	41.0	M = 4.6
1961	08	19	04	56	44.7	-122.5	20.5	M = 4.5
1963	03	07	23	53	44.9	-123.5	20.5 to 29.2	$M_{\rm b}~=~4.6$
1993	03	25	13	34	45.0	-122.6	12.8	$M_{c/d} = 5.6$
2004	07	12	16	45	44.3	-124.5	16.1 to 17.9	$M_{d} = 4.9$
2004	08	19	06	06	44.7	-124.3	17.0 to 17.3	$M_{c/d} = 4.7$
2015	07	04	15	42	44.1	-122.8	5.0	ML = 4.1

Table 2D. Historic Earthquakes Within a  $\pm$  50-mile Radius of Alsea<sup>(1)</sup>

<sup>(1)</sup> The site is located at Latitude 44.380803, Longitude -123.594695.

<sup>(2)</sup> M = unspecified magnitude, M<sub>b</sub> = compressional body wave magnitude, M<sub>c</sub> = primary coda magnitude, M<sub>d</sub> = duration magnitude (also known as coda magnitude), M<sub>L</sub> = local Richter magnitude, and MMI = Modified Mercalli Intensity at or near epicenter.

Seismic events in Oregon were not comprehensively documented until the 1840s (Wong and Bott, 1995). Earthquake epicenters located in Oregon from the late 1920s to 1962 were limited due to the number of and the distance between seismographs, the number of recording stations, and uncertainty in travel times. Therefore, information recorded during that time suggests only earthquakes with magnitudes >5would be recorded in Oregon (Bela, 1979). Oregon State University (OSU) likely had the first station installed in 1946, and the first modern seismograph was installed at OSU in 1962 (Wong and Bott, 1995; Barnett et al., 2009). According to Wong and Bott (1995), seismograph stations sensitive to smaller earthquakes ( $M_{\perp} \leq 4$  to 5) were not implemented in northwestern Oregon until 1979 when the University of Washington expanded their seismograph network to Oregon. The local Richter magnitude ( $M_L$ ) of events occurring before the establishment of seismograph stations have been estimated based on correlations between magnitude and MMI. Some discrepancy exists in the correlations.

Table 3D summarizes distant, strong earthquakes felt in the Alsea area (Noson et al., 1988; Bott and Wong, 1993; Stover and Coffman, 1993; Wong and Bott, 1995; Dewey et al., 2002). None of these events caused significant, reportable damage in Alsea or the surrounding area.

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Earthquake	Modified Mercalli Intensities (MMI)
2001 Nisqually, Washington	ll to III
1965 Seattle – Tacoma, Washington	I to IV
1962 Portland, Oregon	I to IV
1949 Olympia, Washington	V
1873 Crescent City, California	V

#### Table 3D. Distant Earthquakes Felt in the Alsea Area

#### Seismic and Geologic Hazards

Section 1803.7 of the OSSC 2019 requires the evaluation of risks from a range of seismic hazards including landslides (slope stability), earthquake-induced landslides, liquefaction, lateral spread, seismic-induced settlement or subsidence, fault rupture, earthquake-induced flooding and inundation, and local ground motion amplification (OSSC, 2019).

We have developed conclusions regarding the seismic hazards based on the subsurface profiles encountered in our explorations at the project site. The conclusions are also based on our knowledge of the site geology, a review of previous geotechnical investigations performed in the area, and available geologic hazard maps (including information available from DOGAMI).

DOGAMI has completed geologic and seismic hazard studies, which include Benton County (Alsea) (Wang et al., 2001; Burns et al., 2008), and provides online hazard information through HazVu, LiDAR, and SLIDO viewers (DOGAMI, 2016, 2017, 2018).

The above-mentioned maps and references refer to some, but do not cover all of the seismic hazards. The reviewed information is only considered a guide and does not have precedence over site-specific evaluations. In the following sections, information from the available seismic hazard maps is provided along with our site-specific evaluations for comparison.

Landslides and Earthquake-Induced Landslides (Slope Stability). The existing topography at the site is a relatively flat bench above the North Fork Alsea River floodplain. No landslide or slope instability features are mapped on the site. DOGAMI's references, including LiDAR, also indicate no historic landslide inventory or mapped landslides at the site with low landslide susceptibility across most of the site and moderate landslide susceptibility along the transition band from the flat bench to the floodplain (Wang et al., 2001; Burns et al., 2008; DOGAMI, 2016, 2017, 2018). Therefore, there is no risk of landslides or earthquake-induced landslides at the site.

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*Liquefaction, Settlement, and Lateral Spread*. Soil liquefaction occurs when loose, saturated cohesionless soil experiences a significant loss of strength during strong ground shaking. The strength loss is associated with rapid densification of the soil and corresponding development of high pore water pressure, which can lead to the soil behaving like a viscous fluid. Liquefiable soils typically consist of saturated, loose, clean sand and non-plastic to low plasticity silt with a plasticity index (PI) less than 8.

The explorations on-site encountered stiff, medium to high plasticity clayey silt grading to dense silty gravel, some sand (alluvium) extending to  $\pm 16.5$  feet, and residual soil grading to silty sandstone encountered to the maximum depth of the boring ( $\pm 30$  feet). The fine-grained alluvium and residual soil is not liquefiable due to their stiffness and plasticity and the silty gravel is not liquefiable due to its density and coarse gradation. Due to the lack of liquefiable material, the risk of liquefaction impacting the site is nil. The DOGAMI references indicate a moderate liquefaction susceptibility in the project area; (Wang et al., 2001; Burns et al., 2008; DOGAMI, 2018). We presume that hazard mapping must have assumed sandy soil is present.

Lateral spread is a liquefaction-induced hazard, which occurs when soil or blocks of soil are displaced down slope or toward a free face (such as a riverbank) along a liquefied layer. The lateral spread hazard at this site is considered nil due to the absence of a liquefaction hazard. The active channel of the North Fork of the Alsea River is  $\pm$  350 feet to the southwest of the site.

<u>Subsidence</u>. Ground subsidence is a regional phenomenon resulting from a large magnitude CSZ earthquake. It occurs because the subduction of the oceanic crust beneath the continental crust compresses the continental crust and pushes it upward. Prior to the earthquake, the continental crust is held in this position by friction at the CSZ interface. When the earthquake occurs, that frictional bond breaks, allowing the continental crust to drop. The subsidence hazard map included in the Oregon Resilience Plan (OSSPAC, 2013), indicates the ground subsidence in the Alsea area during a  $M_w$  9 CSZ earthquake could be 1 to 2 feet. Ground subsidence cannot be mitigated. Therefore, it should be assumed the site and surrounding area could drop by up to 2 feet during a large magnitude CSZ earthquake.

*Fault Rupture.* The risk of fault rupture is expected to be low due to the lack of known active faulting beneath the site (Baldwin, 1955; Walker and Duncan, 1989; Personius et al., 2003; USGS, 2006b, a). The closest potentially active (Class A) crustal fault is the Owl Creek fault, which is  $\pm 19$  miles northeast of the site.

**Tsunami / Seiche/ Earthquake-Induced Flooding**. Tsunami are waves created by a largescale displacement of the seafloor due to earthquakes, landslides, or volcanic eruptions (Priest, 1995). Tsunami inundation does not apply to this site because Alsea is not on the Oregon Coast. Seiche (the back and forth oscillations of a water body during a seismic event) is also not a local hazard due to the absence of large bodies of water near the site.

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According to HazVu, there is localized flood potential for the Effective FEMA 100-year flood immediately to the south of the site within the floodplain of the North Fork of the Alsea River (DOGAMI, 2018). Earthquake-induced flooding related to the failure of other structures (e.g., dams) or shallow groundwater, and subsidence does not apply to the site.

Local Ground Motion Amplification. Ground motion amplification is the influence of a soil deposit on the earthquake motion. As seismic energy propagates up through the soil strata, the ground motion is typically increased (i.e., amplified) or decreased (i.e., attenuated) to some extent. Based on the presence of stiff fine-grained alluvium followed by dense coarse-grained alluvium followed by residual soil and sandstone, it is our opinion the amplification hazard is low and is consistent with an OSSC/IBC Site Class C (very dense soil/soft rock). The DOGAMI hazard studies indicate the amplification susceptibility for the site is low (NEHRP Site Class B) (Wang et al., 2001; Burns et al., 2008). The site is expected to experience severe ground shaking during a CSZ earthquake due to its proximity to the CSZ (DOGAMI, 2018). See the main report for more discussion on the site response.

#### **SEISMIC DESIGN**

#### **Design Earthquakes**

The OSSC 2019, Section 1803.3.2.1, requires the design of structures classified as essential or hazardous facilities and of major and special occupancy structures to address, at a minimum, the following earthquakes:

- Crustal: A shallow crustal earthquake on a real or assumed fault near the site with a minimum M<sub>w</sub> 6.0 or the design earthquake ground motion acceleration determined in accordance with the OSSC 2019 Section 1613.
- Intraplate: A CSZ intraplate earthquake with Mw of at least 7.0.
- Interface: A CSZ interface earthquake with a Mw of at least 8.5.

The design maximum considered earthquake ground motion maps provided in the OSSC 2019, are based on modified (risk-targeted) 2014 maps prepared by the USGS for an earthquake with a 2% probability of exceedance in 50 years (i.e., a  $\pm 2,475$ -year return period) for design spectral accelerations (USGS, 2014). The modifications include factors to adjust the spectral accelerations to account for directivity and risk.

The 2014 USGS maps were established based on probabilistic studies and include aggregate hazards from a variety of seismic sources. The USGS interactive deaggregation for a 2,475-year return period indicates the seismic hazard at the site is dominated by the CSZ, contributing  $\pm 86\%$  to the overall aggregate hazard. Crustal earthquakes were included in the studies but were not considered to be a principal seismic hazard at this site. The CSZ scenarios considered ranged from M<sub>w</sub> 8.7 to 9.3, located  $\pm 19$  to 44 miles west of the site.

The earthquake magnitudes and source-to-site distances used to generate the 2014 USGS maps satisfy the requirements of OSSC 2019. Seismic design parameters and design response spectrum are discussed in the Site Response Spectrum section of the main report and are shown in Figure 3A (Appendix A).

### CONCLUSION

Based on the findings presented herein, it is our opinion there are no geologic or seismic hazards that would preclude the design and construction of the proposed project. This site-specific seismic hazard investigation for the Alsea School District Building Renovations & Additions in Alsea, Oregon, was prepared by Brooke Running, R.G., C.E.G.

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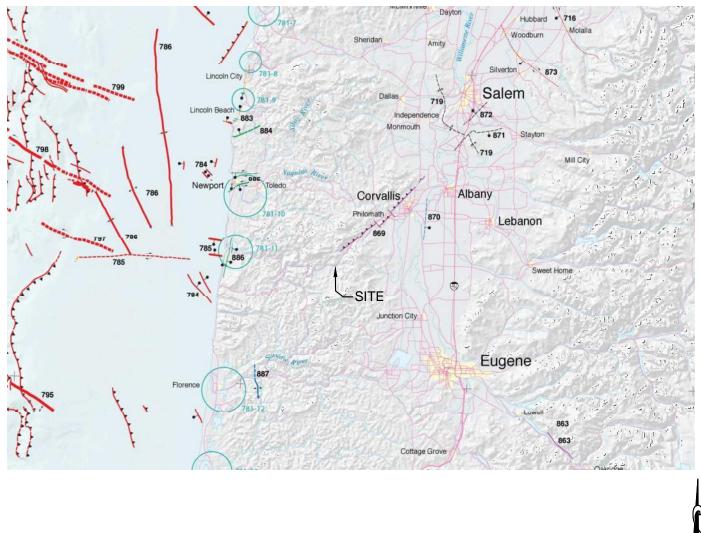
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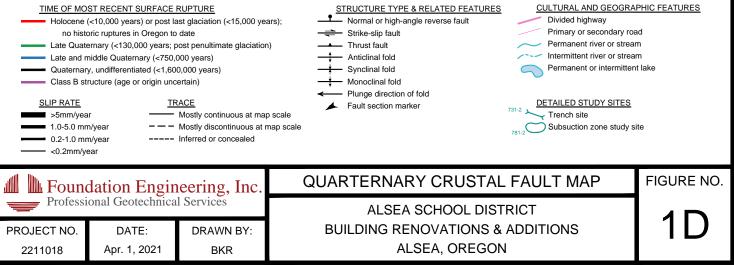
#### EXHIBIT 1 Page 51 of 51



#### NOTES:

- PORTION OF MAP BASED ON MAP OF QUATERNARY FAULTS AND FOLDS IN OREGON (PERSONIUS ET AL., 2003).
- SEE SITE-SPECIFIC SEISMIC HAZARD STUDY FOR A DISCUSSION OF LOCAL FAULTING. FAULTS: #784= CASCADE FOLD AND FAULT BELT; #785= UNNAMED OFFSHORE; #869 = CORVALLIS; #870 = OWL CREEK; #871 = TURNER AND MILL CREEK; #883= SILETZ BAY; #884 = CAPE FOULWEATHER; #885 = YAQUINA; AND #886 = WALDPORT.
- 3. MAP IS NOT TO SCALE.

#### MAP LEGEND:



# **Structural Calculations**

For

# Aslea SD - Hallway

Alsea, OR



NOTE: This Structural Calculation Package contains calculations for the Aslea SD - Hallway located in Alsea, OR. Wind loads, seismic loads, snow loads, and frost depth are per local jurisdiction requirements.

DATE: 20-Jan-2022

Job Number: 20-036.2



Derek Howard, PE 1202 Adams Avenue La Grande, OR 97850 541-786-5315 <u>dhoward@cbse.us</u>

0						
CB CB	SE, LLC			Date	Job N	lumber
1202	2 Adams Ave.		20-	Jan-2022		036.2
La G	rande, OR 97850					
Design Item				Pro	ject	
General Design Criteria				Aslea SD	- Hallway	
	BUILDING LOCA	TION, BUILDING CODE, S	OILS REPORT			
Project Location	Alsea, OR					
Latitude						
Longitude						
County	Bentong					
Building Code	OSSC	1				
Occupancy Category	111	Substantial Risk to Hum	an Life			1
Soils Report	N/A			Soil Bearin	g (psf)	2500
	١	WIND DESIGN CRITERIA				
Velocity of Wind	110		mph		1	
Exposure Category	C		inpi			
Mean Roof Height	18.0		ft			
Parapet Height (if applicable)	1010		ft			
Roof Slope	4.00 : 12					
Kzt	1		Topogra	phic factor (A	SCE7 26.8)	
Building Enclosure	Enclosed			ection 26.10)	,	
	SE	ISMIC DESIGN CRITERIA				
S <sub>s</sub> =	1.05					
S <sub>1</sub> =	0.56		Values t	aken for USGS	seismic ha	zard maps
Soil Site Class	D					
Importance Factor	1.25					
Seismic Design Category	D					
Structure Type	All Other	Structural Systems				
Seismic Force Resisting System						
		ne (wood) walls sheathed	with wood structu	ral panels rate	d for shear	resistance
Response Modification Factor	6.5	5				
· · · · · · · · · · · · · · · · · · ·	POOF		DIA			
	ROUF	FLOOR LIVE LOAD CRITE				
Mapped Ground Snow Load	20		psf		]	
Importance Factor	1.1				-	
Flat Roof Snow Load	20.00		psf			
Sloped Roof Snow Load	25.00		psf		]	
Roof Live Load	20.00		psf		]	
Floor Live Load	60.00		psf		1	
Training Room	100.00		psf			
	-00.00		221			

#### DEAD LOAD DESIGN CRITERIA

		= 00 (
	Asphalt shingles	5.00 psf
	19/32" or 5/8" Plywood - OSB	2.10 psf
S	Trusses	4.00 psf
ROOF DEAD LOADS	Sprinkler	1.50 psf
Č	HVAC	1.50 psf
Ľ	5/8" gypsum board	2.75 psf
		psf
< <	Thickness of insulation	<mark>12</mark> in
E E	fiberglass batt insulation	0.48 psf
		psf
ō	Miscellaneous Items	3 psf
ŏ	Adjustment for roof slope	· ·
Ř	Angle = 18.4 deg	
	Adjustment Factor = 1.05	
	Roof Dead Load	22.0 psf
	Kool Dead Load	22.0 psi
		2.60
	1 1/8" Plywood - OSB	3.60 psf
	Mortar Bed Thickness	1.5 in
S	Mortar Bed Weight	18.13 psf
	Floor I-joists	3.00 psf
Č	5/8" gypsum board	5.50 psf
L Z	Sprinkler	1.50 psf
FLOOR DEAD LOADS	HVAC	1.50 psf
A		psf
E E	fiberglass batt insulation	0.48 psf
	Thickness of insulation	12 in
Ц Н Н		
l X		psf
		psf
ш	Miscellaneous Items	4 psf
	Floor Dead Load	40.0 psf
	5/16" x 7-1/2" fiber cement lap siding	3.00 psf
<u> </u>	15/32" or 1/2" Plywood - OSB	1.70 psf
	2x6 @ 16" o.c.	1.70 psf
Ш	5/8" gypsum board	2.75 psf
		psf
		psf psf
ALL D		psf
MALL D ADS	Thickness of insulation	psf psf
R WALL D OADS	Thickness of insulation	psf psf 5.5 in
DR WALL D LOADS	Thickness of insulation loose cellulose insulation	psf           psf           5.5           0.77           psf
RIOR WALL D LOADS	loose cellulose insulation	psf           psf           5.5           0.77           psf           psf
ERIOR WALL D LOADS		psf           psf           5.5           0.77           psf
KTERIOR WALL DEAD LOADS	loose cellulose insulation	psf           5.5         in           0.77         psf           psf         psf
EXTERIOR WALL DI LOADS	loose cellulose insulation	psf           5.5         in           0.77         psf           psf         psf
	loose cellulose insulation Miscellaneous Items	psf           psf           5.5           0.77           psf           55           psf           5           5           5
	loose cellulose insulation	psf           5.5         in           0.77         psf           psf         psf
	Ioose cellulose insulation Miscellaneous Items Exterior Wall Dead Load (use 12psf minimum)	psf           5.5         in           0.77         psf           psf         5           5         psf
	Ioose cellulose insulation Miscellaneous Items Exterior Wall Dead Load (use 12psf minimum) 5/8" gypsum board	psf           5.5         in           0.77         psf           psf         5           5         psf
<u> </u>	Ioose cellulose insulation         Miscellaneous Items         Exterior Wall Dead Load (use 12psf minimum)         5/8" gypsum board         2x6 @ 16" o.c.	psf           psf           5.5           0.77           psf           psf           5           5           15.0
<u> </u>	Ioose cellulose insulation Miscellaneous Items Exterior Wall Dead Load (use 12psf minimum) 5/8" gypsum board	psf           psf           5.5           0.77           psf           5           5           5           15.0           psf           2.75           2.75
<u> </u>	Ioose cellulose insulation         Miscellaneous Items         Exterior Wall Dead Load (use 12psf minimum)         5/8" gypsum board         2x6 @ 16" o.c.	psf           psf           5.5           0.77           psf           5           5           15.0           psf           2.75           1.70           psf
<u> </u>	Ioose cellulose insulation         Miscellaneous Items         Exterior Wall Dead Load (use 12psf minimum)         5/8" gypsum board         2x6 @ 16" o.c.	psf           psf           5.5           0.77           psf           5           5           15.0           psf           2.75           1.70           psf           2.75           psf
<u> </u>	Ioose cellulose insulation         Miscellaneous Items         Exterior Wall Dead Load (use 12psf minimum)         5/8" gypsum board         2x6 @ 16" o.c.	psf           psf           5.5           0.77           psf           5           5           15.0           psf           2.75           1.70           psf           2.75           psf           2.75           psf           2.75           psf           2.75           psf           psf
<u> </u>	Ioose cellulose insulation         Miscellaneous Items         Exterior Wall Dead Load (use 12psf minimum)         5/8" gypsum board         2x6 @ 16" o.c.	psf           psf           5.5           0.77           psf           5           5           15.0           psf           2.75           psf           1.70           psf           2.75           psf           1.70           psf           2.75           psf           psf           psf           psf           psf           psf           psf
<u> </u>	Ioose cellulose insulation         Miscellaneous Items         Exterior Wall Dead Load (use 12psf minimum)         5/8" gypsum board         2x6 @ 16" o.c.         5/8" gypsum board	psf           psf           5.5           0.77           psf           5           5           15.0           psf           2.75           psf           2.75           psf           2.75           psf           2.75           psf           2.75           psf
<u> </u>	Ioose cellulose insulation         Miscellaneous Items         Exterior Wall Dead Load (use 12psf minimum)         5/8" gypsum board         2x6 @ 16" o.c.         5/8" gypsum board	psf           psf           5.5           0.77           psf           5           5           15.0           psf           2.75           psf           2.75           psf           2.75           psf           2.75           psf           2.75           psf
<u> </u>	Ioose cellulose insulation         Miscellaneous Items         Exterior Wall Dead Load (use 12psf minimum)         5/8" gypsum board         2x6 @ 16" o.c.         5/8" gypsum board	psf           psf           5.5           0.77           psf           5           5           15.0           psf           2.75           psf           2.75           psf           2.75           psf           2.75           psf           2.75           psf           0.77           psf
<u> </u>	Ioose cellulose insulation         Miscellaneous Items         Exterior Wall Dead Load (use 12psf minimum)         5/8" gypsum board         2x6 @ 16" o.c.         5/8" gypsum board         Thickness of insulation         Ioose cellulose insulation	psf           psf           5.5           0.77           psf           5           5           15.0           psf           2.75           psf           2.75           psf           2.75           psf           2.75           psf           2.75           psf
	Ioose cellulose insulation         Miscellaneous Items         Exterior Wall Dead Load (use 12psf minimum)         5/8" gypsum board         2x6 @ 16" o.c.         5/8" gypsum board	psf           psf           5.5           0.77           psf           5           5           15.0           2.75           psf           2.75           psf           2.75           psf           2.75           psf           psf
	Ioose cellulose insulation         Miscellaneous Items         Exterior Wall Dead Load (use 12psf minimum)         5/8" gypsum board         2x6 @ 16" o.c.         5/8" gypsum board         Thickness of insulation         Ioose cellulose insulation	psf           psf           5.5           0.77           psf           5           5           5           15.0           2.75           170           psf           2.75           1.70           psf           psf           5           1.70           psf
ĒX	Ioose cellulose insulation         Miscellaneous Items         Exterior Wall Dead Load (use 12psf minimum)         5/8" gypsum board         2x6 @ 16" o.c.         5/8" gypsum board         Thickness of insulation         Ioose cellulose insulation	psf           psf           5.5           0.77           psf           5           5           15.0           psf           2.75           psf           2.75           psf           2.75           psf           2.75           psf           2.75           psf
	Ioose cellulose insulation         Miscellaneous Items         Exterior Wall Dead Load (use 12psf minimum)         5/8" gypsum board         2x6 @ 16" o.c.         5/8" gypsum board         Thickness of insulation         Ioose cellulose insulation	psf           psf           5.5           0.77           psf           5           5           15.0           2.75           psf           2.75           1.70           psf           2.75           psf           1.70           psf           psf           psf           psf           0.75           psf
	Ioose cellulose insulation         Miscellaneous Items         Exterior Wall Dead Load (use 12psf minimum)         5/8" gypsum board         2x6 @ 16" o.c.         5/8" gypsum board         Thickness of insulation         Ioose cellulose insulation	psf           psf           5.5           0.77           psf           5           5           5           15.0           2.75           170           psf           2.75           1.70           psf           psf           5           1.70           psf

	<b>SSE, LLC</b> 2 Adams Ave. Grande, OR 97850	Date 20-Jan-2022	Job Number 20-036.2
Design Item	Applicable Codes	Pro	oject
Snow Load Calculations	ASCE 7-10	Aslea SD	- Hallway

Ground Snow Load	=	20	psf	
Roof Slope	=	4 :12	=	18.4 deg

#### - Determine Roof Thermal Factor, C<sub>t</sub>, Table 7-3

(	Choose Cor	ndition:	2	C <sub>t</sub> =	1.10	Cold Roof		
	1)	- All structur	es except as	indicated be	low			1
	2)		R-value) betw			with cold, ventilated roofs in which the there ce and the heated space exceeds 25 $^{\circ}F \times h \times$		1.1
	3)	- Unheated	and open air	structures 1	.2			1.2
	4)	- Structures	intentionally	kept below	freezing 1.3	3		1.3
	5)		sly heated gr Btu (0.4 K × n		with a roof	having a thermal resistance (R-value) less th	han 2.0	0.85
			of the struct b) Greenhou	cure. uses with a co	onstantly m	entative of the anticipated conditions during naintained interior temperature of 50 °F (10 ng winters and having either a maintenance	°C) or m	ore at any
ine	Roof Slope	e Factor, C.	•		ture alarm	system to provide warning in the event of a		,

- Determine Roof Slope Factor, C. Roof Slope =

 $c$ hoor slope ractor, $c_s$	Kool Slope	-	55.6 ueg	C <sub>s</sub> -	1.00	
Warm	n Roofs With C <sub>t</sub> <u>&lt;</u> 1.0		Warm	n Roofs With	C <sub>t</sub> <u>=</u> 1.1	
θ <u>&lt;</u> 30 deg	C <sub>s</sub> =		θ <u>&lt;</u> 37.5 deg	C <sub>s</sub> =		
30 deg < θ <u>&lt;</u> 70 deg	C <sub>s</sub> = 1 - Slope (1 / 40)	0.75	37.5 deg < θ <u>&lt;</u> 70 deg	C <sub>s</sub> = 1 - Slop	e (1 / 32.5)	0.93
θ > 70 deg	C <sub>s</sub> =		θ > 70 deg	C <sub>s</sub> =		
Warm	n Roofs With C <sub>t</sub> <u>=</u> 1.2					
θ <u>&lt;</u> 45 deg	C <sub>s</sub> =	1.0	1			
45 deg < θ <u>&lt;</u> 70 deg	C <sub>s</sub> = 1 - Slope (1 / 25)					
θ > 70 deg	C <sub>s</sub> =					
		-				

- Determine Roof Exposure Factor,  $\mathrm{C}_{\mathrm{e}}$  , Table 7-2 C<sub>e</sub>= 0.9

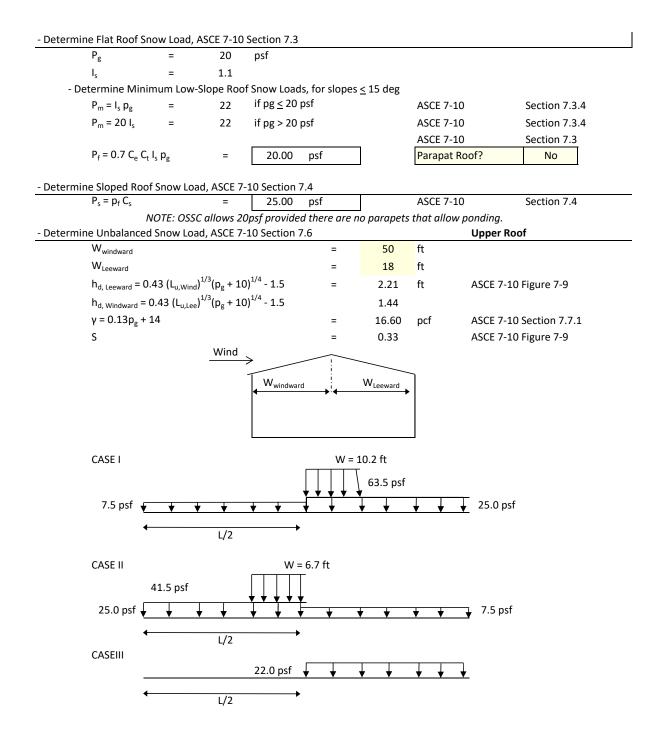
		Exposu	re of Roof <sup>a</sup> =	Fully Exposed
Sruface Roughness Category =	С	Fully Exposed	Partially Exposed	Sheltered
B) (see Section 26.7)		0.9	1	1.2
C) (see Section 26.7)		0.9	1	1.1
D) (see Section 26.7)		0.8	0.9	1
E) Above the treeline in windswept m	nountainous areas	. 0.7	0.8	N/A
F) In Alaska, in areas where trees do ( (3-km) radius of the site.	not exist within a	2-mile 0.7	0.8	N/A

a) The terrain category and roof exposure condition chosen shall be representative of the anticipated conditions during the life of the structure. An exposure factor shall be determined for each roof of a structure.

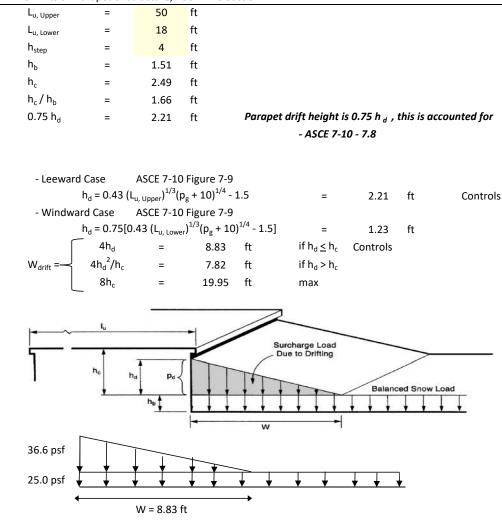
b) Defnitions: Partially Exposed: All roofs except as indicated in the following text. Fully Exposed: Roofs exposed on all sides with no shelter<sup>b</sup> afforded by terrain, higher structures, or trees. Roofs that contain several large pieces of mechanical equipment, parapets that extend above the height of the balanced snow load (h<sub>b</sub>), or other obstructions are not in this category. Sheltered: Roofs located tight in among conifers that qualify as obstructions.

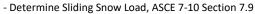
c) Obstructions within a distance of  $10h_o$  provide "shelter," where  $h_o$  is the height of the obstruction above the roof level. If the only obstructions are a few deciduous trees that are leafless in winter, the "fully exposed" category shall be used. Note that these are heights above the roof.

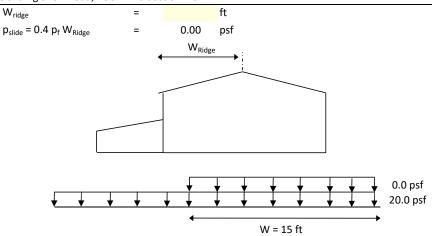
d) Heights used to establish the Exposure Category in Section 26.7 are heights above the ground.



- Determine Drifts on Parapet of Structure, ASCE 7-10 Section 7.7.1







Ca	CBSE, L 1207 Adams						Date 20-Jan-2022	Job Number 20-036.2
ľ.	La Grande, C							
	Design Item			Applicable Codes			Project	
	Beam Calculations			NDS			Aslea SD - Ha	llway
DEAD LOADS           WDL, roof =           WDL, wall =           WDL, mech =           WDL, floor, suite =           Foundation Pressure           q <sub>soll</sub> =         2500	22.0 psf 15.0 psf psf 40.0 psf -10.0 psf	LIVE LOADS w <sub>SL</sub> = w <sub>SL,Drift</sub> = W <sub>LL,roof</sub> = w <sub>LL,mech</sub> =	25.0 36.64 20.0 60.0 100.0	psf psf Acts From psf psf psf	0 to 9	ft		
Point Load Allowed v h <sub>footing</sub> = q <sub>P,Allow</sub> = q <sub>P,Allow</sub> = q <sub>P,Allow</sub> =	v/Out Pad Footing 24 in 10000 lb 15000 lb 25000 lb	@ 12 @ 18 @ 30	in. perimeter footing in. perimeter footing in. perimeter footing					
BM #01           L=         8           Trib         1.00           DL <sub>floor</sub> =         9           DL <sub>wall</sub> =         9           DL <sub>Mech</sub> =         9           SL =         1.00           SL =         1.00           SL origit =         1.00           SL print =         1.00           Pol =         1.00	ft     + Sft       Total       ft     22       ft     0       ft     0       ft     25       ft     0	plf plf plf plf plf plf plf plf lb lb lb	2x6 DF#2 @ Lt DL = LL,floor = SL = LL,roof = TL = Ftg =	9 16" o.c.         eft Reactions         76.5       lb         83.25       lb         160       lb         160       lb         4       in	Middle           DL =         199.5           LL,floor =         122.25           LL,roof =         12.25           TL =         412           Ftg =         5	lb lb lb lb in	DL = LL,floor = SL = LL,roof = TL = Ftg =	Right Reactions 30.75 Ib Ib 45 Ib 1b 76 Ib 3 in
P <sub>LL,Roof</sub> = BM #02 L= 10 Trib DL <sub>Roof</sub> = DL <sub>floor</sub> = DL <sub>wall</sub> = DL <sub>wall</sub> = SL = SL = SL = SL = SL = LL <sub>Roof</sub> = LL <sub>Roof</sub> = LL <sub>Roof</sub> = LL <sub>Mech</sub> = P <sub>DL</sub> = P <sub>DL</sub> = P <sub>SL,Roof</sub> = SL,Roof = SL,Roof = SL =	ft	lb plf plf plf plf plf plf plf lb lb lb	(2)2x10 DL = LL,floor = SL = LL,roof = TL = Ftg =	eft Reactions 420 Ib Ib Ib 417 Ib Ib 837 Ib 7 in	DL =         Middle           DL,floor =	lb lb lb lb in	DL = LL,floor = SL = LL,roof = TL = Ftg =	Right Reactions Ib Ib Ib Ib Ib Ib O Ib O Ib O Ib O Ib
P <sub>LL,Roof</sub> = <u>BM #03</u> L= 5.5 <i>Trrib</i> DL <sub>Roof</sub> = DL <sub>Floor</sub> = DL <sub>Wall</sub> = DL <sub>Wall</sub> = DL <sub>Wall</sub> = SL = SL = SL <sub>Driff</sub> = LL <sub>Roof</sub> = LL <sub>Roof</sub> = LL <sub>Roof</sub> = LL <sub>Mech</sub> = P <sub>DL</sub> = P <sub>DL</sub> = P <sub>LL,Floor</sub> = - - - - - - - - - -	ft ft Tota/ ft 76.5 ft 0 ft 0 ft 0 ft 83 ft 0 ft 0	lb plf BM#1, BM#2 plf plf plf BM#1, BM#2 plf plf plf plf lb lb	DL = LL,floor = SL =	eft Reactions 224 Ib Ib 230 Ib Ib 454 Ib 6 in	DL =	lb lb lb lb in	DL = LL,floor = SL = LL,roof = TL = Ftg =	Right Reactions Ib Ib Ib Ib Ib Ib Ib O Ib O Ib O Ib O Ib
P <sub>SL,Roof</sub> = P <sub>LL,Roof</sub> = <u>BM #04</u> L= <u>8</u> <i>Trib</i>	ft ft Total	lb Ib	<b>5-1/8 X 6 G</b>	L eft Reactions	Middle		] [	Right Reactions

ft	199.5	plf
ft	0	plf
ft	0	plf
ft	0	plf
ft	212	plf
ft	0	plf
ft		lb
	ft           ft	ft         0           ft         0           ft         0           ft         212           ft         0           ft         0

DL =	833	lb
LL,floor =		lb
SL =	852	lb
LL,roof =		lb
TL =	1685	lb
Ftg =	10	in

DL =		lb
LL,floor =		lb
SL =		lb
LL,roof =		lb
TL =	0	lb
Ftg =	0	in

	1			I	I		
lb	DL =		lb		DL =		lb
lb	LL,floor =		lb		LL,floor =		lb
lb	SL =		lb		SL =		lb
lb	LL,roof =		lb		LL,roof =		lb
lb	TL =	0	lb	1	TL =	0	lb
in	Ftg =	0	in	1	Ftg =	0	in
				•			



COMPANY

Jan. 19, 2022 08:53 Roof Joist

# **Design Check Calculation Sheet**

WoodWorks Sizer 2019 (Update 4)

Total Defl'n

0.13 = L/762

Load	Туре	Distribution	Pat-	Location	[ft]	Magnitud	le	Unit
			tern	Start	End	Start	End	
Load1	Dead	Full Area	No			22.00(16.	0")	psf
Load2	Snow	Full Area	Yes			25.00(16.	0")	psf
Self-weight	Dead	Full UDL	No			2.0		plf

# Maximum Reactions (lbs), Bearing Capacities (lbs) and Bearing Lengths (in) :

	1		— 13.042' ———		
	<b>O'</b>		8'		13'
Unfactored: Dead Snow	102 111			66 83	41 60
Factored: Total Bearing:	213		5-	49	100
Capacity Joist Support Des ratio Joist Support Load comb Length Min req'd Cb Cb min Cb support Fcp sup *Minimum bearin		sed: 1/2" for end supports a d by the required width of th	0. 0. 0.5 0.47 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.	94 #2 0* ** 75 75 25 25 25 Jipports	469 586 0.21 0.17 #4 0.50 0.50 1.00 1.00 1.25 625
	f joist spaced at 10	Lumber-soft, D.Fir-L, No Supports: All - Timber-so 6.0" c/c; Total length: 13.06 ottom = at end supports; Re help This section PASSES the	oft Beam, D.Fir-L No. '; Clear span: 7.938', epetitive factor: applie );	2 4.938'; Volume = 0.7 cu.ft ed where permitted (refer t	
Analysis vs. <i>F</i>	Ilowable Stre	ss and Deflection usin	g NDS 2018 :		
Criterion Shear Bending(+) Bending(-) Live Defl'		50     Fv' = 207       549     Fb' = 1547       628     Fb' = 924       L/999     0.40 = L/2	psi psi psi 40 in	Analysis/Design fv/Fv' = 0.24 fb/Fb' = 0.36 fb/Fb' = 0.68 0.14	

L/180

in

0.53 =

0.24

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WoodWorks® Sizer
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WoodWorks® Sizer 2019 (Update 4)

# Page 2

Additiona	I Data:										
FACTORS:		) CD	CM	Ct	CL	CF	Cfu	Cr	Cfrt	Ci	LC#
	180		1.00	1.00	-	_	-	-	1.00	1.00	2
Fb <b>'</b> +	900	1.15	1.00	1.00	1.000	1.300	-	1.15	1.00	1.00	3
Fb'-	900	1.15	1.00	1.00	0.597	1.300	-	1.15	1.00	1.00	2
Fcp'	625	-	1.00	1.00	-	-	-	-	1.00	1.00	-
E'	1.6 mi	llion	1.00	1.00	-	-	-	-	1.00	1.00	3
Emin'	0.58 mi	llion	1.00	1.00	-	-	-	-	1.00	1.00	3
CRITICAL L	OAD COM	IBINATIO	DNS:								
Shear	: LC #										
Bending(				patter	n: Ss)						
Bending(											
Deflecti											
				-		(total					
Bearing						ittern:	Ss)				
		ort 2									
		ort 3	- LC #	4 = D	+ S (pa	ittern:	sS)				
D=dead S											
All LC's				-	-		_				
Load Pat											
Load com		ns: ASD	Basic	from	ASCE 7-	-16 2.4	/ IBC	2018 1	605.3.	1	
CALCULAT											
V max =		_	= 277	lbs; M	(+) = 3	846 lbs-	ft; M	(-) = 3	96 lbs	-ft	
-	33.27 lk										
"Live" d						loads (	live,	wind,	snow)		
Total de						~~ ~				_	
Lateral	stabilit	су(-):	Ĺu =	13.00'	Le =	23.94	RB =	26.5;	Lu bas	ed on	full span

# **Design Notes:**

1. Analysis and design are in accordance with the ICC International Building Code (IBC 2018) and the National Design Specification (NDS 2018), using Allowable Stress Design (ASD). Design values are from the NDS Supplement.

2. Please verify that the default deflection limits are appropriate for your application.

3. Continuous or Cantilevered Beams: NDS Clause 4.2.5.5 requires that normal grading provisions be extended to the middle 2/3 of 2 span beams and to the full length of cantilevers and other spans.

4. Sawn lumber bending members shall be laterally supported according to the provisions of NDS Clause 4.4.1.

#### Roof Joist



Total Defl'n

0.15 = L/810

0.50 =

L/240

in

0.30

Jan. 19, 2022 09:22 BM #02 - (2)2x10

# **Design Check Calculation Sheet**

WoodWorks Sizer 2019 (Update 4)

Туре	Distribution	Pat-	Location	[ft]	Magnituc	de	Unit
		tern	Start	End	Start	End	
Dead	Full UDL				77.0		plf
Snow	Full UDL				83.0		plf
Dead	Full UDL				6.6		plf
	Dead Snow	Dead Full UDL Snow Full UDL	Dead   Full UDL     Snow   Full UDL	Lern   tern   Start     Dead   Full UDL   Full UDL     Snow   Full UDL	Image: DeadFull UDLternStartEndSnowFull UDLFull UDLFull UDLFull UDL	Image: DeadFull UDLternStartEndStartDeadFull UDL77.0SnowFull UDL83.0	Image: DeadFull UDLternStartEndStartEndDeadFull UDL77.0SnowFull UDL83.0

# Maximum Reactions (lbs), Bearing Capacities (lbs) and Bearing Lengths (in) :

	1			10	0.042' ———		
	0'						10'
Unfactored:							
Dead	420						420
Snow	417						417
Factored:							
Total	836						836
Bearing:							
Capacity							
Beam	937						93
Support	1055						105
Des ratio							
Beam	0.89						0.8
Support	0.79						0.7
Load comb	#2						#
Length	0.50*						0.50
Min <sup>req'd</sup>	0.50*						0.50
Cb	1.00						1.0
Cb min	1.00						1.0
Cb support	1.13						1.1
Fcp sup	625						62
*Minimum bearii	ng length s	setting used: 1/2" f	or end supp	orts			
		Total length: Lateral supp	ts: All - Tim 10.06'; Clea port: top = a	ber-soft Be ar span: 9.9 t supports,	am, D.Fir-L 38'; Volume	No.2 = 1.9 cu.ft. supports;	
Analysis vs. A	Allowabl	le Stress and <b>E</b>					
-					1 77 2.4.	Analysis/Design	
Criterion		alysis Value	Design	Value	Unit		
Criterion Shear		fv = 38	Fv'=	207	psi	fv/Fv' = 0.18	
Criterion		-		207 702			

# WoodWorks® Sizer

#### SOFTWARE FOR WOOD DESIGN

BM #02 - (2)2x10

WoodWorks® Sizer 2019 (Update 4)

Page 2

Additional	Data:										
FACTORS:	F/E(psi	) CD	CM	Ct	CL	CF	Cfu	Cr	Cfrt	Ci	LC#
Fv'	180	1.15	1.00	1.00		-		-	1.00	1.00	2
Fb <b>'</b> +				1.00	0.616	1.100	-	1.00	1.00	1.00	2
Fcp'						-				1.00	-
Е'	1.6 mi	llion	1.00	1.00	-	-	-	-		1.00	
Emin'				1.00	-	-	-	-	1.00	1.00	2
CRITICAL LO											
Shear											
Bending(+											
Deflectio											
				(total							
Bearing											
D-deed C-		ort Z	– LC #	2 = D	+ 5						
D=dead S=		tod in	+ h a 7	n n 1	a aut mu	. <b>+</b>					
All LC's Load comb				-	-		/ TDC	2010 1	605 2	1	
		S: ASD	DaSIC	TTOU	ASCE /-	-10 2.4	/ IBC	2010 1	.003.3.	T	
		o o i an	_ 701	lba. M	(1) = 2	000 lba	£+				
V max = 8 EIy = 1	-			IDS; M	(+) = 2	.UOZ IDS	-IL				
-					n-dood	loode (	1100	wind	anow )		
"Live" de Total def						LUAUS (	TTVE,	wind,	5110W)		
Lateral s						18 631	PB -	30 3.	b = ci	nale n	lv width
Lacerar S	capilli	y(+);	ци —	10.00	пе –	TO.02	кв –	50.5;	D – SI	путе р	ry wrach

# **Design Notes:**

 Analysis and design are in accordance with the ICC International Building Code (IBC 2018) and the National Design Specification (NDS 2018), using Allowable Stress Design (ASD). Design values are from the NDS Supplement.
 Please verify that the default deflection limits are appropriate for your application.

3. Sawn lumber bending members shall be laterally supported according to the provisions of NDS Clause 4.4.1.

4. BUILT-UP BEAMS: it is assumed that each ply is a single continuous member (that is, no butt joints are present) and that each ply is equally top-loaded. Where beams are side-loaded, special fastening details may be required. 5. FIRE RATING: Joists, wall studs, and multi-ply members are not rated for fire endurance.



Jan. 19, 2022 09:23 BM #03 - (2)2x6

# **Design Check Calculation Sheet**

WoodWorks Sizer 2019 (Update 4)

Loads:	
--------	--

Load	Туре	Distribution	Pat-	Location	[ft]	Magnitud	de	Unit
			tern	Start	End	Start	End	
Load1	Dead	Full UDL				77.0		plf
Load2	Snow	Full UDL				83.0		plf
Self-weight	Dead	Full UDL				3.9		plf

# Maximum Reactions (lbs), Bearing Capacities (lbs) and Bearing Lengths (in) :

	<u>}</u>			5.542' ———		
	Q'					
	0'					5.5'
Unfactored: Dead	224					224
Snow Factored:	230					230
Total Bearing:	454					454
Capacity Beam Support	937 1055					937 1055
Des ratio Beam Support	0.48 0.43					0.48 0.43
Load comb Length Min req'd	#2 0.50* 0.50*					#2 0.50* 0.50*
Cb Cb min	1.00					1.00
Cb support Fcp sup	1.13 625					1.13 625
*Minimum beari	ng length	setting used: 1/2" f	or end supports			
		Suppor Total length: Lateral supp	bly, D.Fir-L, No.2, 5 ts: All - Timber-soft B 5.56'; Clear span: 5. port: top = at supports tion PASSES the de	eam, D.Fir-L N 438'; Volume = s, bottom = at si	o.2 0.6 cu.ft. upports;	
Analysis vs. A	Allowab	le Stress and D	Deflection using N	DS 2018 :		
Criterion Shear Bending(+) Live Defl' Total Defl'	n 0.	nalysis Value fv = 34 fb = 492 .03 = < L/999 .06 = < L/999	Design Value Fv' = 207 Fb' = 1267 0.18 = L/360 0.28 = L/240	Unit psi psi in in	Analysis/Design fv/Fv' = 0.16 fb/Fb' = 0.39 0.14 0.23	

# WoodWorks® Sizer

#### SOFTWARE FOR WOOD DESIGN

BM #03 - (2)2x6

WoodWorks® Sizer 2019 (Update 4)

Page 2

Additiona	I Data:										
FACTORS:	F/E(psi)	CD	СМ	Ct	CL	CF	Cfu	Cr	Cfrt	Ci	LC#
	180 1			1.00	-	-	-	-	1.00	1.00	2
	900 1				0.942	1.300	-	1.00	1.00	1.00	2
	625				-				1.00	1.00	-
Е'	1.6 mill 0.58 mill	ion	1.00	1.00	-	-	-	-	1.00	1.00	2
Emin'	0.58 mill	ion	1.00	1.00	-	_	-	-	1.00	1.00	2
CRITICAL L	OAD COMBIN	NATIO	NS:								
	: LC #2										
Bending(	+): LC #2	= D	+ S								
Deflecti	on: LC #2	= D	+ S	(live)							
	LC #2	= D	+ S	(total	)						
Bearing	: Suppor										
		t 2 -	· LC #	2 = D	+ S						
D=dead S											
	are liste			-	-						
	binations:	ASD	Basic	from	ASCE 7-	-16 2.4	/ IBC	2018 1	.605.3.	1	
CALCULAT	••••										
	451, V des	2		lbs; M	(+) = 6	520 lbs-	ft				
-	33.27 lb-i	-	-								
	eflection					loads (	live,	wind,	snow)		
	flection =										
Lateral	stability(	+):	Lu =	5.50'	Le = 1	.0.31'	RB = 2	17.4; k	) = sin	gle pl	y width

# **Design Notes:**

 Analysis and design are in accordance with the ICC International Building Code (IBC 2018) and the National Design Specification (NDS 2018), using Allowable Stress Design (ASD). Design values are from the NDS Supplement.
 Please verify that the default deflection limits are appropriate for your application.

3. Sawn lumber bending members shall be laterally supported according to the provisions of NDS Clause 4.4.1.

4. BUILT-UP BEAMS: it is assumed that each ply is a single continuous member (that is, no butt joints are present) and that each ply is equally top-loaded. Where beams are side-loaded, special fastening details may be required. 5. FIRE RATING: Joists, wall studs, and multi-ply members are not rated for fire endurance.



PROJECT

Jan. 19, 2022 09:25 BM #04 - 5.125 x 6

# **Design Check Calculation Sheet**

WoodWorks Sizer 2019 (Update 4)

Load	Туре	Distribution	Pat-	Location [ft]		Magnitude		Unit
			tern	Start	End	Start	End	
Load1	Dead	Full UDL				200.0		plf
Load2	Snow	Full UDL				212.0		plf
Self-weight	Dead	Full UDL				7.1		plf

# Maximum Reactions (lbs), Bearing Capacities (lbs) and Bearing Lengths (in) :

	/	8.042'	
	۱ 		
	۵'		 8'
Unfactored:			
Dead	833		833
Snow	852		852
Factored:			
Total	1685		1685
Bearing:			
Capacity			
Beam	1685		1685
Support	1739		1739
Des ratio	1 00		1.00
Beam	1.00		1.00
Support	0.97		0.97
Load comb	#2		#2
Length	0.51		0.51
Min req'd	0.51 1.00		0.51
Cb Cb min	1.00		1.00
Cb support	1.00		1.00
Fcp sup	625		625

# Glulam-Unbalan., West Species, 24F-V4 DF, 5-1/8"x6"

Supports: All - Timber-soft Beam, D.Fir-L No.2

Total length: 8.06'; Clear span: 7.938'; Volume = 1.7 cu.ft.; 4 laminations, 5-1/8" maximum width, Lateral support: top = at supports, bottom = at supports;

This section PASSES the design code check.

# Analysis vs. Allowable Stress and Deflection using NDS 2018 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	fv = 71	Fv' = 305	psi	fv/Fv' = 0.23
Bending(+)	fb = 1308	Fb' = 2743	psi	fb/Fb' = 0.48
Live Defl'n	0.12 = L/815	0.27 = L/360	in	0.44
Total Defl'n	0.29 = L/330	0.40 = L/240	in	0.73

# WoodWorks® Sizer

#### SOFTWARE FOR WOOD DESIGN

BM #04 - 5.125 x 6

WoodWorks® Sizer 2019 (Update 4)

Page 2

Additiona	al Data:											
FACTORS:	F/E(psi)	CD	CM	Ct	CL	CV	Cfu	Cr	Cfrt	Notes	Cvr	LC#
Fv'	265	1.15	1.00	1.00	-	-	-	-	1.00	1.00	1.00	2
Fb <b>'</b> +	2400	1.15	1.00	1.00	0.994	1.000	-	-	1.00	1.00	-	2
	650		1.00	1.00	-	_	-	-		-		-
	1.8 mil						-	-	1.00	-	-	
-	0.85 mil			1.00	-	_	-	-	1.00	-	-	2
	OAD COMB											
	: LC #2											
	(+): LC #2											
Deflecti	lon: LC #2			. ,								
				(total								
Bearing	: Suppo											
		ort 2	- LC #	2 = D	+ S							
D=dead S			L. L			- 1-						
	are list			-	-		/	0010 1		1		
	abinations	s: ASD	Basic	irom.	ASCE /-	-16 2.4	/ IBC	2018 1	605.3.	T		
CALCULAT	-		1 4 5	0 11		2252 1						
	1676, V d	2		8 Ibs;	M(+) =	= 3353 I	bs-it					
-	166.05 lb					1] . (	1 /					
	deflection					LOADS (	iive,	wind,	S110W)			
	eflection						- aa	с л				
Lateral	stability	'(+) <b>:</b>	⊥и =	8.00'	це = 1	14./5'	KB = (	0.4				
Decise N	- 4											

# **Design Notes:**

1. Analysis and design are in accordance with the ICC International Building Code (IBC 2018) and the National Design Specification (NDS 2018), using Allowable Stress Design (ASD). Design values are from the NDS Supplement.

2. Please verify that the default deflection limits are appropriate for your application.

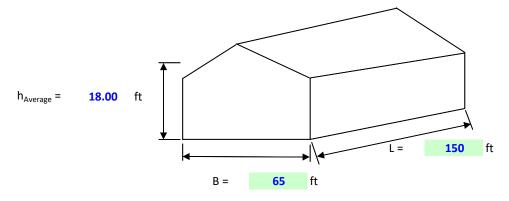
3. Glulam design values are for materials conforming to ANSI 117-2015 and manufactured in accordance with ANSI A190.1-2012

4. GLULAM: bxd = actual breadth x actual depth.

5. Glulam Beams shall be laterally supported according to the provisions of NDS Clause 3.3.3.

6. GLULAM: bearing length based on smaller of Fcp(tension), Fcp(comp'n).

		CBSE,	LLC		Date	Job Number
		1207 Adan	ns Ave.		20-Jan-2022	20-036.2
	Ð	La Grande,	, OR 9785	50		
	Design Item			Applicable Codes	Pro	ject
	Wind Load Calculatic	ons	OSSC 2014, ASCE 7-10		Aslea SD	- Hallway
•	cy Classification = cy Category =	Substantia III	l Risk to	Human Life		
Roof Slop		4	in/ft	18.4 deg		
V=		110	mph	Figure 26.5-1A		
	ocity Used in Calc =	110	mph		ed, data not available in A	ASCE 7 for spec'd speed
Exposure	:= 0 Exposure Categories,	C	ion 26 7	Sec. 26.7.3		
В	surface roughness, a than 1,500 ft. For bu	as defined by uildings with a s in the upwin	Surface F mean ro	ess than or equal to 30 ft, Roughness B, prevails in t oof height greater than 30 ion for a distance greater	he upwind direction for Oft, Exposure B shall ap	a distance greater ply where Surface
С	For all cases where I	Exposures B o	or D do no	ot apply.		
D	direction for a distant Exposure D shall also	nce greater th o apply where istance of 600	an 5,000 e the gro ) ft (183 i	ghness, as def ned by Surf ) ft (1,524 m) or 20 times und surface roughness im m) or 20 times the buildir evious sentence.	the building height, wh nmediately upwind of th	ichever is greater. ne site is B or C, and
Ν	Note.	e located in th vind forces sha		ion zone between exposu ed.	ire categories, the categ	gory resulting in the
Exc		-		ween the preceding categ by a rational analysis met		



I

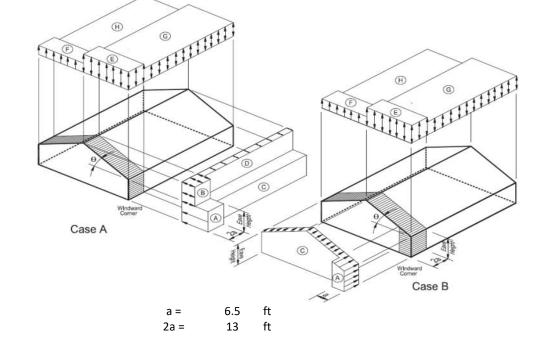
ASCE 7-10 N	AIN WIN	D FORCE RES	ISTING S	YSTEM
Values fror	1.29	20 l	Jpper Va	lue
pg. 305	1.21	15 L	ower Va	lue
λ=	1.26			
K <sub>zt</sub> =	1	Topographic	Factor,	Sec. 26.8.2
Values taker	n from Fig	ure 26.8-1		
А	P <sub>s30=</sub>	25.8	psf	End zone of wall
В	P <sub>s30=</sub>	-7.3	psf	End zone of roof
С	P <sub>s30=</sub>	17.2	psf	Interior zone of wall
D	P <sub>s30=</sub>	-4.1	psf	Interior zone of roof
Е	P <sub>s30=</sub>	-23.1	psf	End zone of windward roof
F	P <sub>s30=</sub>	-15.7	psf	End zone of leeward roof
G	P <sub>s30=</sub>	-16.0	psf	Interior zone of windward roof
Н	P <sub>s30=</sub>	-12.0	psf	Interior zone of leeward roof
Е <sub>ОН</sub>	P <sub>s30=</sub>	-32.3	psf	End zone of roof overhang
G <sub>OH</sub>	P <sub>s30=</sub>	-25.3	psf	Interior zone of roof overhang

1	
Net	Pressures

e	et Pressures					Pr
	А	P <sub>s=</sub>	32.5	psf	End zone of wall	21
	В	P <sub>s=</sub>	-9.2	psf	End zone of roof	32
	С	P <sub>s=</sub>	21.6	psf	Interior zone of wall	8
	D	P <sub>s=</sub>	-5.2	psf	Interior zone of roof	-20
	E	P <sub>s=</sub>	-29.1	psf	End zone of windward roof	
	F	P <sub>s=</sub>	-19.8	psf	End zone of leeward roof	
	G	P <sub>s=</sub>	-20.1	psf	Interior zone of windward roof	
	Н	P <sub>s=</sub>	-15.1	psf	Interior zone of leeward roof	
	Е <sub>ОН</sub>	P <sub>s=</sub>	-40.6	psf	End zone of roof overhang	
	G <sub>OH</sub>	P <sub>s=</sub>	-31.8	psf	Interior zone of roof overhang	

Pressures for Design 21.6 wall - Interior Zone

- 2.5 wall End Zone
- 8.0 roof
- -20.1 roof uplift

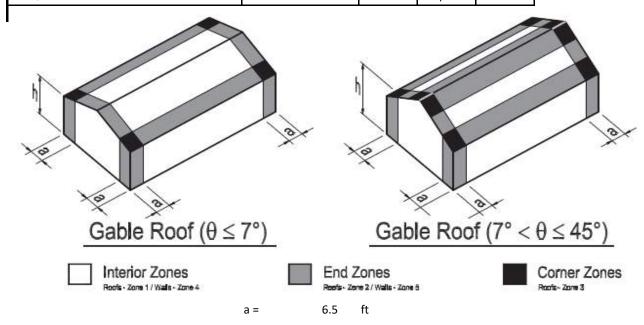


# ASCE 7-10 COMPONENTS AND CLADDING

		al Risk to Hu	uman Life					
Occupancy C			III					
Occupancy C	ategory	-	111					
V=		110	mph	pg. 247-250	D			
Exposure=		С		Sec. 26.7.3				
Roof Slope=		4	in/ft	18.4	deg			
Values from		1.29	20	Upper Valu	ie			
Fig. 30.5-1		1.21	15	Lower Valu	e			
λ=	1.26	-	-					
K <sub>zt</sub> =	1	Topograp	hic Factor,	Sec. 26.8.2				
h <sub>mean</sub> =	18	ft				L=	150	ft
			B =	65	ft			

Zone	Area	P <sub>net30</sub> (+)	P <sub>net30</sub> (-)	P <sub>net</sub> (+)	P <sub>net</sub> (-)	P <sub>net,MAX</sub>		
1	10	12.5	-19.9	15.7	-25.0	25.0	psf	Deef
1	20	11.4	-19.4	14.3	-24.4	24.4	psf	Roof
1	50	10	-18.6	12.6	-23.4	23.4	psf	Interior
1	100	8.9	-18.1	11.2	-22.8	22.8	psf	Zone
2	10	12.5	-34.7	15.7	-43.7	43.7	psf	
2	20	11.4	-31.9	14.3	-40.1	40.1	psf	Roof End
2	50	10	-28.2	12.6	-35.5	35.5	psf	Zone
2	100	8.9	-25.5	11.2	-32.1	32.1	psf	
3	10	12.5	-51.3	15.7	-64.5	64.5	psf	Roof
3	20	11.4	-47.9	14.3	-60.3	60.3	psf	
3	50	10	-43.5	12.6	-54.7	54.7	7 psf Zone	
3	100	8.9	-40.2	11.2	-50.6	50.6	psf	Zone
4	10	21.8	-23.6	27.4	-29.7	29.7	psf	
4	20	20.8	-22.6	26.2	-28.4	28.4	psf	Wall
4	50	19.5	-21.3	24.5	-26.8	26.8	psf	Interior
4	100	18.5	-20.4	23.3	-25.7	25.7	psf	Zone
4	500	16.2	-18.1	20.4	-22.8	22.8	psf	
5	10	21.8	-29.1	27.4	-36.6	36.6	psf	
5	20	20.8	-27.2	26.2	-34.2	34.2	psf	Wall End
5	50	19.5	-24.6	24.5	-30.9	30.9	psf	Wall End
5	100	18.5	-22.6	23.3	-28.4	28.4	psf	Zone
5	500	16.2	-18.1	20.4	-22.8	22.8	psf	

Γ	2 <sub>ОН</sub>	10	-40.6	-51.1	51.1	psf	
	2 <sub>0H</sub>	20	-40.6	-51.1	51.1	psf	Overhang
	2 <sub>0H</sub>	50	-40.6	-51.1	51.1	psf	End Zone
	2 <sub>0H</sub>	100	-40.6	-51.1	51.1	psf	
	3 <sub>OH</sub>	10	-68.3	-85.9	85.9	psf	
	<b>З</b> <sub>ОН</sub>	20	-61.6	-77.5	77.5	psf	Overhang
	<b>З<sub>ОН</sub></b>	50	-52.8	-66.4	66.4	psf	Corner Zone
	3 <sub>OH</sub>	100	-46.1	-58.0	58.0	psf	20110



			CBSE,				D	ate	Job Numb	
		2	1207 Adan	ns Ave.			20-la	n-2022	20-036.2	
	6 HB		La Grande		)		20 94		20 000.2	
	Ľ									
	Design	ltem		A	pplicable C	odes		Pi	roject	
Seismic	c Load Calcu	uations - AF	REA 1	OSS	SC 2014, ASC	CE 7-10	Aslea SD - Hallway			
Seismic Des	ign Criteria	a - IBC , AS	SCE7							
Latitude =		0	L	ongitude =	=	0				
h=	18.00	ft	Average h	eight of str	ucture					
Site Class=	D		_							
S <sub>S</sub> =	1.05	-	F <sub>a</sub> =	1.200		Table 11.4-1		•		
S <sub>1</sub> =	0.56	-	F <sub>v</sub> =	1.440	)	Table 11.4-2	-	g. 115		
S <sub>MS</sub> =	1.260	-				Equation 11.4				
S <sub>M1</sub> = S <sub>DS</sub> =	0.806 0.840	-				Equation 11.4 Equation 11.4				
-DS-	0.040	А				Equalion 11.4	+-3, µy. 113			
S <sub>D1</sub> = Occupency	0.538	g				Equation 11.4	4-4, pg. 115			
Category=	III					Table 1.1 AS	CE7-05, pg. 3	3		
I=	1.25					Table 11.5-1	ASCE7-05, p	g. 116		
Seismic Design										
Category=	D					Tables 11.6-1	1 2 ASCE7-0!	5 pg 116		
R=			e (wood) wa	alls sheath	ed with woo	d Table 12.2-1				
ρ=	1.3	-	, ,					-		
Structure Typ	All Other S	Structural S	ystems							
C <sub>t</sub> =	0.02	x=	0.75			Table 12.8-2	ASCE7-05, p	g. 129		
T <sub>a</sub> =	0.175	s				Equation 12.8	-7 ASCE7-05, pg. 129			
T <sub>L</sub> =	16					Figure 22-15	ASCE7-05, p	g. 228		
C <sub>s</sub> =	0.162					Section 12.8.	1.1, pg. 129			
k=	1									
LEVEL:	V	V <sub>x</sub>	ŀ	H <sub>x</sub>	W,	$_{x}(H_{x}^{k})$	C <sub>vx</sub>	F <sub>x</sub> = W	( C <sub>s</sub> ) (C <sub>vx</sub> )	
TOP				I.		_			_	
5	0	kips	0.00	ft.	0	kip-ft <sup>2</sup>	0.00	0.00	kips	
4	0	kips	0.00	ft.	0	kip-ft <sup>2</sup>	0.00	0.00	kips	
3	0.00	kips	0.00	ft.	0	kip-ft <sup>2</sup>	0.00	0.00	kips	
2	0.00	kips	0.00	ft.	0	kip-ft <sup>2</sup>	0.00	0.000	kips kips	
1 BASE	40.97	kips	9.00	ft.	369	kip-ft <sup>2</sup>	1.00	6.618	kips	
Sum=	41	kips			369	kip-ft <sup>2</sup>	1.00	6.62	kips	
- Oun-		мра	I		303	кір-П	1.00	0.02	Npo	
Notes:										

Type 4 of Table 12.3-2 ASCE7-05.

					Continued	d from previous page
		CBSE,	LLC		Date	Job Number
	1)	1207 Ada	ms Ave		20-Jan-2022	16-019.01
			e, OR 97850		20-Jd11-2022	10-019.01
	U		e, UN 9763U			
	Design Item		Appli	cable Codes	Pro	ject
Seismic	Load Calcuations -	AREA 1	OSSC 20	014, ASCE 7-10	Aslea SD	- Hallway
Level 3						
Roof Area=	ft <sup>2</sup>					
DL <sub>Roof</sub> =	22 psf					
W=	0 lb					
Wall Length=	ft	Exterior	Weight=	15 psf		
Wall Length=	ft	Interior	Weight=	10 psf		
H=	<mark>6</mark> ft	Half the p	late height			
VV=	0 lb					
Floor Area =	ft <sup>2</sup>					
DL <sub>Floor</sub> =	40 psf					
SL=	0 psf	Include 2	0% if Flat Roof	SL <u>&gt;</u> 30psf		
W=	0 lb					
Total W=	0 lb					
Level 2						
Roof Area=	ft <sup>2</sup>					
DL <sub>Roof</sub> =	22 psf					
VV=	0 lb					
Wall Length=	ft	Exterior	Weight=	15 psf		
Wall Length=	ft	Interior	Weight=	10 psf		
H=	12 ft					
W=	0 lb					
Floor Area =	ft <sup>2</sup>					
DL <sub>Floor</sub> =	20 psf			o		
SL=	0 psf	Include 2	0% if Flat Roof	SL <u>&gt;</u> 30psf		
W=	0 lb					
Total W=	0 lb					
Level 1	047 ft <sup>2</sup>					
Roof Area=	817 ft <sup>2</sup>					
DL <sub>Roof</sub> =	22 psf					
W= Wall Longth=	17984.85 lb	Extorior	Woight-	15 pof		
Wall Length= Wall Length=	163 ft 139 ft	Exterior Interior	Weight= Weight=	15 psf		
Wall Length= H=	6 ft	niterioi	Weight=	10 psf		
M=	22983 lb					
Floor Area =	22903 lb ft <sup>2</sup>					
DL <sub>Floor</sub> =	40 psf					
SL=	0 psf	Include 2	0% if Flat Roof	SL > 30psf		
W=	0 psi 0 lb			>		
Total W=	40968 lb					

			CBSE,	LLC			D	ate	Job Number
	111		1207 Adam	ns Ave.			20-la	n-2022	16-019.01
	Gup		La Grande,				20 34	11 2022	10 015.01
			,						
	Design I	tem		Ap	oplicable C	odes		Pı	roject
Seismio	c Load Calcu	ations - AR	REA 2	OSSO	C 2014, AS	CE 7-10		Aslea S	D - Hallway
Seismic Des									
_atitude =	C			ongitude =		0			
h=	18.00	ft	Average he	eight of stru	ıcture				
Site Class=	D		-						
S <sub>S</sub> =	1.05	•	F <sub>a</sub> =	1.2		Table 11.4-1		-	
S <sub>1</sub> =	0.56	-	F <sub>v</sub> =	1.44		Table 11.4-2		g. 115	
S <sub>MS</sub> =	1.260	-				Equation 11.4			
S <sub>M1</sub> =	0.806	-				Equation 11.4			
S <sub>DS</sub> =	0.840	-				Equation 11.4			
S <sub>D1</sub> =	0.538	g				Equation 11.4	4-4, pg. 115		
Occupency Category=						Table 4 4 4 5	057.05		
Jalegory=	III 1.25					Table 1.1 AS			
i= Seismic	1.25					Table 11.5-1	ASCE7-05, p	g. 116	
Design									
Category=	D					Tables 11.6-1	1,2 ASCE7-05	5, pg. 116	
R=	6.5	Light-fram	e (wood) wa	alls sheathe	ed with wo	d Table 12.2-1			
o=	1.3	-							
Structure Typ	All Other St	tructural Sy	/stems						
C <sub>t</sub> =	0.02	x=	0.75			Table 12.8-2	ASCE7-05, p	g. 129	
T <sub>a</sub> =	0.175	s				Equation 12.8	8-7 ASCE7-0	5, pg. 129	
T <sub>L</sub> =	16	s				Figure 22-15	ASCE7-05, p	g. 228	
C <sub>s</sub> =	0.162					Section 12.8.	1.1, pg. 129		
k=	1								
LEVEL:	W	/ <sub>x</sub>	H	l <sub>x</sub>	W	<sub>x</sub> (H <sub>x</sub> <sup>k</sup> )	C <sub>vx</sub>	F <sub>x</sub> = W	( C <sub>s</sub> ) (C <sub>vx</sub> )
TOP									
5	0	kips	0.00	ft.	0	kip-ft <sup>2</sup>	0.00	0.00	kips
4	0	kips	0.00	ft.	0	kip-ft <sup>2</sup>	0.00	0.00	kips
•	0	kips	0.00	ft.	0	kip-ft <sup>2</sup>	0.00	0.00	kips
3	0.00	kips	20.00	ft.	0	kip-ft <sup>2</sup>	0.00	0.000	kips
	0.00		10.00	ft.	0	kip-ft <sup>2</sup>	0.00	0.000	kips
3 2 1	0.00	kips					1	1	
3 2		kips			0	kip-ft <sup>2</sup>	0.00	0.00	kips

Type 4 of Table 12.3-2 ASCE7-05.

					Continued	l from previous page
	0	CBSE,	LLC		Date	Job Number
		1207 Adar	ns Ave.		20-Jan-2022	16-019.01
		La Grande	, OR 97850			
	Design Item		Appli	cable Codes	Pro	ject
Seismic L	oad Calcuations -	AREA 2	OSSC 20	014, ASCE 7-10	Aslea SD	- Hallway
Level 2						
Roof Area=	ft <sup>2</sup>					
DL <sub>Roof</sub> =	22 psf					
VV=	0 lb					
Wall Length=	ft	Exterior	Weight=	15 psf		
Wall Length=	ft	Interior	Weight=	10 psf		
H=	ft	Half the pl	ate height			
VV=	0 lb					
Floor Area =	ft <sup>2</sup>					
DL <sub>Floor</sub> =	40 psf					
SL=	0 psf	Include 20	% if Flat Roof	SL <u>&gt;</u> 30psf		
VV=	0 lb					
Total W=	0 lb					
Level 1						
Roof Area=	ft <sup>2</sup>					
DL <sub>Roof</sub> =	psf					
VV=	0 lb					
Wall Length=	ft	Exterior	Weight=	15 psf		
Wall Length=	<mark>0</mark> ft	Interior	Weight=	10 psf		
H=	ft	Half the pl	ate height			
W=	0 lb					
Floor Area =	ft <sup>2</sup>					
DL <sub>Floor</sub> =	40 psf					
SL=	0 psf	Include 20	% if Flat Roof	SL <u>&gt;</u> 30psf		
W=	0 lb					
Total W=	0 lb					

	(	CBSE, LLC	, LLC							Date	ą	Job Number	
		1207 Ada La Grand.	1207 Adams Ave. La Grande, OR 97850							20-Jan-2022	-2022	20-036.2	
	Desig	Design Item				Ap	Applicable Codes				Project		
	Lateral Evaluation - Area 4	uation - Area	4 e				ASCE 7-10				Aslea SD - Hallway	Ilway	
Seismic	Seismic Design Category	ory O.6	" C	#REF! +	0 fi	2							
		0.0		+ +	0.7	хш							
S <sub>DS</sub>	II	0.84					DL <sub>Wall</sub>	= 15	psf				
Wwall	II	22.0	psf				DL <sub>Roof</sub>	= 20	psf				
WEnd Zone	II II	33.0	psf										
WRoof	II	8.0	psf										
WUplift	II	-21.0	psf										
a	II	6.5	ft										
N-S Load Calcs									Wind	Saismic			
DL <sub>wall</sub> =	= 15	psf	Exterior		Wall Line	Trib. Width (ft)	Wall Area $(ft^2)$	Roof Area (ft²)	Force (kip)	Force (kip)			
II	= 389	sqft			1	14.50	94.3		2645	1604			
II		sqft			2	21.67	140.9		3953	2397			
11	= 10917				3	12.00	78.0		2189	1327			
F <sub>Seismic</sub> =					4	11.67	75.9		2129	1291			
				_					0	0			
									0	0			
					Total	59.84							
E-W Load Calcs													
									Wind	Seismic			
DL <sub>wall</sub> =	= 15	psf	Exterior		Wall Line	Trib. Width (ft)	Wall Area (ft²)	Roof Area (ft²)	Force (kip)	Force (kip)			
"		sqft							i0//I0#	#DIV/0!			
Ш	0	sqft							i0///0#	#DIV/0!			
II	= 2360					_			i0///I0#	#DIV/0!			
F <sub>Seismic</sub> =		ସ							i0///I0#	i0///I0#			

(

i0//10# i0//10#

0.00

Total

НОLD-DOWN DTT22-SDS2.5 HDU2-SDS2.5 HTT4 HTT4 HDU4-SDS2.5 HDU4-SDS2.5 HDU4-SDS2.5 HDU4-SDS2.5 HDU4-SDS2.5 HHDQ14-SDS2.5 HHDQ14-SDS2.5 HHDQ14-SDS2.5 HHDQ14-SDS2.5
---

GRID LINE '1' WALLS, OPENINGS, LOADS	<u>LOADS</u>	Wind LRFD	Seismic LRFD			Wind ASD	Seismic ASD			Type of Shear Wall Seismic Wall Shear, ASD	= = 0	Segmented 214	ented plf
F wall Line	II	2645	1604	۹ ا		1587	1123	q		Wind Wall Shear, ASD	II	302	plf
Uniform Wall Load Total Wall Length		504 5.25	306 ft	plt		303	214	plt					
	Length	Height	W <sub>DL</sub>	$P_{DL,1}$	×	$P_{DL,2}$	×	Edge	Anchor			Available	Required
	(ft) 5 35	(ft)	(plf)	(qI)	(ft)	(qI)	(ft)	Nail (in)	Bolt (in)	HOLD-DOWN	Anchor Bolt	Capacity (Ibs)	Capacity (lbs)
Wall UT	<b>۲.2.</b>	A	40					٥		5.22US-2UUH	551824	5/05	6862
Opening 01													
Wall 02													
Opening 02													
Wall 03													
Opening 03													
Wall 04													
Opening 04													
Wall 05													
Opening 05													
Wall 06													
Opening 06													
Wall 07													
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Opening 13													
Wall 14													
Opening 14													
Wall 15													
Opening 15													
Wall 16													
Opening 16													
Wall 17													

GRID LINE '2' WALLS, OPENINGS, LOADS	<u>LOADS</u>	Wind LRFD	Seismic LRFD			Wind ASD	Seismic ASD			Type of Shear Wall Seismic Wall Shear, ASD	= = Q	Segmented 347	
F wall Line	п	3953	2397	qI		2372		ସା		Wind Wall Shear, ASD		491	plf
Uniform Wall Load	П	819	497	plf		492	348	plf					
Total Wall Length	= Length	4.83 Height	ft w2	P <sub>2</sub> , 1	>	, G	>	Edaa	Anchor			Available	Raduirad
	(ft)	(ft)	(plf)	(lb)	, (ft)	(Ib)	, (ft)	Nail (in)	Bolt (in)	N/NOD-DOWN	Anchor Bolt	Capacity (lbs)	Capacity (lbs)
Wall 01	4.83	6	40					Э Э		HDQ8-SDS3	SSTB28	5517	4434
Opening 01													
Wall 02													
Opening 02													
Wall 03													
Opening 03													
Wall 04													
Opening 04													
Wall 05													
Opening 05													
Wall 06													
Opening 06													
Wall 07													
Opening 07													
Wall 08													
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Wall 10													
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Wall 11													
Opening 11													
Wall 12													
Opening 12													
Wall 13													
Opening 13													
Wall 14													
Opening 14													
Wall 15													
Opening 15													
Wall 16													
Opening 16									T				
Wall 17													

GRID LINE '3' WALLS, OPENINGS, LOADS	<u>LOADS</u>	Wind LRFD	Seismic LRFD			Wind ASD	Seismic ASD			Type of Shear Wall Seismic Wall Shear, ASD	= = Q	Segmented 192	
F wall Line	П	2189	1327	qI		1313		q		Wind Wall Shear, ASD		272	plf
Uniform Wall Load	II	454	275	plf		272	193	plf					
Total Wall Length	= Length	4.83 Height	ft w2	P	×	, Z	*	Frige	Anchor			Availahle	Required
	(ft)	(ft)	(plf)	(ql)	ť,	(ql)	ťft)	Nail (in)	Bolt (in)	N/NOD-DOM/N	Anchor Bolt	Capacity (lbs)	Capacity (lbs)
Wall 01	4.83	6	40					6		HDU2-SDS2.5	SSTB24	3075	2335
Opening 01													
Wall 02													
Opening 02													
Wall 03													
Opening 03													
Wall 04													
Opening 04													
Wall 05													
Opening 05													
Wall 06													
Opening 06													
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Wall 14													
Opening 14													
Wall 15													
Opening 15													
Wall 16													
Opening 16													
Wall 17													

GNID LINE + WALLS, OF EININGS, LOADS	<u>LOADS</u>	Wind	Seismic LRFD			Wind	Seismic ASD			Type of Shear Wall Seismic Wall Shear, ASD		Segmented 100	
F wall Line	П	2129		qI		1277	903	qI		Wind Wall Shear, ASD	11	142	plf
Uniform Wall Load	Ш	~	144	plf		142	101	plf					
Total Wall Length	=		ft	-	,	4	;	E d co	Achor			oldelionv	Docurrod
	(ft)	(ft)	(nlf)	(Ib)	× (ŧ)	(Ib)	× (ft)	Luge Nail (in)	Bolt (in)	NWOG-DIOH	Anchor Bolt	Canacity (lhs)	Canacity (lhs)
Wall 01	6	6	40	(~.)	(2.1)	12.1	6.1	9	1	No H.D. Required	0	0	832
Opening 01													
Wall 02													
Opening 02													
Wall 03													
Opening 03													
Wall 04													
Opening 04													
Wall 05													
Opening 05													
Wall 06													
Opening 06													
Wall 07													
Opening 07								_					
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Opening 13													
Wall 14													
Opening 14													
Wall 15													
Opening 15								_					
Wall 16													
Opening 16													
Wall 17									_				

# Pre-Renovation Asbestos Survey Report

Alsea School District 301 S 3rd Street Alsea, OR 97324

Prepared for:

# **Straightline Architects**

General Information	1.1
Inspection Summary	1.2
Survey Drawings	2.1
Sample Inventories	3.1
Laboratory Data	Not Numbered
AHERA Certificates	Not Numbered



March 2021 Project No.: 27217.000 Phase No.: 0001

4412 S Corbett Avenue, Portland, OR 97239 503.248.1939 Main 866.727.0140 Fax 888.248.1939 Toll-Free

PBSUSA.COM

#### **GENERAL INFORMATION**

#### **BUILDING DATA**

Alsea School District 301 S 3rd Street Alsea, OR 97324

#### CLIENT DATA

Straightline Architects 4521 S Cloverdale Road, Suite 102 Boise, ID 83709

#### **BACKGROUND INFORMATION**

#### **SURVEY SCOPE**

PBS Engineering and Environmental Inc. (PBS) has performed a pre-renovation asbestos survey of accessible building areas in accordance with OSHA in 29 CFR 1910.1001 and compiled a report with the following information:

- The type, location, and approximate quantity of suspect asbestos-containing materials
- Bulk sampling of selected suspect building materials
- Inspection summary
- Floor plan diagrams indicating material and sample locations
- · Laboratory analytical data of bulk material sampled

With regard to asbestos, PBS endeavored to locate all the suspect asbestos-containing materials in the building; however, suspect asbestos-containing materials may be present and concealed within wall, ceiling, or floor spaces. If suspect materials are uncovered during demolition activities that are not identified in this report, testing should be performed prior to impact.

PBS has conducted a physical inspection of the building, compiled this report consistent with the survey scope, and certifies that the information is correct and accurate within the standards of professional quality and contractual obligations.

Rich Dufresne Project Manager Accreditation #: IMR-20-0264A Sean Grabiner Prime Inspector Accreditation #: IRO-21-4508B

Signature

Date

Signature

Date

 $\ensuremath{\mathbb{C}}$  2021 PBS Engineering and Environmental Inc.



DATES	SURVEYED BY	ACTIVITY
2/22/2021	Sean Grabiner	Inspect and Sample

PBS has investigated accessible areas inside of the buildings to locate suspect asbestos-containing building materials (ACBM). Suspect materials may be present in concealed areas (e.g., behind walls and under carpet). The findings are listed below.

#### **ASBESTOS MATERIALS**

The following materials either tested positive, or, based on the experience of PBS field personnel, were not tested and should be considered asbestos-containing. Materials that had mixed results are considered positive. Materials not sampled may contain asbestos and should be tested to verify asbestos content prior to impact through demolition, renovation, etc. (+) Tested Positive, (M) Mixed Results, (P) Presumed Positive, (T) Previously Tested Positive.

See sample inventory for specific results.

<u>Resu</u>	<u>lts</u>	Material Description	Location	<u>Details</u>
(+)	2% to 4%	Red 9" Vinyl Floor Tile/Mastic	Elementary and high school hallways, custodial rooms	1,170 SF
				Non-friable
				Good
		Respon	se Action: Remove as necessary to facilitate	building improvements
(+)	<1%	Floor Tile Mastic	Staff breakroom	425 SF
				Non-friable
				Good
		Respons	se Action: Remove as necessary to facilitate	building improvements
(M)	<1%	Joint Compound on Wallboard	Throughout	NOT QUANTIFIED
				Non-friable
				Good
(+)	<1%	Balck Wall Mastic	Boiler room wall	20 SF
				Non-friable
				Good
		Respons	se Action: Remove as necessary to facilitate	building improvements
(M)	<1%	Window Glazing Compound	Boys locker room	1 EA
				Friable
				Good



#### MATERIALS THAT TESTED NEGATIVE FOR ASBESTOS

The following materials tested negative based on ASHARA sampling minimums and testing by NVLAP participating laboratories. Although no asbestos was detected, it is possible that further sampling could indicate asbestos content. It may be prudent to test prior to impact through demolition, renovation, etc.

<u>Material (type)</u>	Location
Ceramic Tile/Grout	Locker rooms, special education office, restrooms
CMU Mortar	Throughout
Concealed Grid Ceiling Tile	Custodial room
Covebase/Mastic Gray 6"	Staff breakroom restroom
Covebase/Mastic, 4" Gray	Special education office
Covebase/Mastic, Blue 4"	Staff breakroom
Paper Felt/Vapor Barrier	Play barn
Pipe Insulation	Various locations throughout
Poured Flooring/Epoxy Flooring	Near computer lab
Sheet Floor Covering, Beige Pebble Pattern	Staff breakroom
Sheet Floor Covering, Gray	Hallway
Sheet Floor Covering, White	Custodial room
Sink Undercoating	Staff breakroom
Stair Tread	Stage
Vinyl Floor Tile/Mastic, 12" Tan	High school kitchen classroom
Vinyl Floor Tile/Mastic, 12" Tan	Special education office
Vinyl Floor Tile/Mastic, 12" White	High school kitchen classroom, computer lab
Vinyl Floor Tile/Mastic,12" Gray	Hall outside staff breakroom
Window Glazing Compound	Exterior windows
Yellow Carpet Mastic	Various locations
Yellow Wainscot Mastic	Staff breakroom

## BACKGROUND

On February 22, 2021, PBS performed a limited pre-renovation asbestos survey of the Alsea School located at 301 S 3rd Street in Alsea, Oregon. The survey was requested by Straightline Architects in anticipation of renovation.

The purpose of the survey was to locate, identify, and quantify accessible friable and non-friable asbestoscontaining building materials that may be impacted by the planned new additions and remodel project.

Only those portions of the school buildings that are expected to be impacted by the planned additions and remodel project as identified on drawings provided by Straightline Architecture on February 10, 2021, were included in this survey. Asbestos-containing building materials are known to exist in other portions of the building that are not included in the scope of this investigation.

The survey is intended to satisfy the Oregon Department of Environmental Quality (DEQ) requirements to perform an asbestos inspection prior to renovation or demolition activities under Oregon Administrative Rule (OAR) 340-248-0270 and Occupational Safety and Health Administration (OSHA) hazard communication.

This survey report is not suitable nor is it intended to be used as an asbestos abatement project design or an abatement bid document.

#### **ASBESTOS SUMMARY**

The buildings were inspected by a PBS Asbestos Hazard Emergency Response Act (AHERA) accredited inspector to determine the presence, location, and approximate quantity of asbestos-containing materials (ACM). Forty-six bulk samples of building materials, suspected of containing asbestos, were collected and submitted under chain of custody to Lab/Cor Portland Inc. of Portland, Oregon, for polarized light microscopy (PLM) analysis. The following materials were found to contain asbestos:

• Asbestos-containing 9-inch red vinyl floor tile and associated black mastic is present in the elementary and high school hallways, and the adjacent custodial closets. The asbestos-containing floor tile is overlaid with non-asbestos 12-inch gray floor tile in the hallways and non-asbestos white sheet flooring in the custodial closets.

Materials containing less than 1% asbestos:

- The joint compound on gypsum wallboard assemblies tested less than 1% asbestos in two of five samples.
- Brown covebase mastic sampled in the hallway outside of the elementary school restrooms contains less than 1% asbestos. The mastic is associated with the 4-inch rubber covebase and is presumed to be present throughout.
- Black mastic located on the concrete wall in the boiler room contains less than 1% asbestos. The mastic appears to be residual wall mastic from a prior application.
- Floor mastic located under the non-asbestos 12-inch red vinyl floor tile in the staff breakroom and adjacent restroom contains less than 1% asbestos.
- The window glazing compound located on the interior windows in the boys locker room tested less than 1% asbestos.

At the time of this survey, all asbestos-containing building materials were observed to be in good condition.



Please refer to the asbestos bulk sample inventory for more sample details.

#### **Asbestos Regulations**

Oregon DEQ, Environmental Protection Agency (EPA), and OSHA regulations require proper removal and handling of ACM by licensed and trained asbestos abatement contractors prior to building renovations or demolition.

The EPA, DEQ, and OSHA all define ACM as any material containing more than 1% asbestos. Although materials equal to or less than 1% are not considered by regulatory agencies to be an ACM, they still have some asbestos content, and Oregon OSHA has specific requirements for situations in which workers may encounter, disturb, or remove materials containing any level of asbestos. For the sake of hazard communication, these materials are included in the asbestos-containing materials section of this report.

In 1995, Oregon OSHA adopted 29 Code of Federal Regulations (CFR) Part 1926.1101 governing asbestos under OAR 437-003-1926.1101. The regulation has made significant changes in work procedures and how asbestos materials are managed. OSHA believes that the single biggest risk of asbestos exposure is to workers who unknowingly or improperly disturb ACM. Hazard communication, training, personal protection, work practices, exposure monitoring, and recordkeeping are all major components of the regulation.

DEQ's OAR 340, Division 248 also covers asbestos abatement requirements, removal notifications, licensing, and certifications for contractors.

For more information regarding the removal of asbestos-containing materials, please refer to the following:

- 1. Oregon Occupational Safety and Health Administration, OAR 437-003-1926.1101
- 2. Department of Environmental Quality, OAR-340, Division 248



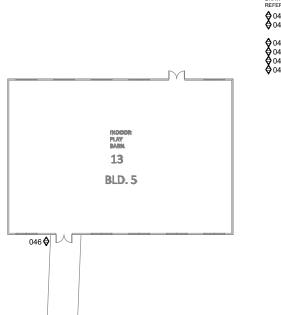
#### SURVEY NOTES

- THIS DRAWING IS DIAGRAMMATIC. IT IS FOR GENERAL INFORMATION AND SAMPLE LOCATIONS.
- 2. ACCESSIBLE SPACES WERE SURVEYED FOR SUSPECT HAZARDOUS MATERIALS. WHEN OBSERVED, THE MATERIALS WERE NOTED ON THE DRAWING.
- 3. ONLY THE PORTIONS OF THE SCHOOL BUILDINGS THAT ARE EXPECTED TO BE IMPACTED BY THE PLANNED ADDITIONS AND REMODEL PROJECT ARE INCLUDED IN THIS SURVEY. ASBESTOS-CONTAINING BUILDING MATERIALS ARE KNOWN TO EXIST IN OTHER PORTIONS OF THE BUILDING THAT ARE NOT IDENTIFIED ON THIS DRAWING.
- 4. THIS DRAWINGS IS NOT SUITABLE FOR, NOR INTENDED TO BE USED AS AN ABATEMENT DESIGN DRAWING.
- 5. JOINT COMPOUND ON GYPSUM WALLBOARD CONTAINS LESS THAN 1% ASBESTOS THROUGHOUT
- 6. BROWN COVE BASE MASTIC CONTAINS LESS THAN 1% ASBESTOS THROUGHOUT.

#### LEGEND

	ASBESTOS-CONTAINING 9"X9" RED FLOOR TILE AND ASSOCIATED BLACK MASTIC UNDER NON-ASBESTOS FLOORING
	RESIDUAL BLACK MASTIC UNDER NON-ASBESTOS FLOORING CONTAINS LESS THAN 1% ASBESTOS
++++++++	RESIDUAL BLACK MASTIC ON CONCRETE WALL CONTAINS LESS THAN 1% ASBESTOS
~~~~	WINDOW GLAZING COMPOUND IN THE LOCKER ROOM CONTAINS LESS THAN 1% ASBESTOS

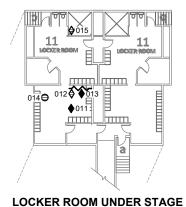
~~~~	WINDOW GLAZ CONTAINS LES		OUND IN THE LOCKER ROOM 6 ASBESTOS
ASBEST	OS SAMPLE S		
<b>♦</b> 007	- DRAWING REF	ERENCE T	O BULK SAMPLE FIELD CODE,
<b>N</b> 555	SEE INVENTOR		PLES
<u> </u>	— MATERIAL SYM	BOL	
NOT N TESTED	EGATIVE POSITIVE		
0	⊖ ●	THERM/	AL SYSTEM INSULATION
	⊟ ∎	SURFAC	CING MATERIAL
٥	♦ ♦	MISCEL	LANEOUS MATERIAL
	ORY OF ASBES	STOS SAI	MPLES
DRAWING REFERENCE	FIELD CODE	LAB RESULT	MATERIAL SAMPLED
♦ 001	27217.000-0001	(<1%/-)	GYPSUM WALLBOARD/
• 001	27217.000-0001	( 1 /0/-)	JOINT COMPOUND
<b>Q</b> 002	27217.000-0002	(-/-)	TANK INSULATION
<b>A</b> 003	27217.000-0003	(-/-)	TANK INSULATION
<b>4</b> 004	27217.000-0004 27217.000-0005	(-/-) (-)	TANK INSULATION PIPE INSULATION
<b>Ö</b> 005	27217.000-0005	(-) (-)	PIPE INSULATION
0007	27217.000-0007	(-)	PIPE INSULATION
<b>A</b> 008	27217.000-0008	(-)	CAULK
<b>\$</b> 009	27217.000-0009	(-)	WALL AND CEILING PLASTER
010	27217.000-0010	(<1%)	MASTIC
<b>0</b> 11	27217.000-0011	(-/+/-)	GYPSUM WALLBOARD/
A			JOINT COMPOUND
♦012 ●013	27217.000-0012	(-/-)	WINDOW GLAZING COMPOUND WINDOW GLAZING COMPOUND
<b>9</b> 013	27217.000-0013 27217.000-0014	(-/<1%) (-)	PIPE INSULATION
<b>0</b> 14	27217.000-0014	(-) (-/-)	CERAMIC TILE/GROUT
016	27217.000-0016	(-/<1%)	VINYL FLOOR TILE/MASTIC
017	27217.000-0017	(-)	SINK UNDERCOATING
<b>Q</b> 018	27217.000-0018	(-/-/-)	COVEBASE/MASTIC
019	27217.000-0019	(-/-/<1%)	) SHEET FLOOR COVERING
<b>\$</b> 020	27217.000-0020	(-/-/-)	GYPSUM WALLBOARD/ JOINT COMPOUND
<b>\$</b> 021	27217.000-0021	(-)	MASTIC
<b>Å</b> 022	27217.000-0022	(-)	COVEBASE/MASTIC
<b>Å</b> 023	27217.000-0023	(-)	VINYL FLOOR TILE/MASTIC
024	27217.000-0024	(-/-/+)	SHEET FLOOR COVERING
025	27217.000-0025	(-/<1%)	COVEBASE/MASTIC
025	27217.000-0025	(-/<1%)	COVEBASE/MASTIC
<b>Q</b> 026	27217.000-0026	(-/-)	CONCEALED GRID CEILING TILE
<b>2</b> 027	27217.000-0027	(-)	PEGHOLE CEILING BOARD
<b>6</b> 028 029	27217.000-0028 27217.000-0029	(-/-) (-)	SHEET FLOOR COVERING WINDOW GLAZING COMPOUND
<b>A</b> 030	27217.000-0029	(-) (-/-)	VINUL FLOOR TILE/MASTIC
<b>♦</b> 031	27217.000-0031	(<1%/-)	GYPSUM WALLBOARD/
• ••• •	2.2.1.000 0001	( 1,0, )	JOINT COMPOUND
<b>\$</b> 032	27217.000-0032	(-/-)	COVEBASE/MASTIC
<b>Q</b> 033	27217.000-0033	(-) ´	CERAMIC TILE GROUT
<b>Q</b> 034	27217.000-0034	(-/-)	MASTIC
<b>Q</b> 035	27217.000-0035	(-/-)	VINYL FLOOR TILE/MASTIC
<b>Q</b> 036	27217.000-0036	(-/-/-)	VINYL FLOOR TILE/MASTIC
037	27217.000-0037	(-/-/+)	MISC. FLOORING MATERIAL
<b>Q</b> 038 <b>Q</b> 039	27217.000-0038	(-)	CEMENT MASONRY UNIT VINYL FLOOR TILE/MASTIC
<b>A</b> 039	27217.000-0039 27217.000-0040	(-/-) (-/-)	POURED FLOOR INC
¥ 040	2.211.000 0040	(')	



#### INVENTORY OF ASBESTOS SAMPLES (CONTINUED)

DRAWING	FIELD	LAB	MATERIAL
REFERENCE	CODE	RESULT	SAMPLED
<b>♦</b> 041 <b>♦</b> 042	27217.000-0041 27217.000-0042	(-) (-/-/-)	CEMENT MASONRY UNIT GYPSUM WALLBOARD/ JOINT COMPOUND
<ul> <li>043</li> <li>044</li> <li>045</li> <li>046</li> </ul>	27217.000-0043	(-)	CERAMIC TILE/GROUT
	27217.000-0044	(-)	MORTAR
	27217.000-0045	(-/-)	STAIR TREAD
	27217.000-0046	(-)	VAPOR BARRIER

BLD.8 TECHNOLOG 1

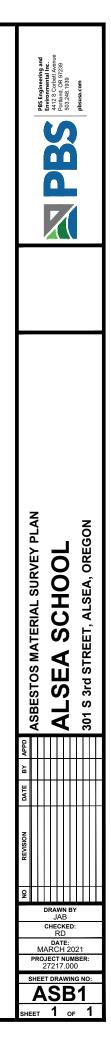


#### MM **\$**030 032 🖨 EIFTH & SDC SEVENTH 031 MUSIC EIGHTH GRAD 033 🖨 -1 1 **\$**034 OFFICE NURSE 3 7 ໄດເຊ -CYM COPY 6 029 🖨 office 3 $\Box$ Ш 01 7 THIRD® POURTH GRADE SECOND & SCIENCE LAB **(** ENGLISH 017 1 1 1 **BLD.** 1 018 019 022 OFFICE 3 3 7 8 020 0 **\$**021 -0 0 57 023 027 **8**035 036 038 3 3 028 STARE MATH 1 FIRST & SECOND 026 024 KINDERGARTEN 4 1 Þ 1 বচ NUP বাচ LIBRAR 2 -**♦**002 ⁄-**♦**003 PLAYGROUND 12 **♦**004 a 7 **O**005 RESOLURCE ROOM **RESOURCE ROOM** 1 1 **0**01 **Q**041 PRESCHOOL BLD.4 PRESCHOOL WOOD SHOP 1 1 10 040 🔶 25 **\$**039 BLD. 2 3

FIRST FLOOR PLAN - SAMPLE LOCATIONS

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L SIZE SHEET FORMAT IS 24X36; IF PRINTED SIZE IS NOT 24X36, THEN THIS SHEET FORMAT HAS BEEN MODIFIED & INDICATED DRAWING SCALE IS NOT ACCURATE.





PREPARED FOR: STRAIGHTLINE ARCHITECTS

HISTORY

1

COMPLITER LAB

1

1

<u>Code</u>	<u>Material</u>		Location	<u>Results</u>	<u>Lab</u>
27217.000-0001	Gypsum Wallboa Compound	rd/Joint	Boiler room; gypsum wallboard v	with joint compound	Lab Cor
		Layer:	Description:	Analysis:	
		Layer 01	fine compact powder, off-white	<1% Chrysotile	
		Layer 02	compact chalky material with paper, white	No Asbestos Detected	
27217.000-0002	Tank Insulation		Boiler room; gray compact powc		Lab Cor
		Layer:	Description:	Analysis:	
		Layer 01	woven fibers, tan	No Asbestos Detected	
		Layer 02	fine compact powder, light gray	No Asbestos Detected	
27217.000-0003	Tank Insulation	Layer:	Boiler room; gray compact powc Description:	ler, tank insulation Analysis:	Lab Cor
		Layer 01	woven fibers, tan	No Asbestos Detected	
		Layer 02	fine compact powder, light gray	No Asbestos Detected	
27217.000-0004	Tank Insulation	Layer:	Boiler room; gray compact powc <b>Description:</b>	ler, tank insulation <b>Analysis:</b>	Lab Cor
		Layer 01	flexible woven material, tan	No Asbestos Detected	
		Layer 02	fine compact powder, gray	No Asbestos Detected	
27217.000-0005	Pipe Insulation		Boiler room; pipe insulation		Lab Cor
		Layer:	Description:	Analysis:	
		Layer 1	fine fibrous powder, white	No Asbestos Detected	
27217.000-0006	Pipe Insulation		Boiler room; pipe insulation		Lab Cor
		Layer:	Description:	Analysis:	
		Layer 1	fine fibrous powder, white	No Asbestos Detected	
27217.000-0007	Pipe Insulation	Layer:	Boiler room; pipe insulation Description:	Analysis:	Lab Cor
		Layer 1	fine fibrous powder, white	No Asbestos Detected	
27217.000-0008	Caulk		Boiler room; off-white caulking ograte	on tank at edge of metal	Lab Cor
		Layer:	Description:	Analysis:	
		Layer 1	soft compact material, white	No Asbestos Detected	



<u>Code</u> 27217.000-0009	<u>Material</u> Wall and Ceiling	Plaster	<u>Location</u> Boiler room; gray plaster on con	<u>Results</u> crete wall	<u>Lab</u> Lab Cor
		Layer:	Description:	Analysis:	
		Layer 1	granular compact powder, gray with paint, blue	No Asbestos Detected	
27217.000-0010	Mastic	Layer:	Boiler room; black, hard mastic c <b>Description:</b>	on concrete wall Analysis:	Lab Cor
		Layer 1	tar, black with thin coating, silver	<1% Chrysotile	
27217.000-0011	Gypsum Wallboa Compound	rd/Joint	Boys locker room; gypsum wallb	oard with joint compound	Lab Cor
		Layer:	Description:	Analysis:	
		Layer 01	paint, white	No Asbestos Detected	
		Layer 02	fine compact powder, off-white	2% Chrysotile	
		Layer 03	compact chalky material with paper, white	No Asbestos Detected	
	Comments:	Gravimetric r	eduction and point count (400): 0.	19	
27217.000-0012	Window Glazing	Compound Layer:	Boys locker room; tan window g <b>Description:</b>	lazing compound Analysis:	Lab Cor
		Layer 01	paint, purple	No Asbestos Detected	
		Layer 02	soft compact material, tan	No Asbestos Detected	
27217.000-0013	Window Glazing	Compound <b>Layer:</b>	Boys locker room; gray window g	glazing compound <b>Analysis:</b>	Lab Cor
		Layer 01	paint, purple	No Asbestos Detected	
		Layer 02	hard compact powder, light gray	<1% Chrysotile	
27217.000-0014	Pipe Insulation		Boys locker room; white pipe ins <b>Description:</b>	ulation <b>Analysis:</b>	Lab Cor
		Layer:	-	-	
		Layer 1	fine fibrous powder, white	No Asbestos Detected	
27217.000-0015	Ceramic Tile/Gro	ut <b>Layer:</b>	Boys locker room; 1" by 1" white <b>Description:</b>	tile with gray grout <b>Analysis:</b>	Lab Cor
		Layer 01	ceramic tile, white	No Asbestos Detected	
		Layer 02	loose granular powder, gray	No Asbestos Detected	



Bulk Sample Inventory Straightline Architects

<u>Code</u>	<u>Material</u>		Location	<u>Results</u>	<u>Lab</u>
27217.000-0016	Vinyl Floor Tile/N	lastic Layer:	Staff breakroom; 12" by 12" red <b>Description:</b>	tile with yellow mastic <b>Analysis:</b>	Lab Cor
		Layer 01 Layer 02	hard vinyl, orange/red mastic, black	No Asbestos Detected <1% Chrysotile	
27217.000-0017	Sink Undercoatin	g <b>Layer:</b>	Staff breakroom; tan sink underc <b>Description:</b>	coating <b>Analysis:</b>	Lab Cor
		Layer 1	fine compact powder, off-white	No Asbestos Detected	
27217.000-0018	Covebase/Mastic	Layer:	Staff breakroom; 4" navy base w <b>Description:</b>	ith tan mastic <b>Analysis:</b>	Lab Cor
		Layer 01 Layer 02 Layer 03	rubbery material, blue mastic, off-white/tan fine compact powder, off-white	No Asbestos Detected No Asbestos Detected No Asbestos Detected	
27217.000-0019	Sheet Floor Cove	ring	Staff breakroom; restroom, beig floor with felt backing	e pebble-pattern sheet	Lab Cor
		Layer:	Description:	Analysis:	
		Layer 01	vinyl, speckled pattern, gray/off-white/tan	No Asbestos Detected	
		Layer 02	fibrous backing, gray	No Asbestos Detected	
		Layer 03	coating, red/white	No Asbestos Detected	
		Layer 04	mastic, black	<1% Chrysotile	
27217.000-0020	Gypsum Wallboa Compound	rd/Joint	Staff breakroom; restroom, gyps compound	um wallboard with joint	Lab Cor
		Layer:	Description:	Analysis:	
		Layer 01	textured paint, white with fine compact powder, white	No Asbestos Detected	
		Layer 02	fine compact powder, off- white with paper backing, white	No Asbestos Detected	
		Layer 03	compact chalky material with paper, white	No Asbestos Detected	
27217.000-0021	Mastic		Staff breakroom; restroom, yello fireproofing wainscot	w mastic behind	Lab Cor
		Layer:	Description:	Analysis:	
		Layer 1	loose particulate, white/yellow	No Asbestos Detected	



<u>Code</u>	<u>Material</u>		Location	<u>Results</u>	<u>Lab</u>
27217.000-0022	Covebase/Mastic		Staff breakroom; restroom, 6" gi		Lab Cor
		Layer:	Description:	Analysis:	
		Layer 01	rubbery material, gray	No Asbestos Detected	
		Layer 02	loose mastic material, white	No Asbestos Detected	
27217.000-0023	Vinyl Floor Tile/N	lastic	Hall outside staff breakroom; 12 with yellow mastic	" by 12" gray streaked tile	Lab Cor
		Layer:	Description:	Analysis:	
		Layer 1	vinyl, gray/white/black, with thin mastic, yellow	No Asbestos Detected	
27217.000-0024	Sheet Floor Cove	ring	Custodial room outside staff bre with felt backing on red floor tile		Lab Cor
		Layer:	Description:	Analysis:	
		Layer 01	vinyl, off-white/gray	No Asbestos Detected	
		Layer 02	fibrous backing, gray	No Asbestos Detected	
		Layer 03	vinyl, red	4% Chrysotile	
		Layer 04	brittle mastic material, black	2% Chrysotile	
27217.000-0025	Covebase/Mastic		Hall outside staff breakroom; 4" and yellow mastics	black base with brown	Lab Cor
		Layer:	Description:	Analysis:	
		Layer 01	rubbery material, gray	No Asbestos Detected	
		Layer 02	mastic, off-white/brown	<1% Anthophyllite	
27217.000-0026	Concealed Grid C	eiling Tile	Custodial room outside staff bre pin hole ceiling tile	eakrooms; 1' by 1' white	Lab Cor
		Layer:	Description:	Analysis:	
		Layer 01	coating, white	No Asbestos Detected	
		Layer 02	compressed fibers, tan	No Asbestos Detected	
27217.000-0027	Pin hole Ceiling B	loard	Hall outside staff breakroom; 4' ceiling board	by 8' white pin hole	Lab Cor
		Layer:	Description:	Analysis:	
		Layer 1	loose particulate, tan/white	No Asbestos Detected	
27217.000-0028	Sheet Floor Cove	ring	Hall outside boys restroom; gray mastic	r sheet floor with red	Lab Cor
		Layer:	Description:	Analysis:	
		Layer 01	vinyl, gray/black	No Asbestos Detected	
		Layer 02	fibrous backing, gray, with thin mastic, red	No Asbestos Detected	



<u>Code</u>	<u>Material</u>		<u>Location</u>	<u>Results</u>	<u>Lab</u>
27217.000-0029	Window Glazing	Compound		Exterior of staff breakroom; gray window glazing compound	
		Layer:	Description:	Analysis:	
		Layer 1	hard compact powder, gray	No Asbestos Detected	
27217.000-0030	Vinyl Floor Tile/M	lastic	Room attached to special educa tan tile with yellow mastic	tion classroom; 12" by 12"	Lab Cor
		Layer:	Description:	Analysis:	
		Layer 01	vinyl, gray/tan/black	No Asbestos Detected	
		Layer 02	thin backing, brown/gray/blue	No Asbestos Detected	
27217.000-0031	Gypsum Wallboa Compound	rd/Joint	Room attached to special educa wallboard with joint compound	tion classroom; gypsum	Lab Cor
		Layer:	Description:	Analysis:	
		Layer 01	fine compact powder, off- white with paint, off- white/yellow/green	<1% Chrysotile	
		Layer 02	compact chalky material with paper, white	No Asbestos Detected	
27217.000-0032	Covebase/Mastic		Room attached to special educa covebase with white mastic	tion classroom; 4" gray	Lab Cor
		Layer:	Description:	Analysis:	
		Layer 01	rubbery material, gray	No Asbestos Detected	
		Layer 02	mastic, off-white	No Asbestos Detected	
27217.000-0033	Ceramic Tile Grou	ut	Room attached to special educa associated with 1' by 1' wall tile	tion classroom; gray grout	Lab Cor
		Layer:	Description:	Analysis:	
		Layer 1	granular compact powder, gray	No Asbestos Detected	
27217.000-0034	Mastic		Office between fifth grade and s classroom; yellow carpet mastic	pecial education	Lab Cor
		Layer:	Description:	Analysis:	
		Layer 01	granular compact powder, gray	No Asbestos Detected	
		Layer 02	loose mastic material, yellow	No Asbestos Detected	
27217.000-0035	Vinyl Floor Tile/N	lastic	Highschool kitchen classroom; 1 streaked tile with yellow mastic	2" by 12" off-white	Lab Cor
		Layer:	Description:	Analysis:	
		Layer 01	hard vinyl, off-white	No Asbestos Detected	
		Layer 02	mastic, yellow with coating, gray	No Asbestos Detected	



<u>Code</u>	<u>Material</u>		Location	<u>Results</u>	<u>Lab</u>
27217.000-0036	Vinyl Floor Tile/M	lastic	Highschool kitchen classroom; 1 yellow & black mastic	2" by 12" tan tile with	Lab Cor
		Layer:	Description:	Analysis:	
		Layer 01	coating, gray	No Asbestos Detected	
		Layer 02	hard vinyl, off-white	No Asbestos Detected	
		Layer 03	mastic, black/red	No Asbestos Detected	
27217.000-0037	Misc. Flooring Ma	aterial	Custodial room outside high sch floor with felt backing on red flo		Lab Cor
		Layer:	Description:	Analysis:	
		Layer 01	flexible vinyl, off-white	No Asbestos Detected	
		Layer 02	fibrous backing, gray	No Asbestos Detected	
		Layer 03	mastic, off-white	No Asbestos Detected	
		Layer 04	hard vinyl, brown	5% Chrysotile	
		Layer 05	mastic, black	3% Chrysotile	
27217.000-0038	Cement Masonry	<sup>,</sup> Unit	Storage room outside high scho CMU base	ol offices; gray grout &	Lab Cor
		Layer:	Description:	Analysis:	
		Layer 1	granular compact powder, gray	No Asbestos Detected	
27217.000-0039	Vinyl Floor Tile/M	lastic	Computer lab classroom; 12" by with yellow mastic	12" off-white streaked tile	Lab Cor
		Layer:	Description:	Analysis:	
		Layer 01	hard vinyl, off-white	No Asbestos Detected	
		Layer 02	mastic material, yellow	No Asbestos Detected	
27217.000-0040	Poured Flooring		Open space next to computer la flooring	b; blue and white epoxy	Lab Cor
		Layer:	Description:	Analysis:	
		Layer 01	hard compact material, clear/blue/white	No Asbestos Detected	
		Layer 02	granular compact powder, gray	No Asbestos Detected	
27217.000-0041	Cement Masonry	' Unit	Open space next to computer la block	b; gray grout and CMU	Lab Cor
		Layer:	Description:	Analysis:	
		Layer 1	granular compact powder, gray	No Asbestos Detected	



<u>Code</u>	<u>Material</u>		Location	<u>Results</u>	<u>Lab</u>
27217.000-0042	Gypsum Wallboa Compound	rd/Joint	Highschool boys restroom; gyps compound and orange peel text		Lab Cor
		Layer:	Description:	Analysis:	
		Layer 01	fine compact powder, off- white, with paint, off-white	No Asbestos Detected	
		Layer 02	fine compact powder, off- white, with paper, green	No Asbestos Detected	
		Layer 03	compact chalky material with paper, white	No Asbestos Detected	
27217.000-0043	Ceramic Tile/Gro	ut	Highschool boys restroom; 4" wa	all tile with off white grout	Lab Cor
		Layer:	Description:	Analysis:	
		Layer 1	loose particulate, white/off- white	No Asbestos Detected	
27217.000-0044	Mortar		Highschool boys restroom; cerar mortar	nic wall tile and bedding	Lab Cor
		Layer:	Description:	Analysis:	
		Layer 1	loose particulate, blue/green/gray/white	No Asbestos Detected	
27217.000-0045	Stair Tread		Highschool side; stairs to stage, t mastic	tan stair tread with yellow	Lab Cor
		Layer:	Description:	Analysis:	
		Layer 01	compact powder, gray	No Asbestos Detected	
		Layer 02	soft particulate, gray/tan	No Asbestos Detected	
27217.000-0046	Vapor Barrier		Exterior of play barn; black vapor	· barrier under wood siding	Lab Cor
		Layer:	Description:	Analysis:	
		Layer 1	fibrous tar, black	No Asbestos Detected	



LabCor Portland Lab/Cor Portland, Inc. 4321 South Corbett Ave., Ste A Portland, OR 97239

### **PLM - Visual Estimate Extended Final Report**

Job Number: 210623

Sub Project: **Reference No.:** 

Inc

Report Number: 210623R01 Report Date: 2/26/2021

**Client: PBS Engineering and Environmental** Address: 4412 S Corbett Avenue Portland, OR 97239 Project Name: Project No.: 27217.000 Phase 0001 PO Number:

Enclosed please find results for samples submitted to our laboratory. A list of samples and analyses follows:

Lab/Cor Sample #	Client Sample # and Description	Analysis	Analysis Notes	Date Received:
210623 - S1	27217.000-0001 -	PLM - Visual Estimate Extended		2/23/2021
210623 - S2	27217.000-0002 -	PLM - Visual Estimate Extended		2/23/2021
210623 - S3	27217.000-0003 -	PLM - Visual Estimate Extended		2/23/2021
210623 - S4	27217.000-0004 -	PLM - Visual Estimate Extended		2/23/2021
210623 - S5	27217.000-0005 -	PLM - Visual Estimate Extended		2/23/2021
210623 - S6	27217.000-0006 -	PLM - Visual Estimate Extended		2/23/2021
210623 - S7	27217.000-0007 -	PLM - Visual Estimate Extended		2/23/2021
210623 - S8	27217.000-0008 -	PLM - Visual Estimate Extended		2/23/2021
210623 - S9	27217.000-0009 -	PLM - Visual Estimate Extended		2/23/2021
210623 - S10	27217.000-0010 -	PLM - Visual Estimate Extended		2/23/2021
210623 - S11	27217.000-0011 -	PLM - Visual Estimate Extended		2/23/2021
210623 - S12	27217.000-0012 -	PLM - Visual Estimate Extended		2/23/2021
210623 - S13	27217.000-0013 -	PLM - Visual Estimate Extended		2/23/2021
210623 - S14	27217.000-0014 -	PLM - Visual Estimate Extended		2/23/2021
210623 - S15	27217.000-0015 -	PLM - Visual Estimate Extended		2/23/2021
210623 - S16	27217.000-0016 -	PLM - Visual Estimate Extended		2/23/2021
210623 - S17	27217.000-0017 -	PLM - Visual Estimate Extended		2/23/2021
210623 - S18	27217.000-0018 -	PLM - Visual Estimate Extended		2/23/2021
210623 - S19	27217.000-0019 -	PLM - Visual Estimate Extended		2/23/2021
210623 - S20	27217.000-0020 -	PLM - Visual Estimate Extended		2/23/2021
210623 - S21	27217.000-0021 -	PLM - Visual Estimate Extended		2/23/2021



LabCor Portland Lab/Cor Portland, Inc.

4321 South Corbett Ave., Ste A Portland, OR 97239

**Client: PBS Engineering and Environmental** 

### PLM - Visual Estimate Extended Final Report

#### Job Number: 210623

Inc

Report Number: 210623R01 Report Date: 2/26/2021

oject Name:			
210623 - S22	27217.000-0022 -	PLM - Visual Estimate Extended	2/23/2021
210623 - S23	27217.000-0023 -	PLM - Visual Estimate Extended	2/23/2021
210623 - S24	27217.000-0024 -	PLM - Visual Estimate Extended	2/23/2021
210623 - S25	27217.000-0025 -	PLM - Visual Estimate Extended	2/23/2021
210623 - S26	27217.000-0026 -	PLM - Visual Estimate Extended	2/23/2021
210623 - S27	27217.000-0027 -	PLM - Visual Estimate Extended	2/23/2021
210623 - S28	27217.000-0028 -	PLM - Visual Estimate Extended	2/23/2021
210623 - S29	27217.000-0029 -	PLM - Visual Estimate Extended	2/23/2021
210623 - S30	27217.000-0030 -	PLM - Visual Estimate Extended	2/23/2021
210623 - S31	27217.000-0031 -	PLM - Visual Estimate Extended	2/23/2021
210623 - S32	27217.000-0032 -	PLM - Visual Estimate Extended	2/23/2021
210623 - S33	27217.000-0033 -	PLM - Visual Estimate Extended	2/23/2021
210623 - S34	27217.000-0034 -	PLM - Visual Estimate Extended	2/23/2021
210623 - S35	27217.000-0035 -	PLM - Visual Estimate Extended	2/23/2021
210623 - S36	27217.000-0036 -	PLM - Visual Estimate Extended	2/23/2021
210623 - S37	27217.000-0037 -	PLM - Visual Estimate Extended	2/23/2021
210623 - S38	27217.000-0038 -	PLM - Visual Estimate Extended	2/23/2021
210623 - S39	27217.000-0039 -	PLM - Visual Estimate Extended	2/23/2021
210623 - S40	27217.000-0040 -	PLM - Visual Estimate Extended	2/23/2021
210623 - S41	27217.000-0041 -	PLM - Visual Estimate Extended	2/23/2021
210623 - S42	27217.000-0042 -	PLM - Visual Estimate Extended	2/23/2021
210623 - S43	27217.000-0043 -	PLM - Visual Estimate Extended	2/23/2021
210623 - S44	27217.000-0044 -	PLM - Visual Estimate Extended	2/23/2021
210623 - S45	27217.000-0045 -	PLM - Visual Estimate Extended	2/23/2021
210623 - S46	27217.000-0046 -	PLM - Visual Estimate Extended	2/23/2021



### PLM - Visual Estimate Extended Final Report

#### Job Number: 210623

#### Report Number: 210623R01 Report Date: 2/26/2021

#### Client: PBS Engineering and Environmental Project Name:

PLM - Visual The submitted sample(s) were analyzed according to the EPA 600/R-93/116: Method for the Determination of Asbestos in Bulk Estimate Extended Building Materials and EPA - 40CFR App. E to Subpart E of Part 763. The sample(s) were analyzed with a digital microscope in order to determine homogeneity, the presence of fibers, and make a preliminary estimate of any asbestos fibers present in the sample. The sample(s), and any observed layers, were then homogenized through techniques appropriate to that material and prepared for analysis by polarized light microscopy (PLM).

Three slide mount preparations were made from random subsamples of the homogenized material. This material was then mounted in the suitable refractive index liquid needed to perform a full optical characterization of the observed fibers. When necessary, dilute HCI, instead of RI liquids, were used to remove cementitious binders to facilitate analysis. The entirety of the slide mount preparations were then analyzed by PLM. Any observed fibers were reported and their optical characteristics recorded according to the EPA 600-R-93-116 method.

**Disclaimer** This report, and the data contained therein, cannot be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government. The results found in this report are based only on the submitted sample(s). LabCor has no control over sampling procedures. This report is only valid when signed by an analyst.

NAD is No Asbestos Detected. Asbestos consists of the six following minerals: chrysotile, amosite, crocidolite, anthophyllite, actinolite, and tremolite.

Additional gravimetric, point-count or TEM analysis may be recommended for samples testing at < or = 1% asbestos, or those with material binders that prevent the detection of small diameter fibers.

The following estimate of error for this method by visual estimation of asbestos percent are as follows: 1% asbestos: >0-3% error, 5% asbestos: 1-9% error, 10% asbestos: 5-15% error, 20% asbestos: 10-30% error.

Sincerely,

Min Gaines **Mia Gaines** 

Analyst



abCor Portland 4321 South			-					Phone: (503) 224-5055 www.labcorpdx.com
Portland, Of				BULK SAMF	PLE ASBEST	OS ANAL	YSIS	
Client: PBS Engineerir 4412 S Corbett Portland, OR 9	Avenue		ital				=	ort Number: 210623R01 eport Date: 02/26/2021
Project Name:	17.000	Phase 000 <sup>-</sup>	1					<b>P.O. No:</b> n/a
Client Sample ID: 272 Client Sample Descript Asbestos Mineral Fiber	rs	Layer	hrysotile	Sample ID: Amosite	S1 Crocidolite		Date Analyzed: Analyst:	02/25/2021 Ryan Talaski-Brown Percent Asbestos
Layer 01 fine compact powder white Layer 02		12 %	Trace	-	-			< 1 %
compact chalky mate with paper, white	erial	88 %	-	-	-			NAI
<u>Other Fibers</u> Layer 01	Fibrous Glass	Cellulose	Mineral Wool	Synthetic		Other	_	Matrix 100 %
Layer 02	-	-	-	-		-	_	100 %
Client Sample ID: 272 Client Sample Descript Asbestos Mineral Fiber	rs	Layer	hrysotile	Sample ID: Amosite	S2 Crocidolite		Date Analyzed: Analyst:	02/25/2021 Ryan Talaski-Brown Percent Asbestos
L <b>ayer 01</b> woven fibers, tan		35 %	-	-	-			NA
Layer 02 fine compact powder	,	65 %	-	-	-			NAI
light gray Other Fibers	Fibrous Glass	Cellulose	Mineral Wool	Synthetic		Other		Matrix
Layer 01 Layer 02	-	35 %	- 8 %	-		-	-	65 % 92 %
lient Sample ID: 272		-0003	0.10	Sample ID:	S3		Date Analyzed:	02/25/2021
Client Sample Descript Asbestos Mineral Fibe	rs	Layer Percent: C	hrysotile	Amosite	Crocidolite		Analyst:	Ryan Talaski-Brown Percent Asbestos
<b>.ayer 01</b> woven fibers, tan		20 %	-	-	-			NAI
.ayer 02 fine compact powder light gray	, ,	80 %	-	-	-			NAI
	Fibrous Glass	Cellulose	Mineral Wool	Synthetic		Other		Matrix
Layer 01 Layer 02	-	-	- 8 %	-		-	-	100 % 92 %



abCor ortland nc 4321 South Portland	n Corbet	t Ave., Ste		BULK	SAMPLE AS	BESTOS	ANALYSIS	Phone: (503) 224-5055 www.labcorpdx.com
Portland, O	OR 9723	19		Asbes	tos and Envir	onmental	Analysis	
lient: PBS Engineeri 4412 S Corbet Portland, OR	t Avenu		ental					ort Number: 210623R01 Report Date: 02/26/2021
Job Number: 21	0623							<b>P.O. No:</b> n/a
Project Name:								
roject Number: 272 Project Notes:	217.000	Phase 00	01					
Client Sample ID: 27	217.000	)-0004		Sample ID:	S4		Date Analyzed:	02/26/2021
lient Sample Descrip	tion:			•			Analyst:	Ryan Talaski-Brown
Asbestos Mineral Fibe		Layer Percent:	Chrysotile	Amosite	Crocidolite			Percent Asbestos
Layer 01								
flexible woven mater tan	rial,	20 %	-	-	-			NAI
Layer 02								
fine compact powde gray	r,	80 %	-	-	-			NAI
Other Fibers	Fibrous Glass	-	Mineral e Wool	Synthetic		Other		Matrix
Layer 01	-	10 %	-	-		-	-	90 %
Layer 02	-	-	8 %	-		-	-	92 %
<u>Client Sample ID:</u> 27 Client Sample Descrip	217.000 tion:	)-0005		Sample ID:	S5		Date Analyzed: Analyst:	02/26/2021 Ryan Talaski-Brown
Asbestos Mineral Fibe	ers	Layer	Chrysotile	Amosite	Crocidolite		, <b>,</b>	Percent Asbestos
Homogeneous	ļ	ercent.	Onrysolite	Amosile	Crocidonile			ASDESIUS
fine fibrous powder, white		100 %	-	-	-			NAI
Other Fibers	Fibrous	3	Mineral					
	Glass	Cellulos	e Wool	Synthetic		Other		Matrix
	Trace	-	-	3 %		-	-	97 %
Client Sample ID: 27	217.000	)-0006		Sample ID:	S6		Date Analyzed:	02/26/2021
Client Sample Descrip	tion:						Analyst:	Ryan Talaski-Brown
Asbestos Mineral Fibe	ers	Layer Percent:	Chrysotile	Amosite	Crocidolite			Percent Asbestos
Homogeneous		100.01						
fine fibrous powder, white		100 %	-	-	-			NAI
Other Fibers	Fibrous Glass	-	Mineral e Wool	Synthetic		Other		► <i>4</i> = 4
	Trace	-	-	Trace		-	-	Matrix 100 %
Night Completion 07		0007			67		Data Analizad	02/26/2021
<u>Client Sample ID:</u> 27 Client Sample Descrip	217.000 tion:	-0007		Sample ID:	<i>31</i>		Date Analyzed: Analyst:	02/26/2021 Ryan Talaski-Brown
Asbestos Mineral Fibe	ers	Layer Percent:	Chrysotile	Amosite	Crocidolite		Analysti	Percent Asbestos
Homogeneous			,		2.23.00.00			
		100 %	-	-	-			NAI
fine fibrous powder, white								
fine fibrous powder, white	Fibrous	;	Mineral					
fine fibrous powder,	Fibrous Glass	s Cellulos		Synthetic 3 %		Other		Matrix 97 %

abCor Portland 4321 South Corbett Av	-	BULK	SAMPLE AS	BESTOS	ANALYSIS	Phone: (503) 224-5055 www.labcorpdx.com
Portland, OR 97239		Asbes	tos and Envir	onmental	Analysis	
2lient: PBS Engineering and Env 4412 S Corbett Avenue Portland, OR 97239	vironmental					ort Number: 210623R01 Report Date: 02/26/2021
Job Number: 210623 Project Name: Project Number: 27217.000 Pha Project Notes:	ase 0001					<b>P.O. No:</b> n/a
Client Sample ID: 27217.000-00	08	Sample ID:	S8		Date Analyzed:	02/26/2021 Duara Talaaki Drawa
	yer cent: Chrysotile	Amosite	Crocidolite		Analyst:	Ryan Talaski-Brown Percent Asbestos:
Homogeneous soft compact material, 10 white	0% -	-	-			NAD
Other Fibers Fibrous Glass C	Mineral Cellulose Wool	Synthetic -		Other -	-	Matrix 100 %
	<b>109</b> yer cent: Chrysotile	Sample ID: Amosite	S9 Crocidolite		Date Analyzed: Analyst:	02/26/2021 Ryan Talaski-Brown Percent Asbestos:
Homogeneous granular compact 10 powder, gray with paint, blue	0 % -	-	-			NAC
Other Fibers Fibrous Glass C	Mineral ellulose Wool 	Synthetic -		Other -	<u>-</u>	Matrix 100 %
	yer cent: Chrysotile	Sample ID:			Date Analyzed: Analyst:	02/26/2021 Ryan Talaski-Brown Percent
Homogeneous tar, black with thin 10	0 % Trace	Amosite -	Crocidolite			Asbestos: < 1 %
coating, silver <u>Other Fibers</u> Fibrous Glass C	Mineral Cellulose Wool	Synthetic		Other	_	Matrix 100 %

abCor Portland nc 4321 South	n Corbet	t Ave., Ste	-	, BULK	SAMPLE AS	BESTOS	ANALYSIS	Phone: (503) 224-5055 www.labcorpdx.com	
Portland, C	DR 9723	19		Asbest	os and Envir	onmental	Analysis		
ilient: PBS Engineer 4412 S Corbe Portland, OR	tt Avenu		ental				-	ort Number: 210623R01 Report Date: 02/26/2021	
Project Name:	<b>0623</b> 217.000	Phase 000	01					<b>P.O. No:</b> n/a	
-	7217.000	)-0011		Sample ID:	S11		Date Analyzed:	02/26/2021	
Client Sample Descrip							Analyst:	Ryan Talaski-Brown	
Asbestos Mineral Fib	ers	Layer Percent:	Chrysotile	Amosite	Crocidolite			Perc	
Layer 01									
paint, white		6 %	-	-	-				NAC
Layer 02 fine compact powde white	er, off-	12 %	2 %	-	-				2 %
Layer 03		<b>00</b> • /							
compact chalky ma with paper, white		82 %	-	-	-				NAC
Other Fibers	Fibrous Glass	cellulos	Mineral e Wool	Synthetic		Other		Matrix	
Layer 01	-	-	-	-		-	-	100 %	
Layer 02	-	-	-	-		-	-	98 %	
Layer 03	-	-	-	-		-	-	100 %	
	7217.000	0-0012		Sample ID:	S12		Date Analyzed:	02/26/2021	
Client Sample Descrip		1					Analyst:	Ryan Talaski-Brown	
Asbestos Mineral Fib Laver 01		Layer Percent:	Chrysotile	Amosite	Crocidolite			Perc Asbe	
paint, purple		10 %	_	_	_				NAC
Layer 02		10 /0							
soft compact mater	ial,	90 %	-	-	-				NAC
Other Fibers	Fibrous Glass	cellulos	Mineral e Wool	Synthetic		Other		Matrix	
Layer 01 Layer 02	-	-	-	-		-	-	100 % 100 %	
Client Sample ID: 27	7217.000	)-0013		Sample ID:	S13		Date Analyzed:	02/26/2021	
Client Sample Descrip		-		•			Analyst:	Ryan Talaski-Brown	
Asbestos Mineral Fib	ers	Layer Percent:	Chrysotile	Amosite	Crocidolite		-	Perc	
Layer 01 paint, purple		15 %	-	-	_				NAC
Layer 02 hard compact powd	or	85 %	Trace	_	-				< 1 %
light gray			Mineral	-	-				< 1 %
Other Fibers	Fibrous Glass			Synthetic		Other		Matrix	
Layer 01 Layer 02	-	-	-	-		-	-	100 % 100 %	
LOVOR (11)	-	-	-	-		_	_	100.9/	

4321 South	n Corbett	ortland t Ave., Ste	-	, BULK	SAMPLE AS	BESTOS	ANALYSIS	Phone: (503) 224-5055 www.labcorpdx.com		
Portland, C	OR 9723	9		Asbest	tos and Envir	onmental	Analysis			
lient: PBS Engineer 4412 S Corbet Portland, OR	tt Avenue		ntal					ort Number: 210623R01 Report Date: 02/26/2021		
Project Name:	<b>0623</b> 217.000	Phase 000	1					<b>P.O. No:</b> n/a		
Client Sample ID: 27	217.000	0-0014		Sample ID:	S14		Date Analyzed:	02/26/2021		
Client Sample Descrip Asbestos Mineral Fibe	ers	Layer Percent: C	Chrysotile	Amosite	Crocidolite		Analyst:	Ryan Talaski-Brown Percent Asbestos		
Homogeneous fine fibrous powder, white		100 %	-	-	-			NA		
<u>Other Fibers</u>	Fibrous Glass -	Cellulose -	Mineral Wool -	Synthetic 2 %		Other -	-	Matrix 98 %		
	217.000	0-0015		Sample ID:	S15		Date Analyzed:	02/26/2021		
Client Sample Descrip Asbestos Mineral Fibe	ers	Layer Percent: C	Chrysotile	Amosite	Crocidolite		Analyst:	Ryan Talaski-Brown Percent Asbestos		
Layer 01 ceramic tile, white Layer 02		95 %	-	-	-			NA		
loose granular powd	ler,	5 %	-	-	-			NA		
Other Fibers	Fibrous Glass	cellulose	Mineral Wool	Synthetic		Other		Matrix		
Layer 01 Layer 02	-	-	-	-		-	-	100 % 100 %		
Client Sample ID: 27 Client Sample Descrip Asbestos Mineral Fibe		<b>)-0016</b> Layer		Sample ID:	S16		Date Analyzed: Analyst:	02/26/2021 Ryan Talaski-Brown		
	Final	Percent: C	hrysotile	Amosite	Crocidolite			Percent Asbestos		
Layer 01 hard vinyl, orange/re Layer 02	ed	97 %	-	-	-			NA		
mastic, black		3 %	Trace	-	-			<1		
Other Fibers	Fibrous Glass	cellulose	Mineral Wool	Synthetic		Other		Matrix		
Layer 01 Layer 02	-	-	-	-		-	-	100 %		

abCor Portland A321 South Corbet			BULK	SAMPLE AS	BESTOS	ANALYSIS	Phone: (503) 224-50 www.labcorpdx.com	55
Portland, OR 9723	39		Asbes	tos and Envir	onmental	Analysis		
Client: PBS Engineering and 4412 S Corbett Avenu Portland, OR 97239		tal					ort Number: 210623 Report Date: 02/26/20	
Job Number: 210623							<b>P.O. No:</b> n/a	
Project Name: Project Number: 27217.000 Project Notes:	Phase 0001							
Client Sample ID: 27217.000 Client Sample Description: Asbestos Mineral Fibers	Layer		Sample ID:			Date Analyzed: Analyst:		Percent
Homogeneous	Percent: C	hrysotile	Amosite	Crocidolite			A	sbestos
fine compact powder, off- white	100 %	-	-	-				NA
Other Fibers Fibrous Glass	-	Mineral Wool -	Synthetic		Other -	_	Matrix 92 %	
Client Sample ID: 27217.000 Client Sample Description: Asbestos Mineral Fibers	Layer	hrysotile	Sample ID: Amosite	S18 Crocidolite		Date Analyzed: Analyst:		Percent
Layer 01								
rubbery material, blue Layer 02	40 %	-	-	-				NA
mastic, off-white/tan	30 %	-	-	-				NA
Layer 03 fine compact powder, off- white	30 %	-	-	-				NAI
Other Fibers Fibrous Glass	-	Mineral Wool	Synthetic		Other		Matrix	
Layer 01 -	-	-	-		-	-	100 %	,
Layer 02 -	-	-	-		-	-	100 %	,



		19		Asbes	tos and Envir	onmental	Analysis	
lient: PBS Engineer 4412 S Corbet Portland, OR	tt Avenu		ntal					ort Number: 210623R01 Report Date: 02/26/2021
Job Number: 21	0623							<b>P.O. No:</b> n/a
Project Name:	0020							
-	217.000	Phase 000	1					
Project Notes:		1 11400 000						
	7217.000 	0-0019		Sample ID:	S19		Date Analyzed:	02/26/2021
lient Sample Descrip		Lover					Analyst:	Ryan Talaski-Brown
Asbestos Mineral Fibe		Layer Percent: C	Chrysotile	Amosite	Crocidolite			Percent Asbestos
.aver 01			Julycoulo	Amosito	Orocidonic			ASSESTOS
vinyl, speckled patte	ern.	45 %	-	-	-			NAI
gray/off-white/tan	-···,	/0						
_ayer 02								
fibrous backing, gra	y	34 %	-	-	-			NAI
ayer 03								
coating, red/white		20 %	-	-	-			NAI
ayer 04								
mastic, black		1 %	Trace	-	-			< 1 %
Other Fibers	Fibrous	5	Mineral					
	Glass	Cellulose	Wool	Synthetic		Other		Matrix
ayer 01.	-	-	-	-		-	-	100 %
ayer 02	-	8 %	-	12 %		-	-	80 %
ayer 03	-	-	-	-		-	-	100 %
_ayer 04								
	-	-	-	-		-	-	100 %
Comments: The enti	- irety of la	- ayer 04 was	- utilized fo	- or analysis.		-	-	100 %
Comments: The enti	- irety of la 7217.000		- utilized fo	- or analysis. Sample ID:	S20	-	- Date Analyzed:	100 %
Comments: The enti Comments: The enti	7217.000		- utilized fo	-	S20	-	- Date Analyzed: Analyst:	
Comments: The enti ilient Sample ID: 27 ilient Sample Descrip	7217.000 otion: ers	<b>)-0020</b> Layer		Sample ID:		-	-	02/26/2021 Ryan Talaski-Brown <b>Percent</b>
Comments: The enti lient Sample ID: 27 lient Sample Descrip usbestos Mineral Fibe	7217.000 otion: ers	)-0020		-	S20 Crocidolite	-	-	02/26/2021 Ryan Talaski-Brown
Comments: The enti Comments: The enti Client Sample ID: 27 Client Sample Descrip Asbestos Mineral Fibe	7217.000 otion: <u>ers</u>	<b>-0020</b> Layer Percent: C		Sample ID:		-	-	02/26/2021 Ryan Talaski-Brown Percent Asbestos
Comments: The enti Comments: The enti Comments: The entity Comments: The entity Comments: The entity Comments: The entity 27 27 27 27 27 27 27 27 27 27	7217.000 otion: ers	<b>)-0020</b> Layer		Sample ID:		-	-	02/26/2021 Ryan Talaski-Brown <b>Percent</b>
Comments: The enti Elient Sample ID: 27 Elient Sample Descrip Asbestos Mineral Fibe	7217.000 otion: ers	<b>-0020</b> Layer Percent: C		Sample ID:		-	-	02/26/2021 Ryan Talaski-Brown Percent Asbestos
Comments: The enti Comments: The enti Comments: The entities Comments: The	7217.000 otion: ers	<b>-0020</b> Layer Percent: C		Sample ID:		-	-	02/26/2021 Ryan Talaski-Brown Percent Asbestos
Comments: The enti Comments: The enti Comments: The entities Comments: The	2217.000 otion: ers	<b>-0020</b> Layer Percent: C		Sample ID:		-	-	02/26/2021 Ryan Talaski-Brown Percent Asbestos
Comments: The enti Comments: The enti Comments: The enti Comments: The enti Comments: The entire Comments: The entire Comments	2217.000 otion: ers	<b>J-0020</b> Layer Percent: C 35 %		Sample ID:		-	-	02/26/2021 Ryan Talaski-Brown Percent Asbestos NAI
Comments: The enti Comments: The enti Comments: The enti Comments: The enti Comments: The enti Comments: The entire Comments:	2217.000 otion: ers	<b>J-0020</b> Layer Percent: C 35 %		Sample ID:		-	-	02/26/2021 Ryan Talaski-Brown Percent Asbestos NAI
Comments: The enti Comments: The enti Comments: The enti Comments: The enti Comments: The enti Comments: The enti- compact possible Comments: The enti- Comments: The enti- Comments: The enti- compact possible Comments: The enti- compact possible Comments: The enti- Comments: The enti- Comments: The enti- Comments: The enti- Comments: The entire Comments: The entire C	<b>2217.000</b> <b>otion:</b> <b>ers</b> e with er, er, off-	D-0020 Layer Percent: C 35 % 15 %		Sample ID:		-	-	02/26/2021 Ryan Talaski-Brown Percent Asbestos NAI
Comments: The enti Comments: The enti Comments: The enti Comments: The enti Comments: The enti Comments: The entire Comments:	<b>2217.000</b> <b>otion:</b> <b>ers</b> e with er, er, off-	<b>J-0020</b> Layer Percent: C 35 %		Sample ID:		-	-	02/26/2021 Ryan Talaski-Brown Percent Asbestos NAI
Comments: The enti Comments: The enti Comments: The enti Comments: The enti Comments: The enti Comments: The enti Comments: The entity Comments: Th	<b>2217.000</b> <b>stion:</b> <b>ers</b> ers with er, off- terial	D-0020 Layer Percent: C 35 % 15 % 50 %	Chrysotile - -	Sample ID:		-	-	02/26/2021 Ryan Talaski-Brown Percent Asbestos NAI
Comments: The entii lient Sample ID: 27 lient Sample Descrip sbestos Mineral Fibe ayer 01 textured paint, white fine compact powde white .ayer 02 fine compact powde white with paper backing, white .ayer 03 compact chalky mat with paper, white	<b>2217.000</b> <b>otion:</b> <b>ers</b> e with er, er, off-	D-0020 Layer Percent: C 35 % 15 % 50 %	Chrysotile - - Mineral	Sample ID: Amosite -		- Other	-	02/26/2021 Ryan Talaski-Brown Percent Asbestos NAI NAI
Comments: The entii Comments: The entii Comments: The entii Comments: The entii Comments: The entii Compact Post Sector 2 Sector	<b>r217.000</b> <b>stion:</b> <b>ers</b> with er, off- terial Fibrous	D-0020 Layer Percent: C 35 % 15 % 50 %	Chrysotile - - Mineral	Sample ID:		- Other	-	02/26/2021 Ryan Talaski-Brown Percent Asbestos NAI
Comments: The enti Comments: The enti Client Sample Descrip Asbestos Mineral Fibe Asbestos Mineral Fibe Asbes	<b>r217.000</b> <b>stion:</b> <b>ers</b> with er, off- terial Fibrous	J-0020 Layer Percent: C 35 % 15 % 50 % 50 %	- - - Mineral Wool	Sample ID: Amosite -		- Other -	-	02/26/2021 Ryan Talaski-Brown Percent Asbestos NAI NAI NAI

Phone: (503) 224-5055 www.labcorpdx.com

## LabCor Portland Inc. 4321 South Corbett Ave., Ste A **BULK SAMPLE ASBESTOS ANALYSIS**

Client: PBS Engineerin	R 97239							om
Client: PBS Engineeri			Asbes	tos and Envir	onmental	Analysis		
4412 S Corbett Portland, OR S		mental				-	ort Number: 2106 Report Date: 02/26	
-	)623						<b>P.O. No:</b> n/a	
Project Name:	17.000 Phase (	0001						
Client Sample ID: 27	217.000-0021		Sample ID:	S21		Date Analyzed:	02/25/2021	
Client Sample Descript	tion:					Analyst:	Tim Cammann	
Asbestos Mineral Fibe		Chrysotile	Amosite	Crocidolite				Percent Asbestos:
Homogeneous								
loose particulate, white/yellow	100 %	-	-	-				NAD
Other Fibers	Fibrous	Mineral			Other			
	Glass Cellulo		Synthetic -		Other -	-	Ma 10	trix )0 %
	217.000-0022		Sample ID:	S22		Date Analyzed:	02/25/2021	
Client Sample Descript						Analyst:	Tim Cammann	
Asbestos Mineral Fibe	<u>rs</u> Layer Percent:	Chrysotile	Amosite	Crocidolite				Percent Asbestos:
Layer 01								
rubbery material, gra	iy 60 %	-	-	-				NAD
Layer 02 loose mastic materia white	al, 40 %	-	-	-				NAD
	Fibrous	Mineral						
	Glass Cellul		Synthetic		Other		Ма	trix
Layer 01		-	-		-	-	10	0 %
Layer 02		-	-		-	-	10	0 %
Client Sample ID: 272	217.000-0023		Sample ID:	S23		Date Analyzed:	02/25/2021	
Client Sample Descript	tion:					Analyst:	Tim Cammann	
Asbestos Mineral Fibe		Chrysotile	Amosite	Crocidolite				Percent Asbestos:
Homogeneous								
vinyl, gray/white/blac with thin mastic, yell		-	-	-				NAD
Other Fibers	Fibrous Glass Cellule	Mineral ose Wool	Synthetic		Other		Ма	trix )0 %

	1 ortidi		_00		Asbes	tos and Envir	onmental	Analysis		
	4412 S Co	neering and orbett Aver OR 97239	d Environme ue	ntal					ort Number: 21062 eport Date: 02/26/2	
Job N	Number:	210623							<b>P.O. No:</b> n/a	
Projec	t Name:									
roject N Projec	umber: t Notes:	27217.00	0 Phase 000	)1						
Client Sa	ample ID:	27217.0	00-0024		Sample ID:	S24		Date Analyzed:	02/25/2021	
	ample Des							Analyst:	Tim Cammann	
	s Mineral	Fibers	Layer Percent:	Chrysotile	Amosite	Crocidolite				Percent Asbestos:
Layer 01			<b>00</b> 0/							
-	off-white/g	gray	20 %	-	-	-				NAD
Layer 02	s backing,	arav	20 %	_	_	_				NAD
Layer 03	-	gray	20 /0							NAD
vinyl,			40 %	4 %	-	-				4 %
Layer 04										
brittle black	e mastic ma	aterial,	20 %	2 %	-	-				2 %
Other Fil	<u>bers</u>	Fibro Glas		Mineral e Wool	Synthetic		Other		Matri	x
Layer 01	l	-	-	-	-		-	-	100	%
Layer 02		10 %	60 %	-	-		-	-	30 °	
Layer 03		-	-	-	-		-	-	96 9	
Layer 04		-	-	-	-		-	-	98 '	%
	ample ID:	27217.0	00-0025		Sample ID:	S25		Date Analyzed:	02/25/2021	
	ample Des s Mineral	-	Layer					Analyst:	Tim Cammann	Percent
Layer 01		Tibers	Percent:	Chrysotile	Amosite	Crocidolite				Asbestos:
•	ery materia	larav	35 %			_				NAD
Layer 02	2						<b>A</b>	and the Taraba		
	ic, off-white		65 %	- Minoral	-	-	Antho	ophyllite- Trace		< 1 %
Other Fil		Fibro Glas		Mineral Ə Wool	Synthetic		Other		Matri	
Layer 01 Layer 02		-	-	-	-	Talc	- 5 %	-	100 95 °	
	ample ID: ample Des	27217.0 cription:	00-0026		Sample ID:	S26		Date Analyzed: Analyst:	02/25/2021 Tim Cammann	
	s Mineral	-	Layer Percent:	Chrysotile	Amosite	Crocidolite		-		Percent Asbestos:
Layer 01 coatir	ng, white		20 %	-	-	-				NAD
Layer 02	2									_
comp	pressed fib		80 %	-	-	-				NAD
			10	Mineral						
	<u>bers</u>	Fibro Glas			Synthetic		Other		Matri	
Other Fil Layer 01 Layer 02	I				Synthetic -		Other -	-	Matri: 100 0 %	%

#### Phone: (503) 224-5055 www.labcorpdx.com

Asbestos and Environmental Analysis

**BULK SAMPLE ASBESTOS ANALYSIS** 

LabCor Portland Inc 4321 South Corbett Ave., Ste A Portland, OR 97239

4321 Sout	th Corbett	t Ave., Ste	n <b>d, Inc</b>	. BULK	SAMPLE AS	BESTOS	ANALYSIS	Phone: (503) 22 www.labcorpdx.c	
Portland, o	OR 9723	9		Asbes	tos and Envir	onmental 4	Analysis		
ilient: PBS Enginee 4412 S Corbe Portland, OR	ett Avenue		ental				•	ort Number: 210 Report Date: 02/2	
Project Name:	<b>10623</b> 7217.000	Phase 00	01					<b>P.O. No:</b> n/a	
Client Sample ID: 2	27217.000	)-0027		Sample ID:	S27		Date Analyzed:	02/25/2021	
Client Sample Descri Asbestos Mineral Fib	bers	Layer Percent:	Chrysotile	Amosite	Crocidolite		Analyst:	Tim Cammann	Percent Asbestos:
Homogeneous loose particulate, tan/white		100 %	-	-	-				NAD
Other Fibers	Fibrous Glass	; Cellulos 90 %	Mineral e Wool	Synthetic		Other			trix 0 %
proper amount of m	naterial red 27217.000	commend	all sample ed.	size, results Sample ID:		tely reflect t	he content of the par Date Analyzed: Analyst:	ent material; re-an 02/25/2021 Tim Cammann	alysis with a
Asbestos Mineral Fib	bers	Layer Percent:	Chrysotile	Amosite	Crocidolite		,		Percent Asbestos:
Layer 01									
vinyl, gray/black		50 %	-	-	-				NAD
	ay, d	50 % 50 %	-	-	-				
Layer 02 fibrous backing, gra with thin mastic, re	ay, ed Fibrous Glass	50 %	- - Mineral :e Wool	- Synthetic	-	Other			NAD NAD
Layer 02 fibrous backing, gra with thin mastic, re Other Fibers Layer 01	ed Fibrous	50 %		- Synthetic - -	-	Other - -	-	1(	NAD
Layer 02 fibrous backing, gra with thin mastic, re Other Fibers Layer 01 Layer 02 <u>Client Sample ID:</u> 2 Client Sample Descri	ed Fibrous Glass - - 27217.000 iption:	50 % Cellulos - 10 %		Synthetic	- - S29	Other - -	- - Date Analyzed: Analyst:	1(	NAD trix 00 % 0 %
Layer 02 fibrous backing, gra with thin mastic, re Other Fibers Layer 01 Layer 02 <u>Client Sample ID:</u> 2 Client Sample Descri Asbestos Mineral Fib	Fibrous Glass - - 27217.000 ption: pers	50 % Cellulos - 10 % <b>)-0029</b> Layer		-	- - S29 Crocidolite	Other - -		1( 9 02/25/2021	NAC trix 00 %
Layer 02 fibrous backing, gra	ed Fibrous Glass - 27217.000 iption: bers F	50 % Cellulos - 10 % <b>)-0029</b> Layer	e Wool - -	Sample ID:		Other - -		1( 9 02/25/2021	NAD trix 00 % 0 % Percent



abCor Fortland nc 4321 South	Corbet	t Ave., St	-	BULK	SAMPLE AS	BESTOS	ANALYSIS	Phone: (503) 224-5055 www.labcorpdx.com		
Portland, O	R 9723	9		Asbes	tos and Envir	onmental	Analysis			
lient: PBS Engineeri 4412 S Corbett Portland, OR S	Avenue		ental				=	ort Number: 2 Report Date: (		
Project Name:	<b>0623</b> 17.000	Phase 00	001					P.O. No: 1	n/a	
lient Sample ID: 27	217.000	-0030		Sample ID:	S30		Date Analyzed:	02/25/2021		
Client Sample Descript	tion:			•			Analyst:	Tim Camma	nn	
Asbestos Mineral Fibe	rs	Layer Percent:	Chrysotile	Amosite	Crocidolite				Percent Asbestos:	
Layer 01										
vinyl, gray/tan/black L <b>ayer 02</b>		82 %	-	-	-				NAD	
thin backing, brown/gray/blue		18 %	-	-	-				NAD	
Other Fibers	Fibrous Glass	Cellulos	Mineral Se Wool	Synthetic		Other			Matrix	
Layer 01	-	-	-	-		-	-		100 %	
Layer 02	-	3 %	-	-		-	-		97 %	
Client Sample ID: 27 Client Sample Descript Asbestos Mineral Fibe	rs	Layer	Chrysotile	Sample ID: Amosite	Crocidolite		Date Analyzed: Analyst:	02/26/2021 Mia Gaines	Percent Asbestos:	
Layer 01										
fine compact powder white with paint, off- white/yellow/green	r, off-	5 %	Trace	-	-				< 1 %	
Layer 02										
compact chalky mate with paper, white		95 %	-	-	-				NAD	
Other Fibers	Fibrous Glass	Cellulos	Mineral se Wool	Synthetic		Other			Matrix	
Layer 01	-	-	-	-		-	-		100 %	
Layer 02	-	1 %	-	-		-	-		99 %	
	217.000	-0032		Sample ID:	S32		Date Analyzed:	02/26/2021		
Client Sample Descript		Lover					Analyst:	Mia Gaines	Dam	
Asbestos Mineral Fibe		Layer Percent:	Chrysotile	Amosite	Crocidolite				Percent Asbestos:	
Layer 01		40.04								
rubbery material, gra L <b>ayer 02</b>	ıy	40 %	-	-	-				NAD	
mastic, off-white		60 %	-	-	-				NAD	
Other Fibers	Fibrous Glass	Cellulos	Mineral se Wool	Synthetic		Other			Matrix	
Layer 01	-	-	-	-		-	-		100 %	
Layer 02	-	-	-	-		-	-		100 %	



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Portland, O	)R 9723	19		Asbes	tos and Envir	onmental	Analysis		
lient: PBS Engineeri 4412 S Corbet Portland, OR	tt Avenue		ental				-	ort Number: Report Date:	
Job Number: 21 Project Name: roject Number: 272 Project Notes:		Phase 000	01					P.O. No:	n/a
Client Sample ID: 27 Client Sample Descrip Asbestos Mineral Fibe	otion: <u>ers</u>	Layer	Chrysotile	Sample ID: Amosite	S33 Crocidolite		Date Analyzed: Analyst:	02/26/2021 Mia Gaines	Percent Asbestos
Homogeneous granular compact powder, gray	ľ	100 %	-	-	-				ASDESIOS
<u>Other Fibers</u>	Fibrous Glass -	Cellulos	Mineral e Wool -	Synthetic -		Other -	-		Matrix 100 %
Client Sample ID: 27 Client Sample Descrip Asbestos Mineral Fibe	ers	Layer	Chrysotile	Sample ID: Amosite	S34 Crocidolite		Date Analyzed: Analyst:	02/26/2021 Mia Gaines	Percent Asbestos
Layer 01 granular compact powder, gray		25 %	-	-	-				NA
Layer 02 loose mastic materia yellow	al,	75 %	-	-	-				NAI
Other Fibers	Fibrous Glass	s Cellulos	Mineral e Wool	Synthetic		Other			Matrix
Layer 01 Layer 02	-	-	-	- 1 %		-	-		100 % 99 %
<u>Client Sample ID:</u> 27 Client Sample Descrip Asbestos Mineral Fibe	ers	Layer	Chrysotile	Sample ID: Amosite	S35 Crocidolite		Date Analyzed: Analyst:	02/26/2021 Mia Gaines	Percent Asbestos
Layer 01 hard vinyl, off-white Layer 02		95 %	-	-	-				NA
mastic, yellow with coating, gray		5 %	-	-	-				NAI
Other Fibers	Fibrous Glass		Mineral e Wool	Synthetic		Other			Matrix
Layer 01		_	-	,					100 %



4321 South	h Corbet	ortlan tt Ave., Ste		BULK	SAMPLE AS	BESTOS	ANALYSIS	Phone: (503 www.labcorp	
Portland, C				Asbest	tos and Envir	onmental	Analysis		
lient: PBS Engineer 4412 S Corbet Portland, OR	tt Avenu		ntal				•	oort Number: ; Report Date:	
Project Name:	<b>0623</b> 217.000	Phase 000	1					P.O. No:	n/a
	7217.000	0-0036		Sample ID:	S36		Date Analyzed:	02/26/2021	
Client Sample Descrip Asbestos Mineral Fibe	<u>ers</u>	Layer Percent: (	Chrysotile	Amosite	Crocidolite		Analyst:	Mia Gaines	Percen Asbesto
Layer 01									
coating, gray		10 %	-	-	-				NA
Layer 02									
hard vinyl, off-white		85 %	-	-	-				NA
Layer 03									
mastic, black/red		5 %	-	-	-				NA
Other Fibers	Fibrous		Mineral Wool	Synthetic		Other			Matrix
	Glass	Cellulose	**001	Oynaicae					IVIALIIA
Layer 01	Glass	6 %	-	-		-	-		94 %
-		00	-	-		-	-		
Layer 02		6 %		- - -		- -	-		94 %
Layer 02	- -	6 % - Trace	- - -		preparation an	- - - d point cou	- - - unt is recommended.		94 % 100 %
	- - al Chrysc	6 % - Trace otile fibers in	- - -	- - - - - - - - - - - - - - - - - - -		- - - d point cou		02/26/2021	94 % 100 %
Layer 02 Layer 03 Comments: Potentia Client Sample ID: 27	- - al Chrysc 7217.000	6 % - Trace otile fibers in	- - -			- - - d point cou	Date Analyzed:	02/26/2021 Mia Gaines	94 % 100 %
Layer 02 Layer 03 Comments: Potentia Client Sample ID: 27 Client Sample Descrip	- - al Chryso 7217.000 otion: ers	6 % - Trace <u>otile fibers ir</u> <b>0-0037</b> Layer	- - -	- - - - - - - - - - - - - - - - - - -		- - d point cou		02/26/2021 Mia Gaines	94 % 100 %
Layer 02 Layer 03 Comments: Potentia Client Sample ID: 27 Client Sample Descrip Asbestos Mineral Fibe Layer 01	- al Chrysc 7217.000 otion: ers	6 % - Trace <u>otile fibers ir</u> <b>0-0037</b> Layer	- - 1 Layer 02	Gravimetric Sample ID:	S37	- - d point cou	Date Analyzed:		94 % 100 % 100 % Percen
Layer 02 Layer 03 Comments: Potentia Client Sample ID: 27 Client Sample Descrip Asbestos Mineral Fibe Layer 01 flexible vinyl, off-wh	- al Chrysc 7217.000 otion: ers	6 % - Trace <u>otile fibers ir</u> <b>0-0037</b> Layer	- - 1 Layer 02	Gravimetric Sample ID:	S37	- - d point cou	Date Analyzed:		94 % 100 % 100 % Percen
Layer 02 Layer 03 Comments: Potentia Client Sample ID: 27 Client Sample Descrip Asbestos Mineral Fibe Layer 01 flexible vinyl, off-wh Layer 02	- al Chrysc 7217.000 otion: ers ite	6 % Trace <u>otile fibers ir</u> <b>0-0037</b> Layer Percent: 0 20 %	- - 1 Layer 02	Gravimetric Sample ID:	S37	- - d point cou	Date Analyzed:		94 % 100 % 100 % Percen Asbesto
Layer 02 Layer 03 Comments: Potentia Client Sample ID: 27 Client Sample Descrip Asbestos Mineral Fibe Layer 01 flexible vinyl, off-wh Layer 02 fibrous backing, gra	- al Chrysc 7217.000 otion: ers ite	6 % Trace otile fibers in <b>D-0037</b> Layer Percent: C	- - 1 Layer 02	Gravimetric Sample ID:	S37	- - d point cou	Date Analyzed:		94 % 100 % 100 % Percen Asbesto
Layer 02 Layer 03 Comments: Potentia Client Sample ID: 27 Client Sample Descrip Asbestos Mineral Fibe Layer 01 flexible vinyl, off-wh Layer 02 fibrous backing, gra Layer 03	- al Chrysc 7217.000 otion: ers ite	6 % Trace btile fibers in <b>D-0037</b> Layer Percent: 0 20 % 25 %	- - 1 Layer 02	Gravimetric Sample ID:	S37	- - d point cou	Date Analyzed:		94 % 100 % 100 % Percen Asbesto NA
Layer 02 Layer 03 Comments: Potentia Client Sample ID: 27 Client Sample Descrip Asbestos Mineral Fibe Layer 01 flexible vinyl, off-wh Layer 02 fibrous backing, gra Layer 03 mastic, off-white	- al Chrysc 7217.000 otion: ers ite	6 % Trace <u>otile fibers ir</u> <b>0-0037</b> Layer Percent: 0 20 %	- - 1 Layer 02	Gravimetric Sample ID:	S37	- - d point cou	Date Analyzed:		94 % 100 % 100 % Percen Asbesto
Layer 02 Layer 03 Comments: Potentia Client Sample ID: 27 Client Sample Descrip Asbestos Mineral Fibe Layer 01 flexible vinyl, off-wh Layer 02 fibrous backing, gra Layer 03 mastic, off-white Layer 04	- al Chrysc 7217.000 otion: ers ite	6 % Trace btile fibers in <b>D-0037</b> Layer Percent: C 20 % 25 % 5 %	- - - Chrysotile - -	Gravimetric Sample ID:	S37	- - d point cou	Date Analyzed:		94 % 100 % Percen Asbesto N/ N/
Layer 02 Layer 03 Comments: Potentia Client Sample ID: 27 Client Sample Descrip Asbestos Mineral Fibe Layer 01 flexible vinyl, off-wh Layer 02 fibrous backing, gra Layer 03 mastic, off-white Layer 04 hard vinyl, brown	- al Chrysc 7217.000 otion: ers ite	6 % Trace btile fibers in <b>D-0037</b> Layer Percent: 0 20 % 25 %	- - 1 Layer 02	Gravimetric Sample ID:	S37	- - d point cou	Date Analyzed:		94 % 100 % 100 % Percen Asbesto NA
Layer 02 Layer 03 Comments: Potentia Client Sample ID: 27 Client Sample Descrip Asbestos Mineral Fibe Layer 01 flexible vinyl, off-whi Layer 02 fibrous backing, gra Layer 03 mastic, off-white Layer 04 hard vinyl, brown Layer 05	- al Chrysc 7217.000 otion: ers ite	6 % - Trace otile fibers in 0-0037 Layer Percent: 0 20 % 25 % 5 % 40 %	- - - - Chrysotile - - - 5 %	Gravimetric Sample ID:	S37	- - d point cou	Date Analyzed:		94 % 100 % Percen Asbesto NA NA S5
Layer 02 Layer 03 Comments: Potentia Client Sample ID: 27 Client Sample Descrip Asbestos Mineral Fibe Layer 01 flexible vinyl, off-whi Layer 02 fibrous backing, gra Layer 03 mastic, off-white Layer 04 hard vinyl, brown Layer 05 mastic, black	- al Chrysc 7217.000 otion: ers ite	6 % - Trace <u>otile fibers in</u> <b>D-0037</b> Layer Percent: C 20 % 25 % 5 % 40 % 10 %	- - - 1 Layer 02 Chrysotile - - 5 % 3 %	Gravimetric Sample ID:	S37	- - d point cou	Date Analyzed:		94 % 100 % Percen Asbesto N/ N/
Layer 02 Layer 03 Comments: Potentia Client Sample ID: 27 Client Sample Descrip Asbestos Mineral Fibe Layer 01 flexible vinyl, off-whi Layer 02 fibrous backing, gra Layer 03 mastic, off-white Layer 04 hard vinyl, brown Layer 05 mastic, black	- al Chryso 7217.000 otion: ers ite ite	6 % - Trace btile fibers ir p-0037 Layer Percent: 0 20 % 25 % 5 % 40 % 10 % 5	- - - - - - 5 % 3 % Mineral	Gravimetric Sample ID: Amosite	S37		Date Analyzed:		94 % 100 % 100 % Percen Asbesto N/ N/ 5 3
Layer 02 Layer 03 Comments: Potentia Client Sample ID: 27 Client Sample Descrip Asbestos Mineral Fibe Layer 01 flexible vinyl, off-wh Layer 02 fibrous backing, gra Layer 03 mastic, off-white Layer 04 hard vinyl, brown Layer 05 mastic, black Other Fibers	- al Chrysc 7217.000 otion: ers ite	6 % - Trace <u>otile fibers ir</u> <b>p-0037</b> Layer Percent: C 20 % 25 % 5 % 40 % 10 % Cellulose	- - - - - - 5 % 3 % Mineral	Gravimetric Sample ID:	S37	- - d point cou	Date Analyzed:		94 % 100 % 100 % Percen Asbesto N/ N/ 5 3 Matrix
Layer 02 Layer 03 <u>Comments: Potentia</u> <u>Client Sample ID:</u> 27 Client Sample Descrip <u>Asbestos Mineral Fibe</u> Layer 01 flexible vinyl, off-wh Layer 02 fibrous backing, gra Layer 03 mastic, off-white Layer 04 hard vinyl, brown Layer 05 mastic, black <u>Other Fibers</u> Layer 01	- al Chrysc 7217.000 otion: ers ite ite ty Fibrous Glass	6 % - Trace btile fibers in <b>D-0037</b> Layer Percent: C 20 % 25 % 5 % 40 % 10 % Cellulose 60 %	- - - - - - - 5 % 3 % Mineral Wool	Gravimetric Sample ID: Amosite	S37		Date Analyzed:		94 % 100 % 100 % Percen Asbesto N/ N/ S 3 Matrix 40 %
Layer 02 Layer 03 <u>Comments: Potentia</u> <u>Client Sample ID:</u> 27 <u>Client Sample Descrip</u> <u>Asbestos Mineral Fibe</u> Layer 01 flexible vinyl, off-whi Layer 02 fibrous backing, gra Layer 03 mastic, off-white Layer 04 hard vinyl, brown Layer 05 mastic, black <u>Other Fibers</u> Layer 01 Layer 01 Layer 02	- al Chrysc 7217.000 otion: ers ite ite ty Fibrous Glass	6 % Trace btile fibers in <b>D-0037</b> Layer Percent: C 20 % 25 % 40 % 10 % Cellulose 60 % 60 %	- - - - - - - 5 % 3 % Mineral Wool	Gravimetric Sample ID: Amosite	S37		Date Analyzed:		94 % 100 % 100 % Percen Asbesto N/ N/ 5 3 Matrix 40 % 40 %
Layer 02 Layer 03 Comments: Potentia Client Sample ID: 27 Client Sample Descrip Asbestos Mineral Fibe Layer 01 flexible vinyl, off-wh Layer 02 fibrous backing, gra Layer 03 mastic, off-white Layer 04 hard vinyl, brown Layer 05	- al Chrysc 7217.000 otion: ers ite ite ty Fibrous Glass	6 % - Trace btile fibers in <b>D-0037</b> Layer Percent: C 20 % 25 % 5 % 40 % 10 % Cellulose 60 %	- - - - - - - 5 % 3 % Mineral Wool	Gravimetric Sample ID: Amosite	S37		Date Analyzed:		94 % 100 % 100 % Percen Asbesto N/ N/ S 3 Matrix 40 %

abCor Fortland 4321 South Corbett Ave., Ste A		BULK SAMPLE ASBESTOS ANALYSIS			ANALYSIS	Phone: (503) 224-5055 www.labcorpdx.com				
Portland, O				Asbes	tos and Envir	onmental.	Analysis			
ilient: PBS Engineeri 4412 S Corbet Portland, OR	tt Avenu		ental					ort Number: 2 Report Date:		)1
Job Number: 210 Project Name: Project Number: 272 Project Notes:		Phase 00	01					P.O. No:	n/a	
Client Sample ID: 27 Client Sample Descrip Asbestos Mineral Fibe	ers	Layer	Ohan an tilla	Sample ID:			Date Analyzed: Analyst:	02/26/2021 Mia Gaines	-	rcent
Homogeneous granular compact powder, gray		Percent: 100 %	Chrysotile	Amosite -	Crocidolite				Asb	estos: NAD
<u>Other Fibers</u>	Fibrous Glass -	Cellulos -	Mineral e Wool -	Synthetic -		Other -	-		Matrix 100 %	
Client Sample ID: 27 Client Sample Descrip Asbestos Mineral Fibe	ers	Layer	Chrysotile	Sample ID: Amosite	S39 Crocidolite		Date Analyzed: Analyst:	02/26/2021 Mia Gaines	-	rcent estos:
Layer 01 hard vinyl, off-white Layer 02		90 %	-	-	-					NAD
mastic material, yell Other Fibers	low Fibrous	10 %	- Mineral	-	-					NAD
Layer 01 Layer 02	Glass - -	Cellulos - 3 %	e Wool - -	Synthetic - -		Other - -	-		Matrix 100 % 97 %	
Client Sample ID: 27 Client Sample Descrip Asbestos Mineral Fibe	ers	Layer	Chrysotilo	Sample ID:			Date Analyzed: Analyst:	02/26/2021 Mia Gaines	-	rcent
Layer 01 hard compact mater clear/blue/white		98 %	Chrysotile	Amosite -	Crocidolite				ASD	estos: NAD
Layer 02 granular compact powder, gray		2%	-	-	-					NAD
Other Fibers	Fibrous Glass	; Cellulos	Mineral e Wool	Synthetic		Other			Matrix	
Layer 01 Layer 02	-	-	-	-		-	-		100 % 100 %	



4321 South	n Corbett	t Ave., Ste	n <b>d, Inc</b>		SAMPLE AS			Phone: (503) 224 www.labcorpdx.co	
Portland, C	DR 9723	9		Asbes	tos and Envir	onmental	Analysis		
lient: PBS Engineer 4412 S Corbe Portland, OR	tt Avenue		ental				-	ort Number: 2106 Report Date: 02/26	
Project Name:	<b>0623</b> 217.000	Phase 00	01					<b>P.O. No:</b> n/a	
Client Sample Descrip Asbestos Mineral Fib	ers	Layer	Chrysotile	Sample ID: Amosite	S41 Crocidolite		Date Analyzed: Analyst:	02/26/2021 Tim Cammann	Percent Asbestos:
Homogeneous granular compact powder, gray		100 %	-	-	-				NAD
<u>Other Fibers</u>	Fibrous Glass -	Cellulos Trace	Mineral e Wool -	Synthetic -		Other -	-	Ma 10	trix 10 %
Client Sample ID: 27	7217.000	-0042		Sample ID:	S42		Date Analyzed:	02/26/2021	
Client Sample Descrip							Analyst:	Tim Cammann	_
Asbestos Mineral Fib		Layer Percent:	Chrysotile	Amosite	Crocidolite				Percent Asbestos:
Layer 01 fine compact powde white, with paint, off white		15 %	-	-	-				NAD
Layer 02 fine compact powde white, with paper, g		20 %	-	-	-				NAD
Layer 03 compact chalky ma with paper, white	terial	65 %	-	-	-				NAD
Other Fibers	Fibrous Glass	Cellulos	Mineral e Wool	Synthetic		Other		Ма	
Layer 01	-	Trace	-	-		-	-		0 %
Layer 02 Layer 03	-	3 % 3 %	-	-		-	-		7 % 7 %
•	7217.000 otion:			Sample ID:	S43		Date Analyzed: Analyst:	02/26/2021 Tim Cammann	
Asbestos Mineral Fib	ers	Layer Percent:	Chrysotile	Amosite	Crocidolite		-		Percent Asbestos:
Homogeneous loose particulate, white/off-white		100 %	-	-	-				NAD
Other Fibers	Fibrous Glass	Cellulos	Mineral e Wool	Synthetic		Other		Ма	trix

ortiand 4001 Cout	Cor Port		-	, BULK	SAMPLE AS	BESTOS	ANALYSIS	Phone: (503) 224 www.labcorpdx.co	
	OR 97239	.,	-	Asbes	tos and Envir	onmental	Analysis		
Client: PBS Enginee 4412 S Corbe Portland, OR	ett Avenue	ronmen	tal				•	ort Number: 2106 Report Date: 02/26	
Project Name:	<b>10623</b> 7217.000 Pha	se 0001						<b>P.O. No:</b> n/a	
Client Sample Descri Asbestos Mineral Fib	<mark>bers</mark> Lay	er	hrysotile	Sample ID: Amosite	S44 Crocidolite		Date Analyzed: Analyst:	02/26/2021 Tim Cammann	Percent Asbestos:
Homogeneous loose particulate, blue/green/gray/wh	100 nite	)%	-	-	-				NAC
<u>Other Fibers</u>		ellulose Trace	Mineral Wool -	Synthetic -		Other -	-	Ma 10	trix 10 %
			ould furth	,		nother sar	nple will need to be su		
<u>Client Sample ID:</u> 2 Client Sample Descri Asbestos Mineral Fib	<u>pers</u> Lay	er		Sample ID:			Date Analyzed: Analyst:	02/26/2021 Tim Cammann	Percent
Layer 01	Perc	ent: C	hrysotile	Amosite	Crocidolite				Asbestos:
compact powder, g	jray 75	i %	-	-	-				NAC
soft particulate, gra	ay/tan 25	i %	-	-	-				NAD
Other Fibers	Fibrous Glass Ce	ellulose	Mineral Wool	Synthetic		Other		Ma	
Layer 01 Layer 02		Frace Frace	-	-	Wollastonite	- 6 %	-	-	10 % 4 %
Client Sample ID: 2 Client Sample Descri Asbestos Mineral Fib	<u>pers</u> Lay	er	hrysotile	Sample ID:			Date Analyzed: Analyst:	02/26/2021 Tim Cammann	Percent
Homogeneous	Feic	ent. C	in ysoule	Amosite	Crocidolite				Asbestos:
fibrous tar, black	100	%	-	-	-				NAD
Other Fibers		ellulose 60 %	Mineral Wool -	Synthetic		Other -	-	Ma 4	

Portland Lab/Cor Portland, Inc.

Asbestos and Environmental Analysis

Client: PBS Engineering and Environmental 4412 S Corbett Avenue Portland, OR 97239

Portland, OR 97239

4321 South Corbett Ave., Ste A

#### Job Number: 210623 **Project Name:** Project Number: 27217.000 Phase 0001

**Project Notes:** 

LabCor

Inc

Report Number: 210623R01 Report Date: 02/26/2021

P.O. No: n/a

This laboratory participates in the National Voluntary Laboratory Accreditation Program (NVLAP). Testing method is per EPA 600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials and EPA - 40CFR App. E to Subpart E of Part 763, PLM. This report and the data contained therein cannot be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government.

• "NAD" is No Asbestos Detected.

• Asbestos consists of the following minerals: chrysotile, amosite, crocidolite, tremolite, actinolite, anthophyllite.

• Material binders, such as those found in vinyl floor tiles, may prevent the detection of small diameter asbestos fibers. A gravimetric preparation and point-count is recommended for such samples.

• Quantitative analysis by PLM point count or TEM may be recommended for samples testing at < or = to 1% asbestos.

• The following estimate of error for this method by visual estimation of asbestos percent are as follows:

1% asbestos: >0-3% error, 5% asbestos: 1-9% error, 10% asbestos: 5-15% error, 20% asbestos: 10-30% error.

• This report pertains only to the samples listed on the report. Report considered valid only when signed by analyst.

**Reviewed by:** 

Min Gaines **Mia Gaines** Analyst



# 21062) 13



## TRANSMITTAL AND CHAIN OF CUSTODY FOR ASBESTOS BULK SAMPLES

Project No.: 27217.000 Phase 0001

Individuals signing this form warront that the informotion provided is correct and complete. The Sender should keep o copy and send the original. The Receiver should complete the form, keep o copy and return the original to the Sender. Receiver shall report damoge of packoge immediately to Sender.

SENDER		· .	RECEIVER	. 1	2/2	
Date Sent: February	24, 2021	· · · · ·	Date Recei	ved: _2/2	5121	
PBS Engineering and En 4412 S Corbett Avenue Portland, OR 97239 S03.248.1939, Fax: 866.		• • •	Company: Address:	Lab Cor 4321 S Corbett Portland, OR S 503-224-5055	97239	
Alex Johnson	Digitally signed Date: 2023.02.24	by Alex Johnson 4 11:28:43 -08'00'	Name	ĺ.	2/23/21	4:45
Authorized Signature	Date	Time	Authorized	l Signature	Date	Time
Sender's ID No.	Brie	f Description		Receiver's ID N	o.	
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PBS Engineering and Enviro	mmental Inc.		Page 1		F	ebruary 24, 2021

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PBS Engineering and Environmental Inc.

Page 2

February 24, 2021

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TRANSMITTAL AND CHAIN OF CUSTODY FOR ASBESTOS BULK SAMPLES 27217.000-0040 27217.000-0041 27217.000-0042 27217.000-0043 27217.000-0044 27217.000-0045 27217.000-0046

Please analyze the enclosed 46 sample(s) for asbestos content using PLM with dispersion staining. PBS requests prior notification if samples will be disposed.

Request verbal results by: \_\_\_\_\_ AM/PM \_\_\_\_\_Date.

Please fax and mail the results to the above address.

TURNAROUND DESIRED: 72 Hour

SG/RD

PBS Engineering and Environmental Inc.

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February 24, 2021

210623



#### PLM - Composite/Gravimetric Point Count - 400 fields Final Report

Job Number: 210793

Report Number: 210793R01 Report Date: 3/10/2021

Address: 4412 S Corbett Avenue Portland, OR 97239 Project Name: Project No.: 27217.000 Phase 0001 PO Number: Sub Project: Reference No.:

**Client: PBS Engineering and Environmental** 

Enclosed please find results for samples submitted to our laboratory. A list of samples and analyses follows:

Lab/Cor Sample #	Client Sample # and Description	Analysis	Analysis Notes	Date Received:
210793 - S1	27217.000-0011 -	PLM -		3/8/2021
		Composite/Gravimetric		
		Point Count - 400 fields		

PLM - The submitted sample(s) were analyzed according to the EPA 600/R-93/116: Method for the Determination of Asbestos in Bulk Composite/Gravim Building Materials and EPA - 40CFR App. E to Subpart E of Part 763. The sample(s) were analyzed with a digital microscope etric Point Count - in order to determine homogeneity, the presence of fibers, and make a preliminary estimate of any asbestos fibers present in 400 fields the sample. The sample(s), and any observed layers, were then homogenized through techniques appropriate to that material and prepared for analysis by polarized light microscopy (PLM).

> A representative portion of each layer of the sample was homogenized with a mortar and pestle and placed in a preweighed scintillation vial. The sample was weighed and then ashed in the furnace at 420°C for 4 hours. The sample was allowed to cool to room temperature and then weighed again. It was then sonicated and filtered onto a preweighed 47µm MCE filter and placed into a drying oven until all moisture was removed from the residue and the filter. It was then allowed to cool and weighed again. These measurements were used to calculate the gravimetric reduction ratio, or the GRR.

> A random subsample of the residue was then homogenized in a mortar and pestle. Eight slide mounts were prepared using the appropriate refractive index liquid needed to fully characterize any observed fibers. A full point-count of 50 fields of view per preparation was then performed. Any fibers that were observed under the graticule of the evepiece were recorded and totaled at the end of the count. This total was then multiplied by 0.25% and the GRR in order to obtain the relative weight percent of asbestos for the sample. Any fibers that were observed, but did not fall under the graticule, were recorded as trace (<0.25%). Any observed fibers were reported and their optical characteristics recorded according to the EPA 600-R-93-116 method.

Disclaimer This report, and the data contained therein, cannot be used to claim product certification, approval, or endorsement by NVLAP. NIST, or any agency of the U.S. Government. The results found in this report are based only on the submitted sample(s). LabCor has no control over sampling procedures. This report is only valid when signed by an analyst.

NAD is No Asbestos Detected. Asbestos consists of the six following minerals: chrysotile, amosite, crocidolite, anthophyllite, actinolite, and tremolite.

Additional gravimetric, point-count or TEM analysis may be recommended for samples testing at < or = 1% asbestos, or those with material binders that prevent the detection of small diameter fibers.

The following estimate of error for this method by visual estimation of asbestos percent are as follows: 1% asbestos: >0-3% error, 5% asbestos: 1-9% error, 10% asbestos: 5-15% error, 20% asbestos: 10-30% error.

Sincerely,

win- to Rvan Talaski-Brown

PLM Technical Manager



LabCor Portland Inc 4321 South Corbett Ave., Ste A	Inc.	Phone: (503) 224-5055 www.labcorpdx.com		
Portland, OR 97239	BULK SAMPLE ASBES	OS ANALYSIS		
Client: PBS Engineering and Environmental 4412 S Corbett Avenue Portland, OR 97239		Report Number: 210793R01 Report Date: 03/10/2021		
Job Number: 210793		<b>P.O. No:</b> n/a		
Project Name: Project Number: 27217.000 Phase 0001 Project Notes:				
Client Sample ID: 27217.000-0011	Sample ID: S1	Date Analyzed: 03/10/2021		
Client Sample Description: <u>Asbestos Mineral Fibers</u> Percent: Chry.	sotile Amosite Crocidolite	Analyst: Ryan Talaski-Brown Percent Asbestos:		
Homogeneous		Point Count: 6 Point Count Fields: 400		
fine powder, light gray 100 % 0.1		0.19 %		
	neral Vool Synthetic 	Other Matrix 99.81 %		
Comments: Gravimetric reduction performed	d on sample. GRR value is 0.126			

This laboratory participates in the National Voluntary Laboratory Accreditation Program (NVLAP). Testing method is per EPA 600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials and EPA - 40CFR App. E to Subpart E of Part 763, PLM. This report and the data contained therein cannot be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government.

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• This report pertains only to the samples listed on the report. Report considered valid only when signed by analyst.

Reviewed by:

an Talori- Bow Ryan Talaski-Brown

PLM Technical Manager

# 210793

## **Katie Schultz**

From:	Alex Johnson < Alex.Johnson@pbsusa.com>
Sent:	Monday, March 8, 2021 2:17 PM
То:	Mark Donahue; Katie Schultz
Subject:	Extended analysis request 27217.000 P1
Attachments:	coc 27217.000 P0001 S0001-0046.pdf

Can we please get a gravimetric reduction/point count on Sample #27217.000-0011 48 hour turnaround.

1

original job #210623 Original job COC attached. PBS Project # 27217.000 Phase 0001

Thnx 🎯

Alex Johnson | Administrative Assistant | PBS Portland | Cell 503-703-0412

## THIS IS TO CERTIFY THAT **RICH A. DUFRESNE**

## HAS SUCCESSFULLY COMPLETED THE TRAINING COURSE

for

# **ONLINE AHERA ASBESTOS INSPECTOR REFRESHER**

In accordance with TSCA Title II, Part 763, Subpart E, Appendix C of 40 CFR

Course Date:

Course Location:

Certificate:

IRO-20-0264A

04/23/2020

Portland, OR

For verification of the authenticity of this certificate contact: PBS Environmental 4412 SW Corbett Avenue Portland, OR 97239 (503) 248-1939



CCB #SRA0615 4-Hr Training

Expiration Date: 04

04/23/2021

ander Fiely

Andy Fridley, Instructor

## THIS IS TO CERTIFY THAT SEAN GRABINER

## HAS SUCCESSFULLY COMPLETED THE TRAINING COURSE

for

# **ONLINE AHERA ASBESTOS INSPECTOR REFRESHER**

In accordance with TSCA Title II, Part 763, Subpart E, Appendix C of 40 CFR

Course Date:

01/18/2021

Course Location:

Portland, OR

Certificate:

IRO-21-4508B

For verification of the authenticity of this certificate contact: PBS Engineering and Environmental Inc. 4412 S Corbett Avenue Portland, Oregon 97239 503.248.1939



4-Hour Online AHERA Inspector Refresher Training; AHERA is the Asbestos Hazard Emergency Response Act enacting Title II of Toxic Substance Control Act (TSCA)

Expiration Date:

01/18/2022

ander Fiely

Andy Fridley, Instructor