

# BSD Fir Grove Elementary School- 2022 Re-Roof

## TECHNICAL SPECIFICATIONS



CIDA PROJECT #: 210307.01

BID SET: SEPTEMBER 29TH, 2022



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**AIA DOCUMENT A101-2017 STANDARD FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR**

- (INCORPORATED BY REFERENCE)

**AIA DOCUMENT A201-2017 GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION**

- (INCORPORATED BY REFERENCE)

**BSD TECHNICAL STANDARDS STANDARDS FOR DESIGN AND CONSTRUCTION OF ALL DISTRICT FACILITIES**

- (INCORPORATED BY REFERENCE—PLEASE SEE WEBSITE)

<https://www.beaverton.k12.or.us/departments/facilities-development/technical-standards>

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- By RWDI dated 10/15/2021

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## **PROJECT TEAM**

### OWNER

Beaverton School District  
16550 SW Merlo Rd  
Beaverton, OR 97003

Contact: Stephen Yamasaki, Project Manager  
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Phone: (503) 356-4458

### ARCHITECT/ STRUCTURAL ENGINEER

#### CIDA

15895 SW 72<sup>ND</sup> Ave, Suite 200  
Portland, OR 97224

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Phone: (503) 226-1285  
Contact: Curtis Gagner  
E-Mail: [curtisg@cidainc.com](mailto:curtisg@cidainc.com)  
Phone: (503) 226-1285

### ROOFING CONSULTANT

#### RWDI USA LLC

421 SW 6<sup>th</sup> Ave, Suite 450  
Portland, OR 97205

Contact: Jasha Kistler  
E-Mail: [jasha.kistler@rwdi.com](mailto:jasha.kistler@rwdi.com)  
Phone: (503) 243-2556

### HAZARDOUS MATERIAL SURVEYOR

#### TRC Solutions

4105 SE International Way  
Milwaukie, OR 97222

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Phone: (503) 387-3251

### GENERAL CONTRACTOR

TBD

## PART 1 - GENERAL

### 1.1 SUMMARY

#### A. Section includes:

1. Project information.
2. Work covered by Contract Documents.
3. Access to site.
4. Coordination with occupants.
5. Work restrictions.
6. Specification and drawing conventions.

#### B. Related Section:

1. Division 01 Section "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

### 1.2 PROJECT INFORMATION

#### A. Project Identification: BSD Fir Grove Elementary School- 2022 Re-roof

1. Project Location: 6300 SW Wilson Ave, Beaverton, OR 97008

### 1.3 WORK COVERED BY CONTRACT DOCUMENTS

#### A. The Work of the Project is defined by the Contract Documents and consists of the following:

1. New roofing overlay over existing built-up roofing system. See architectural plans for areas that are not in scope.

#### B. Type of Contract.

1. Project will be constructed under a single prime contract.
  - a. *Standard Form of Agreement Between Owner and Contractor AIA Document A101, 2017 Edition Modified.*
  - b. *General Conditions of the Contract for Construction AIA Document A201, 2017 Edition Modified.*

### 1.4 ACCESS TO SITE

- #### A. General:
- Contractor shall have full use of portions of the Project site for construction operations during construction period and as indicated in an approved Contractor's site logistics submittal submitted for review prior to start of construction. Contractor's use of designated and

approved portions of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

- B. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.

## 1.5 COORDINATION WITH OCCUPANTS

- A. Partial Owner Occupancy: Owner will occupy the premises during entire construction period, with the exception of areas under construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits unless otherwise indicated.
  - 1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
  - 2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.
  - 3. Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.

## 1.6 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.
  - 1. Comply with limitations on use of public streets and other requirements of authorities having jurisdiction.
  - 2. Comply with noise ordinances of the authorities having jurisdiction.
- B. On-Site Work Hours: Subject to compliance with authorities having jurisdiction limit work in the existing building and site as follows:
  - 1. Weekdays: 7:00 a.m. to 7:00 p.m (Custodian until 3:30 p.m.).
  - 2. Saturdays and Sundays: Arrange with Owner's Representative
- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
  - 1. Obtain Owner's written permission before proceeding with utility interruptions.
- D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.
  - 1. Notify Owner not less than two days in advance of proposed disruptive operations.
  - 2. Obtain Owner's written permission before proceeding with disruptive operations.

- E. Controlled Substances: Use of tobacco products, E-cigarettes/vape devices and other controlled substances on the Project site is not permitted.

## 1.7 SPECIFICATION AND DRAWING CONVENTIONS

- A. 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. Imperative mood and streamlined language are generally used in the Specifications. 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.
  - 2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- C. Drawing Coordination: Requirements for materials and products identified on the Drawings are described in detail in the Specifications. One or more of the following are used on the Drawings to identify materials and products:
  - 1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
  - 2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.
  - 3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

## PART 1 - GENERAL

### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.

### 1.2 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

### 1.3 SUBMITTALS

- A. Substitution Requests: Submit three copies of each request for consideration. Architect to forward any substitution to BSD representative for approval prior to acceptance by the Architect.
  - 1. Substitution Request Form: Use CSI Substitution Request Form 1.5C provided at the end of this section.
  - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
    - a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
    - 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. Include annotated copy of applicable specification section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
    - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
    - e. Samples, where applicable or requested.
    - f. Certificates and qualification data, where applicable or requested.
    - g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
    - h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
    - i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
    - j. 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 date of receipt of purchase order, lack of availability, or delays in delivery.

- k. Cost information, including a proposal of change, if any, in the Contract Sum.
- l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
- m. 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.

## PART 2 - PRODUCTS

### 2.1 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately upon discovery of need for change, but not later than 15 fifteen days prior to time required for preparation and review of related submittals.
  - 1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied:
    - a. Requested substitution has been approved by the Owner.
    - b. Requested substitution is consistent with the Contract Documents and will produce indicated results.
    - c. Requested substitution will not adversely affect Contractor's construction schedule.
    - d. Requested substitution has received necessary approvals of authorities having jurisdiction.
    - e. Requested substitution is compatible with other portions of the Work.
    - f. Requested substitution has been coordinated with other portions of the Work.
    - g. Requested substitution provides specified warranty.
    - h. 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.
- B. Substitutions for Convenience: Not allowed.

## PART 3 - EXECUTION (Not Used)

END OF SECTION



# SUBSTITUTION REQUEST

(During the Bidding Phase)

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

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

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

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

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

The Undersigned certifies:

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

Submitted by: \_\_\_\_\_  
Signed by: \_\_\_\_\_  
Firm: \_\_\_\_\_  
Address: \_\_\_\_\_  
Telephone: \_\_\_\_\_

## A/E's REVIEW AND ACTION

- ☐ Substitution approved - Make submittals in accordance with Specification Section 01330.  
☐ Substitution approved as noted - Make submittals in accordance with Specification Section 01330.  
☐ Substitution rejected - Use specified materials.  
☐ Substitution Request received too late - Use specified materials.

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

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

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

## PART 1 - GENERAL

### 1.1 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
  - 1. Coordination drawings.
  - 2. Requests for Information (RFIs).
  - 3. Project Web site.
  - 4. Project meetings.

### 1.2 DEFINITIONS

- A. RFI: Request from Owner, Architect, Consultant or Contractor seeking information from each other during construction.

### 1.3 COORDINATION

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
  - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
  - 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
  - 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
  - 1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
  - 1. Preparation of Contractor's construction schedule.
  - 2. Preparation of the schedule of values.
  - 3. Installation and removal of temporary facilities and controls.
  - 4. Delivery and processing of submittals.
  - 5. Progress meetings.

6. Preinstallation conferences.
7. Project Closeout Conference.
8. Startup and adjustment of systems.
9. Project closeout activities.

#### 1.4 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings in accordance with requirements in individual Sections, where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
    - a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
    - b. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
- B. Coordination Drawing Organization: Organize coordination drawings as follows:
1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing and electrical Work.
  2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings.
  3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire protection, fire alarm, and electrical equipment.
  4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
  5. Review: Architect/Consultant will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are the Contractor's responsibility.

#### 1.5 REQUESTS FOR INFORMATION (RFIs)

- A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
1. Architect/Consultant will return RFIs submitted to Architect/Consultant by other entities controlled by Contractor with no response.
  2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
1. Project name.
  2. Project number.
  3. Date.
  4. Name of Contractor.
  5. Name of Architect.
  6. RFI number, numbered sequentially.
  7. RFI subject.
  8. Specification Section number and title and related paragraphs, as appropriate.
  9. Drawing number and detail references, as appropriate.
  10. Field dimensions and conditions, as appropriate.
  11. Contractor's suggested resolution. If Contractor's solution(s) impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
  12. Contractor's signature.
  13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
- C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to the District.
- D. Architect's Action: Architect/Consultant will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect/Consultant after 1:00 p.m. will be considered as received the following working day.
1. The following RFIs will be returned without action:
    - a. Requests for approval of submittals.
    - b. Requests for approval of substitutions.
    - c. Requests for coordination information already indicated in the Contract Documents.
    - d. Requests for adjustments in the Contract Time or the Contract Sum.
    - e. Requests for interpretation of Architect's actions on submittals.
    - f. Incomplete RFIs or inaccurately prepared RFIs.
  2. Architect's/Consultant's action may include a request for additional information, in which case the allotted time for response will date from time of receipt of additional information.
  3. Architect's/Consultant's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."
    - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect/Consultant and Owner's Representative in writing within seven days of receipt of the RFI response.
- E. On receipt of Architect's/Consultant's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect/Consultant and Owner's Representative within seven days if Contractor disagrees with response.

- F. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Use software log that is part of Project Web site (e-Builder).

## 1.6 PROPOSAL REQUESTS

- A. Proposal Request Log: Contractor shall maintain a current log of all proposed requests and submit same at each project meeting and with each application for payment. Each proposal request shall have a unique number for tracking purpose. The log shall, at a minimum, show the proposal request number, date initiated, brief description, reference (i.e. RFI or supplemental instruction), estimated cost, estimated time, status, and reason for the proposal request (i.e. Unforeseen Condition/ Regulatory Requirement/ Owner Request/ E&O).

## 1.7 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
  - 1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner's Representative and Architect/Consultant of scheduled meeting dates and times.
  - 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
  - 3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner's Representative and Architect/Consultant, within three days of the meeting.
- B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
  - 1. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Architect and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  - 2. Agenda: Discuss items of significance that could affect progress, including the following:
    - a. Tentative construction schedule.
    - b. Phasing.
    - c. Critical work sequencing and long-lead items.
    - d. Designation of key personnel and their duties.
    - e. Procedures for processing field decisions and Change Orders.
    - f. Procedures for RFIs.
    - g. Procedures for testing and inspecting.
    - h. Procedures for processing Applications for Payment.
    - i. Distribution of the Contract Documents.
    - j. Submittal procedures.
    - k. Sustainable design requirements.

- l. Preparation of record documents.
    - m. Use of the premises and existing building.
    - n. Work restrictions.
    - o. Working hours.
    - p. Owner's occupancy requirements.
    - q. Responsibility for temporary facilities and controls.
    - r. Procedures for moisture and mold control.
    - s. Procedures for disruptions and shutdowns.
    - t. Construction waste management and recycling.
    - u. Parking availability.
    - v. Office, work, and storage areas.
    - w. Equipment deliveries and priorities.
    - x. First aid.
    - y. Security.
    - z. Progress cleaning.
  3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
  1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect/ Consultant and Owner's Representative of scheduled meeting dates.
  2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
    - a. Contract Documents.
    - b. Options.
    - c. Related RFIs.
    - d. Related Change Orders.
    - e. Purchases.
    - f. Deliveries.
    - g. Submittals.
    - h. Review of mockups.
    - i. Possible conflicts.
    - j. Compatibility problems.
    - k. Time schedules.
    - l. Weather limitations.
    - m. Manufacturer's written recommendations.
    - n. Warranty requirements.
    - o. Compatibility of materials.
    - p. Acceptability of substrates.
    - q. Temporary facilities and controls.
    - r. Space and access limitations.
    - s. Regulations of authorities having jurisdiction.
    - t. Testing and inspecting requirements.
    - u. Installation procedures.
    - v. Coordination with other work.

- w. Required performance results.
  - x. Protection of adjacent work.
  - y. Protection of construction and personnel.
3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
  4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
  5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Progress Meetings: Conduct progress meetings at intervals indicated in Owner/Contractor Agreement.
1. Attendees: In addition to representatives of Owner, Owner's Commissioning Authority and Architect/ Consultant, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
  2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
      - 1) Review schedule for next period.
    - b. Review present and future needs of each entity present, including the following:
      - 1) Interface requirements.
      - 2) Sequence of operations.
      - 3) Status of submittals.
      - 4) Deliveries.
      - 5) Off-site fabrication.
      - 6) Access.
      - 7) Site utilization.
      - 8) Temporary facilities and controls.
      - 9) Progress cleaning.
      - 10) Quality and work standards.
      - 11) Status of correction of deficient items.
      - 12) Field observations.
      - 13) Status of RFIs.
      - 14) Status of proposal requests.
      - 15) Pending changes.
      - 16) Status of Change Orders.

- 17) Pending claims and disputes.
  - 18) Documentation of information for payment requests.
- 3. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
  - a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.
- E. Project Closeout Conference: Conduct conference prior to Substantial Completion.
  - 1. Attendees: Owner, Architect/ Consultant, Contractor.
  - 2. Agenda: Procedures for completing and archiving closeout deliverables in e-Builder;
    - a. Requirements for preparing Record Documents;
    - b. Requirements for preparing O&Ms;
    - c. Submittal of warranties;
    - d. Requirements for delivery of Maintenance stock;
    - e. Requirements for demonstration and training.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

## PART 1 - GENERAL

### 1.1 1.1 SECTION INCLUDES

- A. Summary.
- B. General Requirements
- C. System Requirements.
- D. System Access.
- E. System Use.

### 1.2 SUMMARY

- A. Project Management Communications: The Owner, Contractor and Architect shall use the Internet web based project Management communications tool, E-Builder ASP software and protocols included in that software during this project. The use of project management communications as herein described does not replace or change any contractual responsibilities of the participants.
- B. Purpose: The intent of using e-Builder is to improve project work efforts by promoting timely initial communications and responses and to reduce the number of paper documents while providing improved record keeping by creation of electronic document files.

### 1.3 General Requirements:

- A. Project management communications is available through e-Builder as provided by “e-Builder” in the form and manner required by the Owner.
- B. The project communications database is on-line and fully functional. User registration, electronic and computer equipment,, and internet connections are the responsibility of each project participant. The sharing of user accounts is prohibited.
- C. Support: e-Builder will provide on-going support through on-line help files and with website’s training documents uploaded to the project folder.
- D. Authorized Users: Access to the web site will be by individuals who are licensed users as required by the Owner.
- E. Licenses Granted by Owner’s Representative: Owner shall pay for and provide licenses/access for the following members of the project team.
  - 1. Lead member of Architect’s/Consultant’s design team responsible.
  - 2. Contractor’s project manager or lead member of Contractor’s project staff.
  - 3. Others as deemed appropriate by Owner’s Representative.

**1.4 SYSTEM REQUIREMENTS:**

- A. System Configuration:
  - 1. As needed for satisfactory use and navigation on E-Builder and for efficient documentation, preparation and dissemination of project information needed for appropriate management and project team collaboration and construction of the project.
- B. Operating System and software configuration:
  - 1. All software shall be properly licensed with vendors or developers. Use of “e-Builder” does not convey any rights or licensure for use of any software, hardware or internet service provider.
  - 2. Software Configuration:
    - a. As needed for satisfactory use and navigation of E-Builder and for efficient documentation, preparation and dissemination of project information need for appropriate management and project team collaboration and construction of the project.

**1.5 SYSTEM ACCESS**

- A. Minimum Equipment and Internet Connection: In addition to other requirements specified in this Section, the Contractor shall be responsible for providing suitable computer systems for each licensed user at the user’s normal work location with high-speed Internet access, i.e. DSL, local cable company’s Internet connection, or T1 (or higher) connection.
- B. Authorized users will be contacted directly by the web site provider, e-Builder, who will assign the temporary user password.
- C. Individuals shall be responsible for the proper use of their passwords and access to data as agents of the company in which they are employed.

**1.6 SYSTEM USE**

- A. Owner’s Administrative Users: Owner administrative users have access and control of user licenses and all posted items. **DO NOT POST PRIVATE OR YOUR COMPANY’S CONFIDENTIAL ITEMS IN THE DATABASE!**
- B. Improper or abusive language toward any party or repeated posting of items intended to deceive or disrupt the work of the project will not be tolerated and will result in deletion of the offensive items and revocation of user license at the sole discretion of the Administrative User(s). Costs incurred or associated with such issues shall be the financial responsibility of the party responsible for the transgression.
- C. Communications: Communication for this project for the items listed below shall be solely through e-Builder:
  - 1. RFI, Requests for Information.
  - 2. Change Order Requests.
  - 3. Architect’s Supplemental Instructions.
  - 4. All other communication shall be conducted in an industry standard manner.
  - 5. Submittals, contracts, meeting minutes, and other project records.

6. Application for payments.
  7. Project closeout.
- D. Document Integrity and Revisions:
1. Documents, comments, drawings and other records posted to the system shall remain for the project record. The authorship time and date shall be recorded for each document submitted to the system. Submitting a new document or record with a unique ID, authorship, and time stamp shall be the method used to make modifications or corrections.
  2. The system shall identify revised or superseded documents and their predecessors.
  3. Server or Client side software enhancements during the life of the project shall not alter or restrict the content of data published by the system. System upgrades shall not affect access to older documents or software.
- E. Document security: The system shall provide a method for communications of documents. Documents shall allow security group assignment to respect the contractual parties communication except for Administrative Users.
- F. Document Integration: Documents of various types shall be logically related to one another and discoverable,.
- G. Notifications and Distribution: Document distribution to project members shall be accomplished both within the extranet system and via email as appropriate. Project document distribution to parties outside of the project communication system shall be accomplished by secure email of outgoing documents and attachments readable by a standard email client.
- H. Ownership of Documents and Information: All documents, files or other information posted on the system shall become the property of the Owner.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

PART 1 - GENERAL

1.1 CONSTRUCTION PROGRESS DOCUMENTATION

- A. Progress Schedules and Reports: The Contractor, within ten calendar days after being awarded the Contract, shall prepare and submit for the information of the Owner's Representative and the Architect/Consultant a Progress Schedule in critical path management ("CPM") format satisfactory to the Owner's Representative for the Work. The Progress Schedule shall conform to any requirements of the Specifications, shall not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the entire Project to the extent required by the conditions of the Work and Project, shall be related to the entire Project to the extent required by the Contract Documents, shall provide for expeditious and practicable execution of the Work and shall be utilized and conformed to by the Contractor and its Subcontractors. Contractor shall comply with the Progress Schedule. The Progress schedule is for the District's benefit, and to the full extent permitted by law, changes to or variations from the Progress Schedule shall not entitle the Contractor to an extension of the Contract Time or increase of Contract Sum.
- B. Meeting Minutes: Contractor shall be responsible for the preparation and distribution of meeting minutes.

END OF SECTION

## PART 1 - GENERAL

### 1.1 SUMMARY

- A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

### 1.2 QUALITY CONTROL

- A. Submit 3-week work schedule, shop drawings, product data, samples, schedule of values and record documents as follows:
  - 1. Submit to Architect/Consultant and Owner's Representative only through General Contractor.
  - 2. The General Contractor shall provide a set of submittals to the Owner's Representative for review and approval concurrent with review by the Architect and Consultant(s).

### 1.3 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Architect's/ Consultant's Digital Data Files: Electronic copies of CAD Drawings of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals.
  - 1. Architect/Consultant will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings.
    - a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
    - b. Digital data files are provided for Contractor's convenience and to help expedite the submittal preparation process. Use of the digital data files is at Contractor's risk and does not release the Contractor from verifying and indicating as-built conditions which may or may not be indicated in the digital data files.
    - c. Contractor shall execute a release of Architect's/Consultant's liability for Contractor's use of the digital data files. Release form shall be provide by Architect/Consultant upon request.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
  - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
  - 2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
    - a. Architect and Consultant reserve the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect/Consultant's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect/Consultant or Owner's Representative will advise Contractor when a submittal being processed must be delayed for coordination.
  2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
  3. Resubmittal Review: Allow 15 days for review of each resubmittal.
- D. Identification and Information: Place a permanent label or title block on each paper copy submittal item for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
  2. Provide a space approximately 6 by 8 inches (150 by 200 mm) on label or beside title block to record Contractor's review and approval markings and action taken by Architect/Consultant.
  3. Include the following information for processing and recording action taken:
    - a. Project name.
    - b. Date.
    - c. Name of Architect.
    - d. Name of Construction Manager.
    - e. Name of Contractor.
    - f. Name of subcontractor.
    - g. Name of supplier.
    - h. Name of manufacturer.
    - i. Submittal number or other unique identifier, including revision identifier.
      - 1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).
    - j. Number and title of appropriate Specification Section.
    - k. Drawing number and detail references, as appropriate.
    - l. Location(s) where product is to be installed, as appropriate.
    - m. Other necessary identification.
- E. Identification and Information: Identify and incorporate information in each electronic submittal file as follows:
1. Assemble complete submittal package into a single indexed file with links enabling navigation to each item.
  2. Name file with submittal number or other unique identifier, including revision identifier.
    - a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01).

Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).

3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect/ Consultant.
  4. Include the following information on an inserted cover sheet:
    - a. Project name.
    - b. Date.
    - c. Name and address of Architect.
    - d. Name of Construction Manager.
    - e. Name of Contractor.
    - f. Name of firm or entity that prepared submittal.
    - g. Name of subcontractor.
    - h. Name of supplier.
    - i. Name of manufacturer.
    - j. Number and title of appropriate Specification Section.
    - k. Drawing number and detail references, as appropriate.
    - l. Location(s) where product is to be installed, as appropriate.
    - m. Related physical samples submitted directly.
    - n. Other necessary identification.
- F. Options: Identify options requiring selection by the Architect.
- G. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
  2. Note date and content of revision in label or title block and clearly indicate extent of revision.
  3. Resubmit submittals until they are marked with approval notation from Architect's/ Consultant's action stamp.
- H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- I. Use for Construction: Use only final submittals that are marked with approval notation from Architect's or Consultant's action stamp.

## PART 2 - PRODUCTS

### 2.1 SUBMITTAL PROCEDURES

#### A. General Submittal Procedure Requirements:

1. Post electronic submittals as PDF electronic files directly to e-Builder.
  - a. Architect/Consultant will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

2. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section "Closeout Procedures." All closeout submittals to be uploaded to e-Builder in format acceptable to the District.
  3. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
    - a. Provide a digital signature with digital certificate on electronically-submitted certificates and certifications where indicated.
    - b. Provide a notarized statement on original paper copy certificates and certifications where indicated.
  4. Test and Inspection Reports Submittals: Comply with requirements specified in Division 01 Section "Quality Requirements."
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
  2. Mark each copy of each submittal to show which products and options are applicable.
  3. Include the following information, as applicable:
    - a. Manufacturer's catalog cuts.
    - b. Manufacturer's product specifications.
    - c. Standard color charts.
    - d. Statement of compliance with specified referenced standards.
    - e. Testing by recognized testing agency.
    - f. Application of testing agency labels and seals.
    - g. Notation of coordination requirements.
    - h. Availability and delivery time information.
  4. For equipment, include the following in addition to the above, as applicable:
    - a. Wiring diagrams showing factory-installed wiring.
    - b. Printed performance curves.
    - c. Operational range diagrams.
    - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
  5. Submit Product Data before or concurrent with Samples.
  6. Submit Product Data in the following format:
    - a. PDF electronic file.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data without field-verifying as-built conditions which may or may not be indicated at part of the released digital data files.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    - a. Identification of products.
    - b. Schedules.
    - c. Compliance with specified standards.
    - d. Notation of coordination requirements.
    - e. Notation of dimensions established by field measurement.
    - f. Relationship and attachment to adjoining construction clearly indicated.
    - g. Seal and signature of professional engineer if specified.
  2. Submit Shop Drawings in the following format:
    - a. PDF electronic file.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
  2. Identification: Attach label on unexposed side of Samples that includes the following:
    - a. Generic description of Sample.
    - b. Product name and name of manufacturer.
    - c. Sample source.
    - d. Number and title of applicable Specification Section.
  3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
    - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
    - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
  4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
    - a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect/ Consultant will return submittal with options selected.
  5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or

containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

- a. Number of Samples: Submit three sets of Samples. Architect/Consultant will retain two Sample sets; remainder will be returned.
  - 1) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
  1. Submit product schedule in the following format:
    - a. PDF electronic file.
- F. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."
- G. Application for Payment: Comply with requirements specified in Division 01 Section "Payment Procedures."
- H. Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."
- I. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design.
  1. Submit subcontract list in the following format:
    - a. PDF electronic file.
- J. Coordination Drawings: Comply with requirements specified in Division 01 Section "Project Management and Coordination."
- K. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- L. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on American Welding Society (AWS) forms. Include names of firms and personnel certified.
- M. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

- N. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- O. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- P. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- Q. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- R. Product Test Reports: Submit written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- S. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project.
- T. Schedule of Tests and Inspections: Comply with requirements specified in Division 01 Section "Quality Requirements."
- U. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- V. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- W. Field Test Reports: Submit reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- X. Maintenance Data: Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."
- Y. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

## PART 3 - EXECUTION

### 3.1 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect/Consultant and Owner's Representative.
- B. Project Closeout and Maintenance/Material Submittals: Refer to requirements in Division 01 Section "Closeout Procedures."
- C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

### 3.2 ARCHITECT'S/ CONSULTANT'S ACTION

- A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Architect/ Consultant will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect or Consultant will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
- C. Incomplete submittals are not acceptable, will be considered nonresponsive, and will be returned without review.
- D. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION

PART 1 - GENERAL

1.1 CONSTRUCTION/ MAINTENANCE BUILDING SECURITY RULES

- A. The Contractor shall enforce strict discipline and good order among the Contractor's employees, Subcontractors, and other persons carrying out the contract on District property. The District may require that the Contractor immediately remove from the project site and District property any employee or other person carrying out the contract that the District considers objectionable.
- B. District Personnel (i.e., Building Administrator, Custodian, or a building monitor etc.) must be present when a contractor is performing work within an existing school facility.
- C. Only District Personnel will deactivate the security system upon arriving and reactivate the system when they leave the facility.
  - 1. If the responsible District Personnel for a particular day changes during the day, the District Personnel shall coordinate this change in responsibility and advise the contractor's superintendent.
- D. Contractor personnel will not be furnished District security badges and/or access codes to the Building security system.
- E. The Contractor shall have a responsible party such as a superintendent, foreman, or supervisor on site during any work being performed by either their own forces or that of their subcontractors.
- F. The superintendent shall check in with the responsible District Personnel upon arrival and advise when all work is complete, contract personnel have left, and the area is secure.
- G. The Contractor's superintendent shall be responsible for security in areas where work is being performed as well as ingress and egress to that area.
- H. At the Owner's Representative's discretion, the superintendent may be issued a building key to allow access to areas where work is being performed.
- I. The superintendent shall maintain a daily log defining what areas within the building were accessed by Contractor personnel, which personnel from their firm were in the building, and which subcontracting firms were in the building.,
- J. Each of the Contractor's employees, Subcontractors' employees, and principals/owners involved at the site may, at the option of the District, be subject to a security check, at any time, through the Beaverton Police Department or other authority.
- K. Contractor shall perform or have performed criminal background checks for every employee on all active campus (i.e., children are present) projects prior to that employee's admittance to the project site. Once an employee passes the criminal background check, they need to get an ID badge and a hard hat sticker (not provided by BSD), which they must wear while they are on site at all times. Contractor may be fined up to \$500 for every worker working on site without

the proper ID badge and a hat sticker. The following are the convicted crimes that may appear on the background check:

- Aggravated Murder of Murder
- Assault in the First Degree
- Kidnapping in the First Degree
- Rape in the First, Second, or Third Degree
- Sodomy in the First, Second, or Third Degree
- Unlawful Sex Penetration in the First or Second Degree
- Arson in the First Degree
- Sexual Abuse in the First, Second, or Third Degree
- Contributing to the Sexual Delinquency of a Minor
- Sexual Misconduct
- Public Misconduct
- Public Indecency
- Bigamy
- Incest
- Child Neglect in the First Degree
- Endangering the Welfare of a Minor
- Using Child in Display of Sexually Explicit Conduct
- Sale or Exhibition of Visual Reproduction of Sexual Conduct by a Child
- Paying for Viewing of Sexual Conduct Involving a Child
- Encouraging Child Sex Abuse in First, Second or Third Degree
- Possession of Materials Depicting Sexual Explicit Conduct of a Child in the First or Second Degree
- Arson in the First Degree
- Robbery in the First Degree
- Treason
- Abuse of a Corpse in the First Degree
- Prostitution, Promoting Prostitution, or Compelling Prostitution
- Sadoomasochistic Abuse or Sexual Conduct in a Live Show
- Furnishing, Sending, or Displaying Obscene Materials to Minors
- Exhibiting an Obscene Performance to a Minor
- Disseminating Obscene Materials
- Publicly Displaying Nudity or Sex for Advertising Purposes
- Distribution of Controlled Substance to Minors
- Manufacture or Delivery of Controlled Substance to Minor or Student within 1000 Feet of a School
- Attempt to Commit Any of the Above-Listed Crimes

- L. Smoking and any use of tobacco products is not allowed within 50 feet of the campus property. Contractor may be fined up to \$500 for each incident of tobacco use within the area of work by the Contractor or Subcontractors.
- M. Firearms are not allowed on campus property. Law enforcement will be contacted if any contractor personnel are in possession of a firearm on site (Including firearms located in a locked vehicle).
- N. Abusive, inappropriate, and/or foul language is strictly prohibited on active campus projects. Employees who abuse this rule will be asked to leave the project site.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

## PART 1 - GENERAL

### 1.1 SUMMARY

- A. 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. 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.
  - 2. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Consultant, Owner's Representative, or authorities having jurisdiction are not limited by provisions of this Section.

### 1.2 CONFLICTING REQUIREMENTS

- A. Referenced Standards: 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 conflicting 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.

### 1.3 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. 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 retesting and reinspecting.
- B. Manufacturer's Field Reports: Prepare written information documenting tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of representative making report.
  2. Statement on condition of substrates and their acceptability for installation of product.
  3. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
  4. Results of operational and other tests and a statement of whether observed performance complies with requirements.
  5. Other required items indicated in individual Specification Sections.
- 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.

#### 1.4 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- C. 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.
- D. 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.
- 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 Specification Sections 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. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
  2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- H. Manufacturer's Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. 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. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect/Consultant and Owner's Representative with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

## 1.5 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. Owner 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 reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, 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 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.
  6. Cover and secure opening from moisture and/or debris/rodents
  7. Storage and security of the mechanical equipment is the responsibility of the contractor.
- C. **Manufacturer's Field Services:** Where indicated, engage a manufacturer's representative to observe and inspect the Work. Manufacturer's representative's services include examination of substrates and conditions, verification of materials, inspection of completed portions of the Work, and submittal of written reports.
- 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, Consultant, Owner's Representative and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect/Consultant, Owner's Representative 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 in-situ 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. 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 quality-assurance 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.

#### 1.6 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Owner's Representative will engage a qualified 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/Consultant 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 quality-control service to Architect/Consultant and Owner's Representative 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 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 or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Division 01 Section "Execution."
- 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

## PART 1 - GENERAL

### 1.1 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.

### 1.2 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.

### 1.3 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. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

PRIVATE tbl1

AA	Aluminum Association, Inc. (The)
AAADM	American Association of Automatic Door Manufacturers
AABC	Associated Air Balance Council
AAMA	American Architectural Manufacturers Association
AASHTO	American Association of State Highway and Transportation Officials
AATCC	American Association of Textile Chemists and Colorists
ABAA	Air Barrier Association of America
ABMA	American Bearing Manufacturers Association
ACI	American Concrete Institute
ACPA	American Concrete Pipe Association
AEIC	Association of Edison Illuminating Companies, Inc. (The)
AF&PA	American Forest & Paper Association
AGA	American Gas Association
AGC	Associated General Contractors of America (The)
AHA	American Hardboard Association (Now part of CPA)
AHAM	Association of Home Appliance Manufacturers
AI	Asphalt Institute
AIA	American Institute of Architects (The)

AISC	American Institute of Steel Construction
ISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
ALCA	Associated Landscape Contractors of America (Now PLANET - Professional Landcare Network)
ALSC	American Lumber Standard Committee, Incorporated
AMCA	Air Movement and Control Association International, Inc.
ANSI	American National Standards Institute
AOSA	Association of Official Seed Analysts, Inc.
APA	Architectural Precast Association
APA	APA - The Engineered Wood Association
APA EWS	APA - The Engineered Wood Association; Engineered Wood Systems (See APA - The Engineered Wood Association)
API	American Petroleum Institute
ARI	Air-Conditioning & Refrigeration Institute
ARMA	Asphalt Roofing Manufacturers Association
ASCE	American Society of Civil Engineers
ASCE/SEI	American Society of Civil Engineers/Structural Engineering Institute (See ASCE)
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
ASME	ASME International (American Society of Mechanical Engineers International)
ASSE	American Society of Sanitary Engineering
ASTM	ASTM International (American Society for Testing and Materials International)
AWCI	Association of the Wall and Ceiling Industry
AWCMA	American Window Covering Manufacturers Association (Now WCMA)
AWI	Architectural Woodwork Institute

AWPA	American Wood Protection Association (Formerly: American Wood Preservers' Association)
AWS	American Welding Society
AWWA	American Water Works Association
BHMA	Builders Hardware Manufacturers Association
BIA	Brick Industry Association (The)
BICSI	BICSI, Inc.
BIFMA	BIFMA International (Business and Institutional Furniture Manufacturer's Association International)
BISSC	Baking Industry Sanitation Standards Committee
BSD	Beaverton School District
BWF	Badminton World Federation (Formerly: IBF - International Badminton Federation)
CCC	Carpet Cushion Council
CDA	Copper Development Association
CEA	Canadian Electricity Association
CEA	Consumer Electronics Association
CFFA	Chemical Fabrics & Film Association, Inc.
CGA	Compressed Gas Association
CIMA	Cellulose Insulation Manufacturers Association
CISCA	Ceilings & Interior Systems Construction Association
CISPI	Cast Iron Soil Pipe Institute
CLFMI	Chain Link Fence Manufacturers Institute
CRRC	Cool Roof Rating Council
CPA	Composite Panel Association
CPPA	Corrugated Polyethylene Pipe Association
CRI	Carpet and Rug Institute (The)

CRSI	Concrete Reinforcing Steel Institute
CSA	Canadian Standards Association
CSA	CSA International (Formerly: IAS - International Approval Services)
CSI	Cast Stone Institute
CSI	Construction Specifications Institute (The)
CSSB	Cedar Shake & Shingle Bureau
CTI	Cooling Technology Institute (Formerly: Cooling Tower Institute)
DHI	Door and Hardware Institute
EIA	Electronic Industries Alliance
EIMA	EIFS Industry Members Association
EJCDC	Engineers Joint Contract Documents Committee
EJMA	Expansion Joint Manufacturers Association, Inc.
ESD	ESD Association (Electrostatic Discharge Association)
ETL SEMCO	Intertek ETL SEMCO (Formerly: ITS - Intertek Testing Service NA)
FIBA	Federation Internationale de Basketball (The International Basketball Federation)
FIVB	Federation Internationale de Volleyball (The International Volleyball Federation)
FM Approvals	FM Approvals LLC
FM Global	FM Global (Formerly: FMG - FM Global)
FMRC	Factory Mutual Research (Now FM Global)
FRSA	Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.
FSA	Fluid Sealing Association

FSC	Forest Stewardship Council
GA	Gypsum Association
GANA	Glass Association of North America
GRI	(Part of GSI)
GS	Green Seal
GSI	Geosynthetic Institute
HI	Hydraulic Institute
HI	Hydronics Institute
HMMA	Hollow Metal Manufacturers Association (Part of NAAMM)
HPVA	Hardwood Plywood & Veneer Association
HPW	H. P. White Laboratory, Inc.
IAS	International Approval Services (Now CSA International)
IBF	International Badminton Federation (Now BWF)
ICEA	Insulated Cable Engineers Association, Inc.
ICRI	International Concrete Repair Institute, Inc.
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers, Inc. (The)
IESNA	Illuminating Engineering Society of North America
IEST	Institute of Environmental Sciences and Technology
IGCC	Insulating Glass Certification Council
IGMA	Insulating Glass Manufacturers Alliance
ILI	Indiana Limestone Institute of America, Inc.
ISO	International Organization for Standardization Available from ANSI
ISSFA	International Solid Surface Fabricators Association

ITS	Intertek Testing Service NA (Now ETL SEMCO)
ITU	International Telecommunication Union
KCMA	Kitchen Cabinet Manufacturers Association
LMA	Laminating Materials Association (Now part of CPA)
LPI	Lightning Protection Institute
MBMA	Metal Building Manufacturers Association
MFMA	Maple Flooring Manufacturers Association, Inc.
MFMA	Metal Framing Manufacturers Association, Inc.
MH	Material Handling (Now MHIA)
MHIA	Material Handling Industry of America
MIA	Marble Institute of America
MPI	Master Painters Institute
MSS	Manufacturers Standardization Society of The Valve and Fittings Industry Inc.
NAAMM	National Association of Architectural Metal Manufacturers
NACE	NACE International (National Association of Corrosion Engineers International)
NADCA	National Air Duct Cleaners Association
NAGWS	National Association for Girls and Women in Sport
NAIMA	North American Insulation Manufacturers Association
NBGQA	National Building Granite Quarries Association, Inc.
NCAA	National Collegiate Athletic Association (The)
NCMA	National Concrete Masonry Association
NCPI	National Clay Pipe Institute
NCTA	National Cable & Telecommunications Association

NEBB	National Environmental Balancing Bureau
NECA	National Electrical Contractors Association
NeLMA	Northeastern Lumber Manufacturers' Association
NEMA	National Electrical Manufacturers Association
NETA	InterNational Electrical Testing Association
NFHS	National Federation of State High School Associations
NFPA	NFPA (National Fire Protection Association)
NFRC	National Fenestration Rating Council
NGA	National Glass Association
NHLA	National Hardwood Lumber Association
NLGA	National Lumber Grades Authority
NOFMA	NOFMA: The Wood Flooring Manufacturers Association (Formerly: National Oak Flooring Manufacturers Association)
NOMMA	National Ornamental & Miscellaneous Metals Association
NRCA	National Roofing Contractors Association
NRMCA	National Ready Mixed Concrete Association
NSF	NSF International (National Sanitation Foundation International)
NSSGA	National Stone, Sand & Gravel Association
NTMA	National Terrazzo & Mosaic Association, Inc. (The)
NTRMA	National Tile Roofing Manufacturers Association (Now TRI)
NWWDA	National Wood Window and Door Association (Now WDMA)
OPL	Omega Point Laboratories, Inc. (Now ITS)
PCI	Precast/Prestressed Concrete Institute
PDCA	Painting & Decorating Contractors of America

PDI	Plumbing & Drainage Institute
PGI	PVC Geomembrane Institute
PLANET	Professional Landcare Network (Formerly: ACLA - Associated Landscape Contractors of America)
PTI	Post-Tensioning Institute
RCSC	Research Council on Structural Connections
RFCI	Resilient Floor Covering Institute
RIS	Redwood Inspection Service
SAE	SAE International
SDI	Steel Deck Institute
SDI	Steel Door Institute
SEFA	Scientific Equipment and Furniture Association
SEI/ASCE	Structural Engineering Institute/American Society of Civil Engineers (See ASCE)
SGCC	Safety Glazing Certification Council
SIA	Security Industry Association
SIGMA	Sealed Insulating Glass Manufacturers Association (Now IGMA)
SJI	Steel Joist Institute
SMA	Screen Manufacturers Association
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
SMPTE	Society of Motion Picture and Television Engineers
SPFA	Spray Polyurethane Foam Alliance (Formerly: SPI/SPFD - The Society of the Plastics Industry, Inc.; Spray Polyurethane Foam Division)
SPIB	Southern Pine Inspection Bureau (The)
SPRI	Single Ply Roofing Industry

SSINA	Specialty Steel Industry of North America
SSPC	SSPC: The Society for Protective Coatings
STI	Steel Tank Institute
SWI	Steel Window Institute
SWRI	Sealant, Waterproofing, & Restoration Institute
TCA	Tile Council of America, Inc. (Now TCNA)
TCNA	Tile Council of North America, Inc.
TIA/EIA	Telecommunications Industry Association/Electronic Industries Alliance
TMS	The Masonry Society
TPI	Truss Plate Institute, Inc.
TPI	Turfgrass Producers International
TRI	Tile Roofing Institute
UL	Underwriters Laboratories Inc.
UNI	Uni-Bell PVC Pipe Association
USAV	USA Volleyball
USGBC	U.S. Green Building Council
USITT	United States Institute for Theatre Technology, Inc.
WASTEC	Waste Equipment Technology Association
WCLIB	West Coast Lumber Inspection Bureau
WCMA	Window Covering Manufacturers Association
WCSC	Window Covering Safety Council (Formerly: WCMA - Window Covering Manufacturers Association)
WDMA	Window & Door Manufacturers Association (Formerly: NWWDA - National Wood Window and Door Association)
WI	Woodwork Institute (Formerly: WIC - Woodwork Institute of California)
WIC	Woodwork Institute of California (Now WI)

WMMPA        Wood Moulding & Millwork Producers Association

WSRCA        Western States Roofing Contractors Association

WWPA        Western Wood Products Association

C.    Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

PRIVATE tbl2

IAPMO       International Association of Plumbing and Mechanical Officials

ICC        International Code Council

ICC-ES      ICC Evaluation Service, Inc.

UBC        Uniform Building Code  
(See ICC)

D.    Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

PRIVATE tbl3

CE        Army Corps of Engineers

CPSC       Consumer Product Safety Commission

DOC        Department of Commerce

DOD        Department of Defense

DOE        Department of Energy

EPA        Environmental Protection Agency

FAA        Federal Aviation Administration

FCC        Federal Communications Commission

FDA        Food and Drug Administration

GSA        General Services Administration

HUD        Department of Housing and Urban Development

LBL        Lawrence Berkeley National Laboratory

NCHRP      National Cooperative Highway Research Program  
(See TRB)

NIST	National Institute of Standards and Technology
OSHA	Occupational Safety & Health Administration
PBS	Public Buildings Service (See GSA)
PHS	Office of Public Health and Science
RUS	Rural Utilities Service (See USDA)
SD	State Department
TRB	Transportation Research Board
USDA	Department of Agriculture
USPS	Postal Service

- E. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

PRIVATE tbl4

ADAAG	Americans with Disabilities Act (ADA) Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities Available from U.S. Access Board
CFR	Code of Federal Regulations Available from Government Printing Office
DOD	Department of Defense Military Specifications and Standards Available from Department of Defense Single Stock Point
DSCC	Defense Supply Center Columbus (See FS)
FED-STD	Federal Standard (See FS)
FS	Federal Specification Available from Department of Defense Single Stock Point  Available from Defense Standardization Program  Available from General Services Administration  Available from National Institute of Building Sciences

FTMS Federal Test Method Standard  
(See FS)

MIL (See MILSPEC)

MIL-STD (See MILSPEC)

MILSPEC Military Specification and Standards  
Available from Department of Defense Single Stock Point

UFAS Uniform Federal Accessibility Standards  
Available from Access Board

F. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

PRIVATE tbl5

CBHF State of California, Department of Consumer Affairs Bureau of Home Furnishings and Thermal Insulation

CCR California Code of Regulations

CPUC California Public Utilities Commission

TFS Texas Forest Service  
Forest Resource Development

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

## PART 1 - GENERAL

### 1.1 SUMMARY

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

### 1.2 USE CHARGES

- A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Architect/Consultant, Owner's Representative, testing agencies, and authorities having jurisdiction. Temporary facilities required for the project include but may not be limited to:
  - 1. Sanitary Facilities
  - 2. Telephone/Fax
  - 3. Internet
- B. Water from Existing System: 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 from Existing System: 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.

### 1.3 INFORMATIONAL SUBMITTALS

- A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.
- B. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

### 1.4 QUALITY ASSURANCE

- A. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

### 1.5 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Engage installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

## PART 2 - PRODUCTS

### 2.1 TEMPORARY FACILITIES

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

### 2.2 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
  - 1. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return air grille in system and remove at end of construction and clean HVAC system as required in Division 01 Section "Closeout Procedures."

## PART 3 - EXECUTION

### 3.1 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.
  - 1. Locate facilities to limit site disturbance as specified in Division 01 Section "Summary."
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

### 3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
  - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
  - 1. Provide portable facilities as required for workmen. Keep facilities clean and in sanitary condition. Remove from the site upon completion of the Work.
- C. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

- D. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
- E. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
- F. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.
  - 1. Connect temporary service to Owner's existing power source, as directed by Owner.
- G. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
  - 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
  - 2. At a conspicuous place within the primary field office post a list of important telephone numbers, including:
    - a. Police and fire departments.
    - b. Ambulance service.
    - c. Contractor's home office.
    - d. Architect's office.
    - e. Engineers' offices.
    - f. Owner's Representative's office.
    - g. Principal subcontractors' field and home offices.

### 3.3 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
- B. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.
- C. Temporary Enclosures: Contractor to provide Weather Mitigation Plan in the event of rain and to establish procedures for temporary protection as well as an emergency contact list, please see roofing specification 075423 for additional information. Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
  - 1. Where heating or cooling is needed and permanent enclosure is not complete, insulate temporary enclosures.

- 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.
1. Prohibit smoking in construction areas.
  2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
  3. Develop and supervise an overall fire-prevention -and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
  4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

### 3.4 MOISTURE AND MOLD CONTROL

- A. Contractor's Moisture Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.

### 3.5 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.
1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
  2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section "Closeout Procedures."

END OF SECTION

## PART 1 - GENERAL

### 1.1 MATERIAL AND EQUIPMENT SELECTION

- A. Comply with standards and these specifications including size, make, type, and quality specified, or as accepted in writing by the Architect/Consultant and Owner's Representative.
- B. All products shall be new and of current manufacture unless otherwise specified.
- C. All similar products shall be of the same manufacturer.
- D. Manufactured and Fabricated Products:
  - 1. Design, fabricate, and assemble in accordance with the best engineering and shop practices.
  - 2. Manufacture like parts of duplicate units to standard sizes and gauges and to be interchangeable.
  - 3. All similar products shall be of the same manufacturer. Two or more items of the same kind shall be considered identical and by the same manufacturer.
  - 4. Provide products suitable for service conditions.
  - 5. Adhere to equipment capacities, sizes, and dimensions shown or specified unless variations are specifically approved in writing by the Architect/Consultant or Owner's Representative.
- E. Do not use material or equipment for any purpose other than that for which it is designed or is specified.
- F. Fabricate and install equipment to deliver its full rated capacity at the efficiency for which it was designed.
- G. Select and install equipment to operate at full capacity without excessive noise or vibration.
- H. Provide electrical products with Underwriter's Laboratories Label or as approved by the local inspection authority.
- I. Any software provided with products shall be provided with appropriate licensing and use agreements for a minimum of 10 years.

### 1.2 MANUFACTURER'S INSTRUCTIONS

- A. Perform work in accordance with manufacturer's printed installation instructions, obtain and distribute copies of such instructions to parties involved in the installation, including submittal to the Architect through the Owner's Project Management Database (e-Builder).
- B. Maintain one set of complete instructions at the job site during installation and until completion.
- C. Handle, install, connect, clean, condition, and adjust products in strict accordance with manufacturer's printed instructions and in conformity with specified requirements.

1. Consult with Architect/Consultant for further instructions should job conditions or specified requirements conflict with manufacturer's instructions.
  2. Do not proceed with work without clear instructions.
- D. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by the Contract Documents.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

## PART 1 - GENERAL

### 1.1 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
  - 1. Construction layout.
  - 2. Field engineering and surveying.
  - 3. Installation of the Work.
  - 4. Coordination of Owner-installed products.
  - 5. Progress cleaning.
  - 6. Starting and adjusting.
  - 7. Protection of installed construction.
  - 8. Correction of the Work.
- B. Related Sections:
  - 1. Division 01 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
  - 2. Division 01 Section "Cutting and Patching".

### 1.2 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

### 1.3 WARRANTY

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

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

## EXECUTION

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to the Architect and Owner's Representative for the visual and functional performance of in-place materials.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
  1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
  2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, 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. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
  2. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
  3. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
  4. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

#### 3.2 PREPARATION

- A. Existing Utility Information: Furnish information to Owner's Representative that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. 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.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of the Contractor, submit a request for information to Architect/ Consultant according to requirements in Division 01 Section "Project Management and Coordination."

### 3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and as-built conditions. If discrepancies are discovered, notify Architect/ Consultant promptly.

### 3.4 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.
  - 3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- 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. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- G. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
  - 1. Allow for building movement, including thermal expansion and contraction.
- H. 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.
- I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

### 3.5 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
  - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
  - 2. Contractor shall use a magnetic sweeper to assure that all nails, shavings, screws, and/or any hazardous metal materials are removed from the site.
  - 3. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
  - 4. Contractor shall use a magnetic sweeper to assure that all nails, shavings, screws, and/or any hazardous metal materials are removed from the site and roof.
  - 5. 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: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways.
- 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.

3.6 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: Comply with qualification requirements in Division 01 Section "Quality Requirements."

3.7 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.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.8 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.
  - 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.
- E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION

## PART 1 - GENERAL

### 1.1 SUMMARY

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

### 1.2 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. Notify A/E immediately and without further modification to structural elements if such compromise to structure inadvertently occurs.
- 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. Notify A/E immediately if such compromise to operational elements inadvertently occurs.

### 1.3 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.

## PART 2 - PRODUCTS

### 2.1 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. Submit 3 samples for Architect and Owner approval.

## PART 3 - EXECUTION

### 3.1 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.

### 3.2 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.

### 3.3 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. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
  5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
  6. 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.
  3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
  4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
  5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.
- 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

## PART 1 - GENERAL

### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
1. Substantial Completion procedures.
  2. Final completion procedures.
  3. Warranties.
  4. Final cleaning.

### 1.2 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete with request.
1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
  2. Advise Owner's Representative of pending insurance changeover requirements.
  3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
  4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
  5. Prepare and submit Project Record Documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
  6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
  7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
  8. Complete startup testing of systems.
  9. Submit test/adjust/balance records.
  10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
  11. Advise Owner of changeover in heat and other utilities.
  12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
  13. Complete final cleaning requirements, including touchup painting.
  14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
  15. Prepare Closeout Log: An electronic spreadsheet log listing all closeout deliverables required in the specifications including contractor's record drawings, warranties, shop drawings, product data, extra stock, training and O&Ms. See Sample Closeout Log provided in at the end of this section.

- B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect, Consultant and Owner's Representative will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
  - 1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
  - 2. Results of completed inspection will form the basis of requirements for final completion.

### 1.3 FINAL COMPLETION

- A. Preliminary Procedures: Before requesting final inspection for determining final completion, complete the following:
  - 1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."
  - 2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
  - 3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
  - 4. Submit pest-control final inspection report and warranty.
  - 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
- B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect, Consultant and Owner's Representative will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
  - 1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

### 1.4 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
  - 1. Organize list of spaces in a sequential order.
  - 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
  - 3. Submit list of incomplete items in the following format:
    - a. PDF electronic file.

## 1.5 WARRANTIES

- A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.
- B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
  - 1. Scan warranties and bonds and assemble complete warranty and bond submittal package into individual PDF files organized by specification section. All warranties to be in pdf format and placed in warranty folder on E-Builder.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
  - 1. Use cleaning products that meet Green Seal GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

## PART 3 - EXECUTION

### 3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
  - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
    - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
    - d. Remove tools, construction equipment, machinery, and surplus material from Project site.

- e. Remove snow and ice to provide safe access to building.
- f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
- g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
- h. Sweep concrete floors broom clean in unoccupied spaces.
- i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
- j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
- k. Remove labels that are not permanent.
- l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
  - 1) Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates.
- m. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
- n. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
- o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
- p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
- q. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
- r. Leave Project clean and ready for occupancy.

END OF SECTION

# CLOSEOUT LOG: BSD Fir Grove- 2022 Re-Roof

[illegible]

## PART 1 - GENERAL

### 1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
  - 1. Operations and Maintenance Manual.
    - a. Title page.
    - b. Table of contents.
    - c. Manual contents.
      - 1) Contact list.
      - 2) Certificate of Substantial Completion (AIA G704-2000).
      - 3) Contractor's Statement of Warranty.
      - 4) Asbestos Free Certification Letter.
      - 5) Certificate of Occupancy.
      - 6) Final Permit Inspection Approvals.
- B. See Divisions 02 through 49 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

### 1.2 SUBMITTALS

- A. Manual: Upload to E-Builder in PDF form at least 15 days before final inspection. Architect/Consultant and Owner's Representative will return an electronic copy with comments within 15 days after final inspection.
  - 1. Correct or modify each manual to comply with Architect's comments. Submit final electronic copy of each corrected manual within 15 days of receipt of Architect's/Consultant's and Owner's Representative's comments.

## PART 2 - PRODUCTS

### 2.1 MANUAL, GENERAL

- A. Organization: Unless otherwise indicated, organize manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. The manual shall contain a title page, table of contents, and manual contents.
- B. Title Page: Include the following information:
  - 1. Subject matter included in manual.
  - 2. Name and address of Project.
  - 3. Name and address of Owner.
  - 4. Date of submittal.
  - 5. Name, address, and telephone number of Contractor.

6. Name and address of Architect.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
- D. Manual Contents: Arrange contents numerically by specification section.

#### OPERATION INFORMATION

- E. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and equipment descriptions, operating standards, operating procedures, operating logs, wiring and control diagrams, and license requirements.
- F. Descriptions: Include the following:
  1. Product name and model number.
  2. Manufacturer's name.
  3. Equipment identification with serial number of each component.
  4. Equipment function.
  5. Operating characteristics.
  6. Limiting conditions.
  7. Performance curves.
  8. Engineering data and tests.
  9. Complete nomenclature and number of replacement parts.
- G. Operating Procedures: Include start-up, break-in, and control procedures; stopping and normal shutdown instructions; routine, normal, seasonal, and weekend operating instructions; and required sequences for electric or electronic systems.
- H. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- I. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

#### PRODUCT MAINTENANCE INFORMATION

- J. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- K. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- L. Product Information: Include the following, as applicable:
  1. Product name and model number.

2. Manufacturer's name.
  3. Color, pattern, and texture.
  4. Material and chemical composition.
  5. Reordering information for specially manufactured products.
- M. Maintenance Procedures: Include manufacturer's written recommendations and inspection procedures, types of cleaning agents, methods of cleaning, schedule for cleaning and maintenance, and repair instructions.
- N. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- O. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

#### SYSTEMS AND EQUIPMENT MAINTENANCE INFORMATION

- P. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- Q. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- R. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including maintenance instructions, drawings and diagrams for maintenance, nomenclature of parts and components, and recommended spare parts for each component part or piece of equipment:
- S. Maintenance Procedures: Include test and inspection instructions, troubleshooting guide, disassembly instructions, and adjusting instructions that detail essential maintenance procedures:
- T. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
- U. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- V. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- W. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

## PART 3 - EXECUTION

### 3.1 MANUAL PREPARATION

- A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- B. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
- C. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
- D. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.
  - 1. Do not use original Project Record Documents as part of operation and maintenance manuals.
- E. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION

## PART 1 - GENERAL

### 1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for Project Redlined Documents, including the following:
  - 1. Redlined Drawings.
  - 2. Redlined Specifications.
  - 3. Record Product Data.
- B. See Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
- C. See Divisions 02 through 49 Sections for specific requirements for Project Record Documents of the Work in those Sections.

### 1.2 SUBMITTALS

- A. Redlined Drawings: Comply with the following:
  - 1. Submit Redline Drawings. Redlines must be in color or easily recognizable from background.
- B. Redlined Specifications: Submit PDF of Project's Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit PDF of each Product Data submittal.

## PART 2 - PRODUCTS

### 2.1 REDLINED DRAWINGS

- A. Redlined Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings.
  - 1. Preparation: Contractor to mark Redlined Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
    - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
    - b. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.

2. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
3. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
4. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

## 2.2 REDLINED SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
  3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
  4. Note related Change Orders, Record Product Data, and Record Drawings where applicable.

## 2.3 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
  3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.

## 2.4 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

## PART 3 - EXECUTION

### 3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.

- B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

END OF SECTION

PART 1 - GENERAL

1.1 INSTRUCTION OF OWNER'S PERSONNEL

- A. Prior to Final Completion or acceptance, fully instruct the Owner's Designated Representative and maintenance personnel in the operation, adjustment, and maintenance of all products, equipment, and systems.
  - 1. The District reserves the right to videotape training sessions.
- B. Operating and maintenance manual shall constitute the basis of instruction.
  - 1. Review contents of manual with Owner's personnel in full detail to explain all aspects of operations and maintenance.
  - 2. Review complete heating and cooling cycles with Owner's Designated Representative. Review location of dampers, valves, and control equipment.

END OF SECTION

022623 LIMITED SUPPLEMENTAL ASBESTOS SURVEY REPORT  
(see next page)

# **ASBESTOS SURVEY REPORT**

## **Fir Grove Elementary School Roof Project**

**6300 SW Wilson Avenue  
Beaverton, OR 97008**

Prepared for:

### **Beaverton School District**

**16550 SW Merlo Road  
Beaverton, OR 97006**

**Inspection Dates:** October 22, 2021  
**Report Prepared:** November 5, 2021

Prepared By:



**4105 SE International Way, Suite 505  
Milwaukie, OR 97222  
503.387.3251**

TRC Project Number: 466190

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### Appendices

- Appendix A – Figure(s) and Photo Page(s)
- Appendix B – Laboratory Analytical Data Sheets
- Appendix C – Inspector Certification(s)

## **EXECUTIVE SUMMARY**

TRC Environmental Corporation (TRC) was contracted by the Beaverton School District to conduct an asbestos survey, including collection of bulk asbestos samples, laboratory analysis, and preparation of a report for the roof at Fir Grove Elementary School located at 6300 SW Wilson Avenue in Beaverton, Oregon 97008. Mr. Jason Stone, AHERA accredited building inspector performed the survey on October 22<sup>nd</sup>, 2021. The survey activities included the review of prior sampling documentation and reports provided by the District, inspection and assessment of accessible suspect building materials, collection of bulk samples of suspect asbestos containing building materials that had previously not be sampled, and submission of bulk samples for laboratory analysis.

### **ASBESTOS MATERIAL SUMMARY**

Suspect asbestos containing building materials were sampled and submitted under the chain-of-custody (COC) protocol to an accredited laboratory for polarized light microscopy (PLM) bulk sample analysis. Inspection, sampling and analytical procedures were performed in general accordance with the U.S. Environmental Protection Agency's (EPA's) National Emission Standards for Hazardous Air Pollutants (NESHAP) EPA 40 CFR 61 Subpart M, the EPA Asbestos Hazard Emergency Response Act (AHERA) 40 CFR Part 763, and Federal Occupational Safety and Health Administration (OSHA) 29 CFR 1926.1101 guidelines.

Results of the bulk sampling indicated none of the materials sampled during this survey contained detectable levels of asbestos, based on the PLM method.

However, any materials uncovered during renovation activities that are not addressed in this inspection report or prior reports for the building are considered presumed asbestos containing materials and must be sampled by an accredited asbestos inspector prior to disturbance, or they must be treated as asbestos containing.

## INTRODUCTION

An asbestos survey was conducted by TRC of the roof at Fir Grove Elementary School, located at 6300 SW Wilson Avenue in Beaverton, Oregon. It was reported by the client that this limited asbestos survey is being conducted in conjunction with their planned roof renovation project. The survey activities were performed on October 22<sup>nd</sup>, 2021 and included the review of prior sampling documentation and reports as well as the inspection, assessment and bulk sampling of suspect asbestos containing building materials that had not previously been sampled. Sample locations are presented on the Sample Location Diagrams in Appendix A. Laboratory analytical results are presented in Appendix B.

Mr. Jason Stone, AHERA accredited building inspector, conducted the survey inspection and sampling activities. Copies of training certificates and state licenses (where applicable) are presented in Appendix C, Inspector Certifications.

## BACKGROUND

### Asbestos Containing Materials

The United States Environmental Protection Agency (EPA) define an asbestos-containing material (ACM) as any material containing more than one percent (>1.0%) asbestos by weight. In addition, ACMs are designated as:

Friable asbestos - material which can be crumbled, pulverized or reduced to powder by hand pressure, a.k.a. Regulated Asbestos Containing Materials (RACM).

Category I Non-friable - includes resilient floor coverings, asphalt roofing products, gaskets and packing.

Category II Non-friable - any non-friable ACM that is not in Category I (i.e. Asbestos-cement (Transite) siding or roofing material).

### OSHA Regulated Materials

The Occupational Safety and Health Administration (OSHA) regulates all materials containing any detectable level of asbestos by weight, including those materials containing 1.0% or less.

### Asbestos Sampling and Analytical Procedures

Representative bulk samples of suspect asbestos-containing building materials were randomly collected from the interior of the building. Homogenous material determination was based on the following criteria:

- Similar physical characteristics (same color and texture, etc.),
- Application (sprayed or trowel-on, assembly into a system, etc.),
- Material function (thermal insulation, floor tile, wallboard system, etc.).

The bulk samples were collected, labeled, and shipped to the certified analytical laboratory under proper COC documentation, and condition and approximate quantity assessments were performed by the accredited inspector during the inspection. Laboratory services were provided by TRC Labs, in Windsor, Connecticut, a National Voluntary Laboratory Accreditation Program (NVLAP code #101424-0).

Bulk samples were analyzed by PLM utilizing the EPA's Test Methods: Methods for the Determination of Asbestos in Bulk Building Materials (EPA 600/R-93/116, July 1993) and the McCrone Research Institute's The Asbestos Particle Atlas as method references.

Analysis by PLM was performed by visual observation of the bulk sample and slides prepared of the bulk sample for microscopic examination and identification. The samples were analyzed for asbestos (Chrysotile, Amosite, Crocidolite, Anthophyllite, and Actinolite/Tremolite), fibrous non-asbestos constituents (mineral wool, cellulose, etc.) and non-fibrous constituents. Using a stereoscope, the microscopist visually estimates the relative amounts of each constituent by determining the estimated area of the asbestos compared with the area estimate of the total sample.

## ASBESTOS FINDINGS & RECOMMENDATIONS

The following table presents the location and quantities of each suspect building material identified and sampled during this survey as well as all applicable analytical results:

Sample No.	Material	Sample Location	Asbestos Content	Approximate Quantity
FGES-01A FGES-01B FGES-01C FGES-01D FGES-01E FGES-01F FGES-01G	Built-up Roofing, Black	Throughout Roof	ND	46,000 SF
FGES-02A FGES-02B FGES-02C	Asphaltic Roof System, Grey	Gym Roof	ND	15,000 SF
FGES-03A FGES-03B FGES-03C	Roof Mastic, Black	Throughout Roof	ND	N/A
FGES-04A FGES-04B FGES-04C	Silver Paint	Throughout Roof	ND	2,000 SF
FGES-05A FGES-05B FGES-05C	Roof Caulking, Grey	Throughout Roof	ND	N/A

ND = Non-detect

SF = Square feet

LF = Linear Feet

N/A = Not Applicable

### Asbestos Containing Materials (ACMs)

Results of the bulk sampling indicated none of the materials sampled during this limited survey contained detectable levels of asbestos, based on the PLM method.

### Non-Detect Materials (ND)

Asbestos was not detected in the following materials sampled during this investigation:

Material	Location
Built-up Roofing, Black	Throughout Roof
Asphaltic Roof System, Grey	Gym Roof
Roof Mastic, Black	Throughout Roof
Silver Paint	Throughout Roof
Roof Caulking, Grey	Throughout Roof

Due to the Site being an occupied building at the time of the inspection and sampling, a full destructive investigation for concealed materials was not performed. Hidden building materials (e.g., hidden roofing materials, old floor mastic patches hidden under carpeting, chalkboard mastic, mirror mastic, wood paneling mastic, etc.), other than those discussed in this report, could be uncovered when removing building finishes during renovation activities. Any materials encountered during the renovation activities that are not identified in this report, should either be presumed to be asbestos containing and handled as ACM or be sampled by an accredited asbestos inspector to determine if it contains asbestos.

## RECOMMENDATIONS

Results of the bulk sampling indicated none of the materials sampled during this survey contained detectable levels of asbestos, based on the PLM method. However, any materials uncovered during renovation or demolition activities that are not addressed in this inspection report or prior reports for the building are considered presumed asbestos containing materials and must be sampled by an accredited asbestos inspector prior to disturbance, or they must be treated as asbestos containing.

## DISCLAIMER

The content presented in this report is based on data collected during the site inspection and survey, review of pertinent regulations, requirements, guidelines and commonly followed industry standards, and information provided by the Beaverton School District, their clients, agents, and representatives.

The work has been conducted in an objective and unbiased manner and in accordance with generally accepted professional practice for this type of work. TRC believes the data and analysis to be accurate and relevant, but cannot accept responsibility for the accuracy or completeness of available documentation or possible withholding of information by other parties.

This asbestos survey report is designed to aid the property owner, architect, construction manager, general contractor, and asbestos abatement contractor in locating potential ACMs. This report is not intended for, and may not be utilized as, a bidding document or as an abatement project specification document.

If you have any questions, or need any further clarification regarding this report, please do not hesitate to contact Mr. Ron Landolt at (503) 407-0734.

Sincerely,  
**TRC Environmental Corporation**

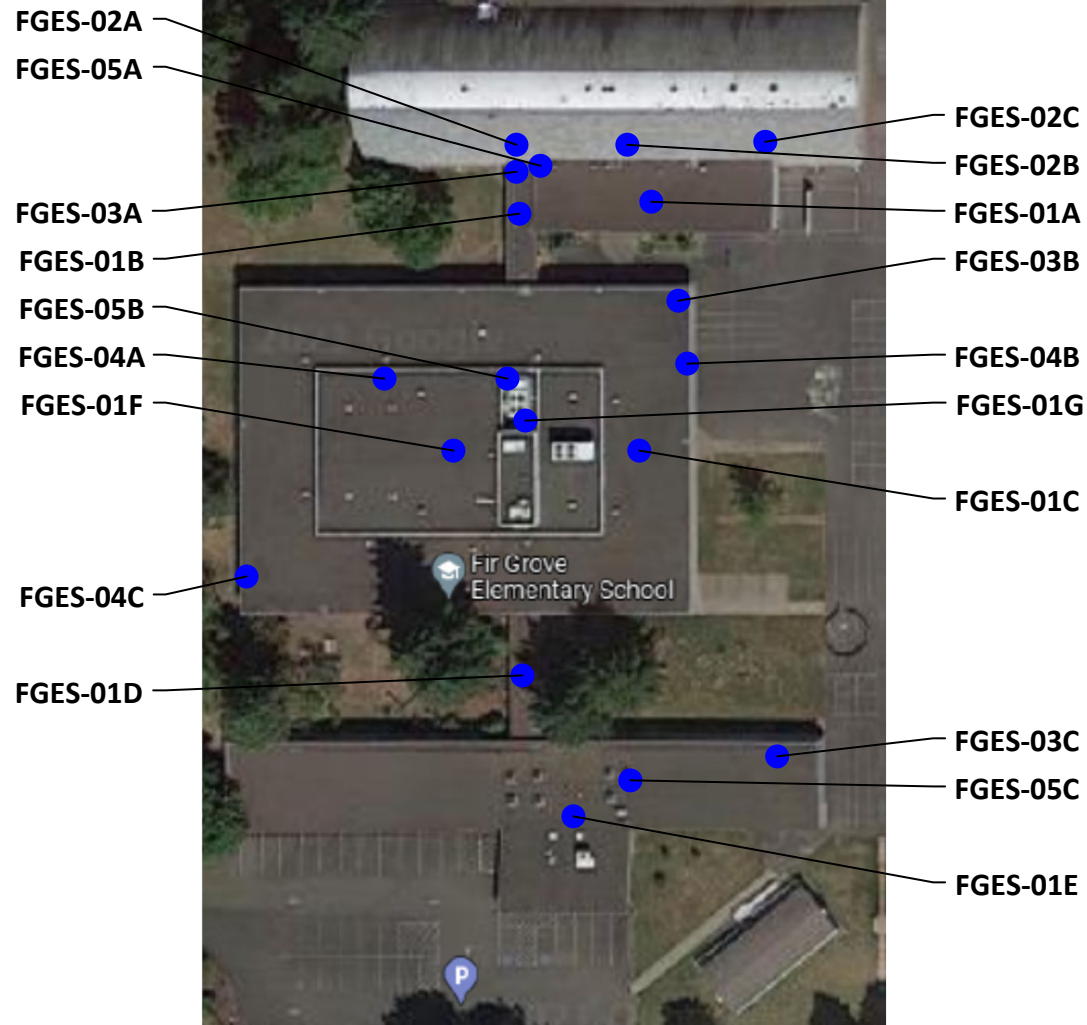


Jason Stone  
Project Manager



Ron Landolt, CAC  
NW Region BSI Practice Manager

## **Appendix A – Figure(s) and Photo Page(s)**



#### LEGEND

● — Non-Asbestos Sample Location

#### ASBESTOS SURVEY REPORT SAMPLE LOCATION DIAGRAM

FIR GROVE ELEMENTARY SCHOOL  
6300 SW WILSON AVENUE  
BEAVERTON, OREGON 97008

TRC Project No.: 466190

Figure: 1

Drawn by: JS

Reviewed by: RAL

Date: November 2021



4105 SE International Way, Suite 505  
Milwaukie, Oregon 97222  
Phone: (503) 387-3251 Fax: (503) 908-1318

## BSD-FIR GROVE ELEMENTARY SCHOOL – OVERVIEW PHOTOGRAPHIC LOG



## BSD-FIR GROVE ELEMENTARY SCHOOL SUSPECT ASBESTOS CONTAINING MATERIALS PHOTOGRAPHIC LOG

**Sample Numbers:** FGES-01A, FGES-01B, FGES-01C, FGES-01D, FGES-01E, FGES-01F, & FGES-01G

**Material Description:** Built-up Roofing

**Material Color:** Black

**Accessible Material:** Accessible

**Reason Inaccessible:** N/A

**Asbestos Detected:** Negative

**Asbestos Type:** No Asbestos Detected

**Homogeneous Area:** Roof Throughout

**Total Approximate Quantity:** 46,000 SF

**Condition:** Good

**Material Type:** Misc.

**NESHAP Category:** N/A

**Notes:** Not Applicable



**Sample Numbers:** FGES-02A, FGES-02B, & FGES-02C

**Material Description:** Asphaltic Roof System

**Material Color:** Grey

**Accessible Material:** Accessible

**Reason Inaccessible:** N/A

**Asbestos Detected:** Negative

**Asbestos Type:** No Asbestos Detected

**Homogeneous Area:** Gym Roof

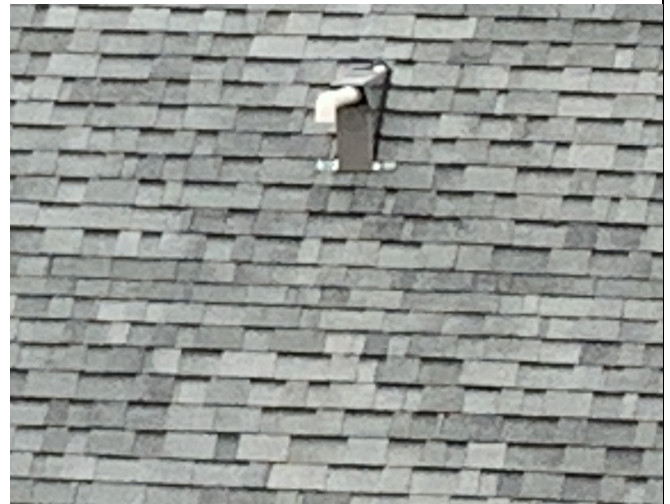
**Total Approximate Quantity:** 15,000 SF

**Condition:** Good

**Material Type:** Misc.

**NESHAP Category:** N/A

**Notes:** Not Applicable



## BSD-FIR GROVE ELEMENTARY SCHOOL SUSPECT ASBESTOS CONTAINING MATERIALS PHOTOGRAPHIC LOG

**Sample Numbers:** FGES-03A, FGES-03B, & FGES-03C

**Material Color:** Black

**Accessible Material:** Accessible

**Reason Inaccessible:** N/A

**Asbestos Detected:** Negative

**Asbestos Type:** No Asbestos Detected

**Homogeneous Area:** Roof

**Total Approximate Quantity:** N/A

**Condition:** Good

**Material Type:** Misc.

**NESHAP Category:** N/A

**Notes:** Not Applicable



**Sample Numbers:** FGES-04A, FGES-04B, & FGES-04C

**Material Color:** Silver

**Accessible Material:** Accessible

**Reason Inaccessible:** N/A

**Asbestos Detected:** Negative

**Asbestos Type:** No Asbestos Detected

**Homogeneous Area:** Roof

**Total Approximate Quantity:** 2,000 SF

**Condition:** Good

**Material Type:** Misc.

**NESHAP Category:** N/A

**Notes:** Not Applicable



## BSD-FIR GROVE ELEMENTARY SCHOOL

**Sample Numbers:** FGES-05A, FGES-05B, & FGES-05C

**Material Description:** Roof Caulking

**Material Color:** Grey

**Accessible Material:** Accessible

**Reason Inaccessible:** N/A

**Asbestos Detected:** Negative

**Asbestos Type:** No Asbestos Detected

**Homogeneous Area:** Roof

**Total Approximate Quantity:** 1,200 LF

**Condition:** Good

**Material Type:** Misc.

**NESHAP Category:** N/A

**Notes:** Not Applicable



## **Appendix B – Laboratory Analytical Data Sheets**



**BULK ASBESTOS ANALYSIS REPORT**

CLIENT: Beaverton School District

Lab Log #: 0057827  
Project #: 466190.0000.0000  
Date Received: 10/25/2021  
Date Analyzed: 10/28/2021

Site: Fir Grove ES, 6300 SW Wilson Avenue, Beaverton, OR

**POLARIZED LIGHT MICROSCOPY by EPA 600/R-93/116**

Sample No.	Sample Location	Homogeneous Material Description	Other Matrix Materials	Asbestos %	Asbestos Type
FGES-01A	See Diagram	LAYER 1 Grey-Brown Insulation	90% cellulose	ND	None
FGES-01A		LAYER 2 Black Built-up Roofing	60% cellulose 10% synthetic fiber	ND	None
FGES-01B	See Diagram	LAYER 1 Brown Insulation	99% cellulose	ND	None
FGES-01B		LAYER 2 Black Built-up Roofing	20% synthetic fiber	ND	None
FGES-01C	See Diagram	LAYER 1 Yellow Insulation	---	ND	None
FGES-01C		LAYER 2 Black Built-up Roofing	10% cellulose 10% synthetic fiber	ND	None
FGES-01D	See Diagram	LAYER 1 Grey-Brown Insulation	90% cellulose	ND	None
FGES-01D		LAYER 2 Black Built-up Roofing	20% cellulose 10% synthetic fiber	ND	None
FGES-01E	See Diagram	LAYER 1 Brown Insulation	99% cellulose	ND	None
FGES-01E		LAYER 2 Black Built-up Roofing	10% fibrous glass 20% synthetic fiber	ND	None
FGES-01F	See Diagram	LAYER 1 Grey-Brown Insulation	90% cellulose	ND	None
FGES-01F		LAYER 2 Black Built-up Roofing	20% fibrous glass 20% synthetic fiber	ND	None
FGES-01G	See Diagram	LAYER 1 Brown Insulation	99% cellulose	ND	None
FGES-01G		LAYER 2 Black Built-up Roofing	20% fibrous glass 20% synthetic fiber	ND	None

**TRC LABORATORY ASBESTOS ANALYTICAL ACCREDITATIONS**

NVLAP Lab Code 101424-0  
RI #PLM0007 TX #300354  
CO# AL-15020

AIHA-LAP, LLC #100122 CT #PH-0426  
VT #AL910359 LA#05011 VA #3333 000283  
PHIL# 461 PA#68-03387

ME LA-0075, LB-0071  
AZ #A20944

MA #AA000052  
HI #L-09-004

NY #10980 WV #000622  
NJ #CT004 CA #2907



## POLARIZED LIGHT MICROSCOPY by EPA 600/R-93/116

Sample No.	Sample Location	Homogeneous Material Description		Other Matrix Materials	Asbestos %	Asbestos Type
FGES-02A	See Diagram	LAYER 1 Black/Grey/White Asphaltic Shingle	20%	fibrous glass	ND	None
FGES-02A		LAYER 2 Black/Grey Asphaltic Shingle	20%	fibrous glass	ND	None
FGES-02A		LAYER 3 Black Membrane		- - -	ND	None
FGES-02B	See Diagram	LAYER 1 Black/Grey/White Asphaltic Shingle	20%	fibrous glass	ND	None
FGES-02B		LAYER 2 Black/Grey Asphaltic Shingle	20%	fibrous glass	ND	None
FGES-02B		LAYER 3 Black Membrane		- - -	ND	None
FGES-02C	See Diagram	LAYER 1 Black/Grey/White Asphaltic Shingle	20%	fibrous glass	ND	None
FGES-02C		LAYER 2 Black/Grey Asphaltic Shingle	20%	fibrous glass	ND	None
FGES-02C		LAYER 3 Black Membrane		- - -	ND	None
FGES-03A	See Diagram	Black Roof Mastic	10%	cellulose	ND	None
FGES-03B	See Diagram	Black Roof Mastic	10%	cellulose	ND	None
FGES-03C	See Diagram	Black Roof Mastic	10%	cellulose	ND	None
FGES-04A	See Diagram	Silver/Black Paint	20%	cellulose	ND	None
FGES-04B	See Diagram	Silver/Black Paint	20%	cellulose	ND	None
FGES-04C	See Diagram	Silver/Black Paint	20%	cellulose	ND	None
FGES-05A	See Diagram	Grey Roof Caulking		- - -	ND	None
FGES-05B	See Diagram	Grey Roof Caulking		- - -	ND	None
FGES-05C	See Diagram	Grey/Black Roof Caulking		- - -	ND	None

### TRC LABORATORY ASBESTOS ANALYTICAL ACCREDITATIONS

NVLAP Lab Code 101424-0  
RI #PLM0007 TX #300354  
CO# AL-15020

AIHA-LAP,LLC #100122 CT #PH-0426  
VT #AL910359 LA#05011 VA #3333 000283  
PHIL# 461 PA#68-03387

ME LA-0075, LB-0071  
AZ #A20944

MA #AA000052  
HI #L-09-004

NY #10980 WV #000622  
NJ #CT004 CA #2907



## POLARIZED LIGHT MICROSCOPY by EPA 600/R-93/116

Sample No.	Sample Location	Homogeneous Material Description	Other Matrix Materials	Asbestos %	Asbestos Type
------------	-----------------	----------------------------------	------------------------	------------	---------------

ND - asbestos was not detected

Trace - asbestos was observed at level of 1% or less - This is the reporting limit

NA/PS - Not Analyzed / Positive Stop

SNA - Sample Not Analyzed- See Chain of Custody for details

Notes: Asbestos-Containing Material (ACM) is any material containing more than 1% asbestos

Note: Polarized-light microscopy is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. In those cases, EPA recommends, and certain states (e.g. NY) require, that negative results be confirmed by quantitative transmission electron microscopy.

The Laboratory at TRC follows the EPA's Interim Method for the Determination of Asbestos in Bulk Insulation 1982 (EPA 600/M4-82-020) Bulk Analysis Code 18/A01 and the EPA recommended Method for the Determination of Asbestos in Bulk Building Materials July 1993, R.L. Perkins and B.W. Harvey, (EPA/600/R-93/116) Bulk Analysis Code 18/A03, which utilize polarized light microscopy (PLM). Our analysts have completed an accredited course in asbestos identification. TRC's Laboratory is accredited under the National Voluntary Laboratory Accreditation Program (NVLAP), for Bulk Asbestos Fiber Analysis, NVLAP Code 18/A01, effective through June 30, 2021. TRC is accredited by the AIHA Laboratory Accreditation Programs (AIHA-LAP), LLC in the Industrial Hygiene Program (IHLAP) for PLM effective through October 1, 2022. Asbestos content is determined by visual estimate unless otherwise indicated. Quality Control is performed in-house on at least 10% of samples and QC data related to the samples is available upon written request from client.

This report shall not be reproduced, except in full, without the written approval of TRC. This report must not be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government. This report relates only to the items tested.

Analyzed by:

Kathleen Williamson, Laboratory Manager

Reviewed by:

Joel Corso, Approved Signatory

**Date Issued**

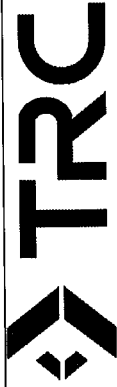
10/28/2021

### TRC LABORATORY ASBESTOS ANALYTICAL ACCREDITATIONS

NVLAP Lab Code 101424-0  
RI #PLM0007 TX #300354  
CO# AL-15020

AIHA-LAP, LLC #100122 CT #PH-0426  
VT #AL910359 LA#05011 VA #3333 000283  
PHIL# 461 PA#68-03387

ME LA-0075, LB-0071 MA #AA000052 NY #10980 WV #000622  
AZ #A20944 HI #L-09-004 NJ #CT004 CA #2907



4105 SE International Way, Suite 505, Milwaukie, OR 97222

Client:  
Beaverton School District

## ASBESTOS BULK SAMPLE CHAIN OF CUSTODY FORM

Project Number:  
466190

Sampling Technician:  
Jason Stone  
Mobile App: BSI - Portland - HAZMAT Survey

Tracking Number:

Requested TAT:  
3 DAY




Project Name:  
BSD-Fir Grove Elementary School  
Fir Grove Elementary School

### ASBESTOS BULK SAMPLE INFORMATION

Sample Date	Sample Identification	Material Description	Homogeneous Area	Sample Location	Lab Identification (Lab Use Only)
10/22/21	FGES-01A	Built-up Roofing , Black	Roof Throughout	See Diagram	
10/22/21	FGES-01B	Built-up Roofing , Black	Roof Throughout	See Diagram	
10/22/21	FGES-01C	Built-up Roofing , Black	Roof Throughout	See Diagram	
10/22/21	FGES-01D	Built-up Roofing , Black	Roof Throughout	See Diagram	
10/22/21	FGES-01E	Built-up Roofing , Black	Roof Throughout	See Diagram	
10/22/21	FGES-01F	Built-up Roofing , Black	Roof Throughout	See Diagram	
10/22/21	FGES-01G	Built-up Roofing , Black	Roof Throughout	See Diagram	
10/22/21	FGES-02A	Asphaltic Roof System , Grey	Gym Roof	See Diagram	
10/22/21	FGES-02B	Asphaltic Roof System , Grey	Gym Roof	See Diagram	
10/22/21	FGES-02C	Asphaltic Roof System , Grey	Gym Roof	See Diagram	
10/22/21	FGES-03A	Roof Mastic , Black	Roof	See Diagram	
10/22/21	FGES-03B	Roof Mastic , Black	Roof	See Diagram	
10/22/21	FGES-03C	Roof Mastic , Black	Roof	See Diagram	
10/22/21	FGES-04A	Silver Paint, Silver	Roof	See Diagram	
10/22/21	FGES-04B	Silver Paint, Silver	Roof	See Diagram	

kw

57827

10/22/21	FGES-04C	Silver Paint, Silver	Roof	See Diagram	
10/22/21	FGES-05A	Roof Caulking , Grey	Roof	See Diagram	
10/22/21	FGES-05B	Roof Caulking , Grey	Roof	See Diagram	
10/22/21	FGES-05C	Roof Caulking , Grey	Roof	See Diagram	
Special Instruction to Laboratory: N/A					
CHAIN OF CUSTODY INFORMATION AND LABORATORY INFORMATION					
Relinquished By:		Date and Time		Received By:	
1. (Print): Jason Stone		10/22/2021 2:28 pm America/Los_Angeles		 	
(Sign): 					
II. (Print):					
(Sign):					
Email Results To: jstone@trccompanies.com, mcuda@trccompanies.com, rlandolt@trccompanies.com		Analytical Method: PLM EPA 600/R-93/116		Lab Comments:	

## **Appendix C – Inspector Certification(s)**

# Certificate of Completion

This is to certify that  
**Jason Stone**  
has satisfactorily completed  
4 hours of refresher training as an  
AHERA Building Inspector

to comply with the training requirements of  
TSCA Title II, 40 CFR 763 (AHERA)

EPA Provider # 1085

179818

Certificate Number



Dec 16, 2020 Expires in 1 year.

Date(s) of Training

Exam Score: N/A  
(if applicable)

A handwritten signature in black ink, appearing to read "Ed Edinger".

Instructor: Ed Edinger

ARGUS PACIFIC, INC / 21905 64th AVE W, SUITE 100 / MOUNTLAKE TERRACE, WASHINGTON 98043 / 206.285.3373 / ARGUSPACIFIC.COM

## PART 1 - GENERAL

### 1.1 SUMMARY

#### A. Section Includes:

1. Miscellaneous steel framing and supports.
2. Metal ladders.
3. Miscellaneous steel trim.

### 1.2 SUBMITTALS

#### A. Product Data: For the following:

1. Paint products.

#### B. Shop Drawings: Show fabrication and installation details for metal fabrications.

1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

## PART 2 - PRODUCTS

### 2.1 METALS, GENERAL

#### A. Metal Surfaces, General: Provide materials with smooth, flat surfaces without blemishes.

### 2.2 FERROUS METALS

#### A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

#### B. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.

#### C. Steel Tubing: ASTM A 500, cold-formed steel tubing.

#### D. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40) unless otherwise indicated.

### 2.3 MISCELLANEOUS MATERIALS

#### A. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

2.4 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Use connections that maintain structural value of joined pieces.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges. Remove sharp or rough areas on exposed surfaces.
- C. Weld corners and seams continuously to comply with the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. At exposed connections, finish exposed welds and surfaces smooth and blended.
- D. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Locate joints where least conspicuous.
- E. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

2.5 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

2.6 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
- C. Galvanize exterior miscellaneous steel trim.

2.7 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Finishes must comply with Beaverton School District's published Technical Standards.

- B. Finish metal fabrications after assembly.

## 2.8 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. At exposed connections, finish exposed welds and surfaces smooth and blended.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide in-place construction with adequate solid blocking for secure anchorage.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

### 3.2 ADJUSTING AND CLEANING

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 055000

## SECTION 061000 - ROUGH 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. Section Includes:
  - 1. Framing with dimension lumber.
  - 2. Framing with engineered wood products.
  - 3. Rooftop equipment bases and support curbs.
  - 4. Wood blocking, cants, and nailers.
  - 5. Wood furring.
  - 6. Wood sleepers.

#### 1.3 DEFINITIONS

- A. Boards or Strips: Lumber of less than 2 inches nominal (38 mm actual) size in least dimension.
- B. Dimension Lumber: Lumber of 2 inches nominal (38 mm actual) size or greater but less than 5 inches nominal (114 mm actual) size in least dimension.
- C. Exposed Framing: Framing not concealed by other construction.
- D. OSB: Oriented strand board.
- E. Timber: Lumber of 5 inches nominal (114 mm actual) size or greater in least dimension.

#### 1.4 ACTION 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.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. 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, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber 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. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by grading agency.
  - 3. Dress lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.
- C. 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, as published by manufacturer, shall 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.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWP A U1; Use Category UC2 for interior construction not in contact with ground.
  - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
  - 2. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
3. Wood framing members that are less than 18 inches (460 mm) above the ground in crawlspaces or unexcavated areas.

## 2.3 DIMENSION LUMBER FRAMING

A. Ceiling Joists: No. 2 grade.

1. Species:
  - a. Douglas fir; WCLIB or WHPA.

B. Joists, Rafters, and Other Framing Not Listed Above: No. 2 grade.

1. Species:
  - a. Douglas fir; WCLIB or WHPA.

C. Exposed Framing Indicated to Receive a Stained or Natural Finish: Hand-select material for uniformity of appearance and freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot-holes, shake, splits, torn grain, and wane.

1. Species and Grade: As indicated above for load-bearing construction of same type.

## 2.4 ENGINEERED WOOD PRODUCTS

A. Laminated-Veneer Lumber: Structural composite lumber made from wood veneers with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D5456 and manufactured with an exterior-type adhesive complying with ASTM D2559.

1. Extreme Fiber Stress in Bending, Edgewise: 2600 psi (17.9 MPa for 12-inch nominal- (286-mm actual-) depth members.
2. Modulus of Elasticity, Edgewise: 2,000,000 psi (13 700 MPa).

B. Parallel-Strand Lumber: Structural composite lumber made from wood strand elements with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D5456 and manufactured with an exterior-type adhesive complying with ASTM D2559.

1. Extreme Fiber Stress in Bending, Edgewise: 2900 psi (20 MPa) for 12-inch nominal- (286-mm actual-) depth members.
2. Modulus of Elasticity, Edgewise: 2,200,000 psi (15 100 MPa).

- C. Wood I-Joists: Prefabricated units, I-shaped in cross section, made with solid or structural composite lumber flanges and wood-based structural panel webs, let into and bonded to flanges. Comply with material requirements of and with structural capacities established and monitored according to ASTM D5055.
  - 1. Web Material: Either OSB or plywood, complying with DOC PS 1 or DOC PS 2, Exposure 1.
  - 2. Structural Properties: Depths and design values not less than those indicated.
  - 3. Comply with APA PRI-400. Factory mark I-joists with APA-EWS trademark indicating nominal joist depth, joist class, span ratings, mill identification, and compliance with APA-EWS standard.
- D. Rim Boards: Product designed to be used as a load-bearing member and to brace wood I-joists at bearing ends, complying with research or evaluation report for I-joists.
  - 1. Manufacturer: Provide products by same manufacturer as I-joists.
  - 2. Material: product made from any combination solid lumber, wood strands, and veneers.
  - 3. Thickness: as indicated.
  - 4. Comply with APA PRR-401, rim board grade. Factory mark rim boards with APA-EWS trademark indicating thickness, grade, and compliance with APA-EWS standard.

## 2.5 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
  - 1. Blocking.
  - 2. Nailers.
  - 3. Rooftop equipment bases and support curbs.
  - 4. Cants.
  - 5. Furring.
- B. Dimension Lumber Items: No. 2 grade lumber of any of the following species:
  - 1. Hem-fir; WCLIB or WWPA.
  - 2. Douglas fir-larch; WCLIB or WWPA.
- C. Concealed Boards: 19 percent maximum moisture content and any of the following species and grades:
  - 1. Douglas fir-larch; No. 2 grade WCLIB or WWPA
  - 2. Hem-fir No. 2 grade: WCLIB, or WWPA.
- D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- 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.
- F. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

**2.6 FASTENERS**

- A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture.
  - 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M or of Type 304 stainless steel.
- B. Nails, Brads, and Staples: ASTM F1667.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

**2.7 METAL FRAMING ANCHORS**

- A. Allowable design loads, as published by manufacturer, shall 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. Framing anchors shall be punched for fasteners adequate to withstand same loads as framing anchors.
- B. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653/A653M, G60 (Z180) coating designation.
  - 1. Use for interior locations unless otherwise indicated.
- C. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A653/A653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 (Z550) coating designation; and not less than 0.036 inch (0.9 mm) thick.
  - 1. Use for wood-preservative-treated lumber and where indicated.
- D. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304
  - 1. Use for exterior locations and where indicated.

**2.8 MISCELLANEOUS MATERIALS**

- A. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch (0.6 mm).
- B. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chlorpyrifos as its active ingredient.

**PART 3 - EXECUTION****3.1 INSTALLATION, GENERAL**

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- B. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.
- C. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- D. Install metal framing anchors to comply with manufacturer's written instructions.
- E. Do not splice structural members between supports unless otherwise indicated.
- F. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
- G. Sort and select lumber so that natural characteristics do 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.
- H. Comply with AWWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
  - 1. Use inorganic boron for items that are continuously protected from liquid water.
  - 2. Use copper naphthenate for items not continuously protected from liquid water.
- I. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- J. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
  - 1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code (IBC).
  - 2. ICC-ES evaluation report for fastener.
- K. Use steel common 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 between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.
- L. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.
  - 1. Comply with indicated fastener patterns where applicable.

2. Use common nails unless otherwise indicated. Drive nails snug but do not countersink nail heads.

### 3.2 INSTALLATION OF WOOD BLOCKING AND NAILERS

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

### 3.3 INSTALLATION OF WOOD FURRING

- A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.
- B. Furring to Receive Plywood or Hardboard Paneling: Install 1-by-3-inch nominal- (19-by-63-mm actual-) size furring vertically at 24 inches (610 mm) o.c.

### 3.4 INSTALLATION OF CEILING JOIST AND RAFTER FRAMING

- A. Ceiling Joists: Install with crown edge up and complying with requirements specified above for floor joists. Face nail to ends of parallel rafters.
  1. Where ceiling joists are at right angles to rafters, provide additional short joists parallel to rafters from wall plate to first joist; nail to ends of rafters and to top plate, and nail to first joist or anchor with framing anchors or metal straps. Provide 1-by-8-inch nominal- (19-by-184-mm actual-) size or 2-by-4-inch nominal- (38-by-89-mm actual-) size stringers spaced 48 inches (1200 mm) o.c. crosswise over main ceiling joists.
- B. Provide special framing as indicated for eaves, overhangs, dormers, and similar conditions if any.

### 3.5 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet enough that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061000

SECTION 075423 – THERMOPLASTIC POLYOLEFIN (TPO) MEMBRANE ROOFING AND RELATED SHEET METAL

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Induction welded mechanically attached TPO membrane roofing system.
- B. High density polyiso cover board.
- C. Sheet Metal Flashing and Trim:
  - 1. Formed roof-drainage sheet metal fabrications.
  - 2. Formed low-slope roof sheet metal flashings.
  - 3. Formed wall sheet metal fabrications.
  - 4. Formed equipment support flashings.
  - 5. Sheet metal counter flashing.
- D. Miscellaneous materials.
- E. Preparation of existing roofing system for new recover application.

1.2 REFERENCES

- A. Roofing Terminology: Refer to the following publications for definitions of roofing work related terms in this Section:
  - 1. ASTM D1079, Standard Terminology Relating to Roofing and Waterproofing.
  - 2. The NRCA Roofing and Waterproofing Manual.
  - 3. Roof Consultants Institute, Glossary of Building Envelope Terms.
- B. Sheet Metal Terminology and Techniques: SMACNA Architectural Sheet Metal Manual.

1.3 DESIGN CRITERIA

- A. General: Installed roofing membrane system to remain watertight and resist specified wind uplift pressures, thermally induced movement, and exposure to weather without failure.
- B. Material Compatibility: Roofing materials to be compatible with one another under conditions of service and application required and as demonstrated by roofing system manufacturer based on testing and field experience.
- C. Installer to comply with current code requirements based on Authority Having Jurisdiction.

- D. Wind Uplift Performance: Roofing system to be identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist wind uplift pressure calculated in accordance with ASCE 7.
- E. Fire-Test-Response Characteristics: Provide roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method below by UL, FMG, or another testing and inspecting agency acceptable to Authorities Having Jurisdiction. Materials to be identified with appropriate markings of applicable testing and inspecting agency.
  - 1. Exterior Fire-Test Exposure: Class A; ASTM E108, for application and roof slopes indicated.

#### 1.4 SUBMITTALS

##### A. Moisture Mitigation Plan Submittal:

- 1. Contractor shall prepare and submit a 3-part moisture mitigation plan to address potential inclement weather and for District and Architect approval prior to commencement of work. The moisture mitigation plan shall include the following:
  - 2. Part 1: Prevention
    - a. Contractor's protocol for obtaining and reviewing weather forecast during construction and disseminating forecasted weather information and concerns to the Project Team. Include weather forecast source, intervals at which the forecast will be reviewed and the Contractor's method for disseminating forecasted weather-related impacts or concerns to the Project Team.
    - b. Contractor's protocol for weatherizing building at end of each work day.
      - 1) Include a roof plan showing areas where temporary weatherization are to be employed with detailed information of materials and techniques used to achieve temporary weatherization. Provide drawing details as needed to clarify intent and reference details on plan. If re-roof is to be phased, submit requested roof plan for each phase
      - 2) Provide a list of key members of the Construction team involved with end-of-day weatherization and their associated roles and responsibilities (e.g., Those responsible for performing the work, those responsible for overseeing work being performed, those responsible for a quality control check after work is completed, etc)
    - c. Provide list of equipment and where it is to be stored on-site for full project duration and for the sole purpose of deploying during a wet weather emergency to help minimize immediate wet weather affects to unprotected surfaces and affected interior areas.
    - d. Contractor's Action Plan (To be posted in job trailer or other District-approved location): Provide an organized and cohesive Action Plan for addressing wet weather intrusion. A separate Action Plan shall be provided for each of two scenarios:
      - 1) Scenario A: Wet weather is encountered during the workday with appointed staff available to respond immediately.
      - 2) Scenario B: Wet weather is encountered during off-work hours with few or no appointed construction staff on site.

- 3) For each of the above scenarios, include in the Action Plan (at a minimum) the following:
    - a) Response Team: Appoint a wet weather Response Team capable of adequately implementing contractor's Action Plan. This team shall consist of selected Contractor's staff and those of subcontractors as needed at Contractor's discretion. In addition, the District will provide a list of District and School staff to be included as part of the Response Team. Provide a list for each member of the Response Team and include emergency contact information for each, including name, role, phone number and e-mail address. Include in this list and identify at least one member of Contractor's appointed Response Team who can be reached on a 24-hour, seven days-per-week basis.
    - b) Stakeholder Contact List: The District will provide a list of District stakeholders to be contacted in the event of wet weather intrusion into the building for Contractor's integration with the Action Plan.
    - c) Location of dehumidifying equipment, drip buckets, absorbing blankets, moisture absorbing media, etc. to be employed if unprotected exterior surfaces are exposed to moisture and/or if moisture has penetrated the building envelope into the building's interior. Include instructions for locating and operating equipment if required. Refer to Item Part 1.c above for Contractor's list of equipment and materials to be stored on-site.
    - d) Sequence of Operations: Develop a Sequence of Operations for employing the Action Plan, including prioritizing the individuals to be notified upon implementation of the Action Plan and steps required to ensure moisture mitigation measures' effectiveness throughout the course of the wet weather event. As part of this sequence of operations identify the source and contact information for those responsible in supplying additional moisture mitigation equipment and materials if needed to address significant or prolonged wet weather event.
  - e. Contractor's method for educating Contractor and Subcontractor staff of Moisture Mitigation Plan, including Action Plan, and gaging such staff's preparedness to execute the Contractor's Action Plan.
3. Part 2: Immediate Response
    - a. Provide written protocol for implementing Action Plan for both scenarios identified above.
  4. Part 3: Moisture and Mold Mitigation
    - a. Identify Contractor's protocol for quantifying wet weather related impact to exposed exterior surfaces and interior spaces and how Contractor intends to disseminate this information to The District and Architect. Include description of technologies to be employed for moisture detection in concealed and unconcealed locations. Initial verbal notification to the Owner and Architect shall take place within 24 hours of a water intrusion event.

- b. Identify measures to be taken after immediate wet weather event to ensure continued moisture and mold mitigation response. Include Contractor's protocol for drying and/or cleaning of school assets impacted by wet weather, including electronics, books, classroom and office furniture, etc.
  - c. Describe the conditions under which Contractor-provided moisture and mold mitigation equipment and materials/supplies would be disengaged following a wet weather intrusion.
  - d. Provide written confirmation that Contractor intends to work collaboratively with and support an Owner or Architect-contracted industrial hygienist or other moisture and mold mitigation expert. Such subcontractor may be hired at Owner's discretion to help quantify the locations and effects of wet weather related impacts for Contractor remediation.
  - e. Outline Contractor's protocol for wet weather-related clean up.
- B. Product Data: Manufacturer data sheets for each product to be provided.
- C. Shop Drawings: Show locations and extent of roofing and each layer or component by name.
  - 1. Coordinate Roof Plan: Submit plan coordinated with and indicating all other work that penetrates or contacts the roofing membrane. Include the following:
    - a. Submit plan at minimum  $\frac{1}{4}"=1'-0"$ .
    - b. Accurately indicate every piece of rooftop equipment and the pipes, conduits and ducts servicing that equipment.
    - c. Accurately indicate every device or product mounted on or penetrating the roof.
    - d. Include roof edge fascia, copings and accessories specified elsewhere in Division 7.
    - e. Relative elevations and slopes of substrates and finished roof surface.
    - f. Drain locations and size of sumps.
    - g. Areas of walkways over roofing.
    - h. Relative elevations and slopes of substrates and finished roof surface.
    - i. Cross-reference to all details.
  - 2. For roofing system. Include, sections, details, and attachments to other work. Indicate joint, penetration and termination conditions and conditions of interface with adjacent walls, parapets, and other materials and as follows: Show all layers of the roof system starting from the substrate. Show continuity with other weather-resistive materials and air barrier/water resistive barrier materials. Include sufficient detail to indicate compliance with conditions unique for this Project. Include the following:
    - a. Submit details at a minimum  $3"=1'-0"$ .
    - b. Parapet and edge details.
    - c. Curbs, rails, hatches, and vents in accordance with Roof Accessories: Division 7.
    - d. Expansion joints and dividers.
    - e. All flashing details.
    - f. Layout of components including all layers of roof assembly.
    - g. Show step-by-step, layer-by-layer instructions for installation of waterproofing system.
  - 3. Drawings:
    - a. Details: minimum  $3"=1'-0"$ .

- b. Isometric diagrams. Exploded, sequential 3 dimensional diagrams showing step-by-step methods of installing flashing, seams and other sensitive areas.
- D. Tapered Insulation – Shop Drawings: Provide comprehensive panel layout of roof plans and sections as required to identify slopes in regard to hips, valley's, ridges and to all drain locations. Identify thickness of insulation in relation to all applicable existing conditions to include curb mounted equipment, parapet heights, door and structure elevation impacts, potential obstructions and ponding issues.
- E. Sheet Metal Detail Drawings:
  - 1. Include plans, elevations, sections and attachment details.
  - 2. Distinguish between shop and field assembly work.
  - 3. Include identification of finish for each item.
  - 4. Include pattern of seams and details of termination points, expansion joints and expansion joint covers, direction of expansion, roof penetration flashing, and connections to adjoining work.
- F. Verification Samples: Provide for each product specified.
- G. Installer Certificates: Signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install roofing system.
- H. Maintenance Data for all products installed.
- I. Warranty: Provide manufacturer's current warranty specimen.
- J. Prior to beginning the work of this section, provide a copy of the final System Assembly Letter issued by the manufacturer indicating that the products and system to be installed will be eligible to receive the specified manufacturer's warranty when installed by a certified contractor/installer in accordance with the manufacturer's application requirements and inspected and approved by a manufacturer's Technical Representative.
- K. Prior to roofing system installation, provide a copy of the Warranty Application Confirmation document issued by the manufacturer indicating that the project has been reviewed for eligibility to receive the specified warranty and is registered.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive the specified manufacturer's warranty with a minimum of five years of experience with work of this type.
- B. Manufacturer's Technical Representative: Manufacturer shall assign a technical representative to provide quality assurance and to assist in the proper application of the products to suit the particular project requirements. Manufacturer's Technical Representative shall:
  - 1. Review shop drawings and certify the indicated detailing complies with manufacturer's written instructions and requirements.
  - 2. Interpret modification of manufacturer's standard details and instruction to suit conditions not specifically covered.

3. Acceptance of Adjacent Materials: provide instruction for coordination with waterproof connections to adjacent waterproof materials and air barriers.
  4. Approve installer in writing.
  5. Attend pre-construction conferences, workshops, coordination meetings and similar meetings to ensure proper installation of roofing.
  6. Conduct indicated Field Quality testing and inspection or cause same to be done by qualified individual.
- C. Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E329.
- D. Source Limitations: Obtain all components from the single source roofing manufacturer guaranteeing the roofing system. All products used in the system to be labeled by the single source roofing manufacturer issuing the warranty.
- E. Fire-Test-Response Characteristics: Roofing materials to comply with the fire-test-response characteristics indicated as determined by testing identical products per test method 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.
- F. Pre-installation Roofing Conference: Conduct conference at Project site.
1. Attendees:
    - a. Owner.
    - b. Architect.
    - c. Owner's insurer if applicable.
    - d. Construction Manager Quality manager and staff.
    - e. Independent testing and inspecting agency representative.
    - f. Roofing installer.
    - g. Roofing system manufacturer's representative.
    - h. Roofing system manufacturer's independent inspector.
    - i. Installer of Roof Specialties and Roof Accessories.
    - j. Deck Installer.
    - k. Electrical installer.
    - l. Plumbing installer.
    - m. Installer of adjacent wall cladding, coping, roof edge accessories and parapets.
    - n. Any installers whose work interfaces with or affects waterproofing.
  2. Review required submittals, outstanding and completed.
  3. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
  4. Review manufacturer's training and inspection services.
  5. Review and finalize construction schedule and verify availability of materials, installers personnel, equipment, and facilities needed to make progress and avoid delays.
  6. Review requirements for scheduling work based on weather forecasts and for hot and cold weather procedures.
  7. Examine substrate conditions and finishes for compliance with requirements, including flatness and fastening. Discuss requirements for roofer's acceptance of substrate prior to roofing.
  8. Review adjacent walls, and other intersections with adjacent construction for coordination.

9. Review structural loading limitations of roof deck during and after waterproofing.
10. Review flashings and connections of roofing systems into adjacent air/vapor barrier and waterproof materials.
11. Review special roofing details, penetrations, and conditions of other construction that will affect roofing system.
12. Review temporary protection requirements for roofing system during and after installation.
13. Review roof observation and repair procedures after roofing installation.
14. Record discussion, including agreement or disagreement on matters of significance; furnish copy of recorded discussions to each participant. If substantial disagreements exist at conclusion of conference, determine how disagreements will be resolved and set date for reconvening conference.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture and directions for storage.
- 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.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. 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.

#### 1.7 PROJECT CONDITIONS

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

#### 1.8 WARRANTY

- A. Manufacturer Warranty: Provide manufacturer's 25-year total system warranty, No Dollar Limit System Warranty.
  1. Single-source special warranty to include roofing membrane, base flashings, roofing membrane accessories, roof insulation, fasteners, cover board, substrate board, vapor retarder, walkway products, manufacturer's expansion joints, manufacturer's edge metal products, and other single-source components of roofing system marketed by the manufacturer.
- B. Installer Warranty: Submit roofing Installer's warranty for the following period:
  1. Warranty Period: 2-years from date of Substantial Completion.

## 1.9 ROOFING SYSTEM-RELATED SUBSTITUTIONS

- A. Due to recent COVID-19 related supply chain interruptions, substitutions will be considered for the specified roofing system and associated accessories where an alternate system's performance characteristics, terms and duration of manufacturer's warranty and ease of maintenance meet or exceed those of the specified system. To be considered alternate, systems must be single-ply membrane systems, and as follows:
1. Ethylene Propylene Diene Monomer (EPDM)
  2. Polyvinyl Chloride (PVC)
  3. Ketone Ethylene Ester (KEE)
- B. Partial Substitutions: In the interest of project budget and material availability, partial substitutions for individual components of the specified roofing system will be considered where it can be shown that the proposed substitution is approved by the roofing system manufacturer as part of the warranted roofing system. Such partial substitutions may include but are not limited to:
1. Cover board
  2. Vapor Barrier

## PART 2 - PRODUCTS

### 2.1 MANUFACTURER

- A. Subject to compliance with requirement acceptable Manufacturers include and are not limited to:
1. Johns Manville
  2. Carlisle
  3. GAF
  4. Firestone

### 2.2 THERMOPLASTIC POLYOLEFIN (TPO) ROOFING MEMBRANE

- A. Fabric-Reinforced Thermoplastic Polyolefin Sheet: ASTM D6878, uniform, flexible sheet formed from a thermoplastic polyolefin, internally fabric or scrim reinforced.
1. Membrane Thickness: 60-mil (nominal)
  2. Exposed Face Color: White

### 2.3 AUXILIARY ROOFING MATERIALS – SINGLE PLY

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with membrane roofing.
1. Liquid-type auxiliary materials to meet VOC limits of Authorities Having Jurisdiction.

- B. Sheet Flashing: Manufacturer's internally reinforced or scrim reinforced, smooth backed membrane with same thickness and color as sheet membrane.
- C. Sheet Flashing (Self-Adhered): 60 mil (1.5 mm) thick, manufacturer's internally reinforced or scrim reinforced with weldable selvage edges on each side of roll, one encapsulated edge and self-adhering capabilities in a wide installation temperature range.
  - 1. Serviceable Installation Substrate Temperature: 20°F (-7°C) and rising.
- D. Bonding Adhesive: Manufacturer's standard solvent-based bonding adhesive for membrane, and solvent-based bonding adhesive for base flashings.
  - 1. Serviceable Installation Ambient Air Temperature: 25°F and rising
- E. Self-Adhered Primer: One-part penetrating primer solution to enhance the adhesion of self-adhering membranes.
- F. Liquid Applied Flashing: Manufacturer's single ply liquid and fabric reinforced flashing system created with a fleece polyester scrim and a two-component polyurethane based liquid applied flashing material, consisting of a liquid resin and a curing agent.
- G. Liquid Applied Flashing Primer: Manufacturer's single ply liquid flashing primer.
- H. Pre-molded Flashing Boots: Manufacturer's standard conical elastomeric boots, molded to fit pipe penetrations.
- I. Metal Termination Bars: Manufacturer's standard predrilled stainless-steel or aluminum bars, with anchors.
- J. Membrane Fasteners and Plates: Factory-coated steel fasteners and galvalume coated steel plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening TPO membrane materials to substrate, and acceptable to membrane roofing system manufacturer. Note: Attachment of TPO membrane and insulation at field of roof areas to be done with TPO Induction Welding Plates, see below description.
  - 1. Induction Welding Plate: Round specially coated galvalume plate with a recessed center and raised flat bonding surface specifically designed for induction welding application.
- K. Miscellaneous Accessories: Provide pourable sealers, primers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, cover strips, and other accessories approved by roofing system manufacturer and required for full installation.

## 2.4 WALKWAY PADS

- A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads sourced from membrane roofing system manufacturer.

2.5 HIGH-DENSITY POLYISO COVER BOARD

- A. High-Density Polyisocyanurate: ASTM C 1289, Type II, Class 4, Grade 1, High-density Polyisocyanurate technology bonded in-line to inorganic coated glass facers with greater than 80 lbs. of compressive strength.
  - 1. Thickness: 1/2 inch.
  - 2. R-value: 2.5.

2.6 TAPERED INSULATION AND/OR CRICKETING MATERIALS

- A. Tapered Insulation and/or Cricketing Materials, Where Required: ASTM C1289, Type II, Class 1, Grade 2 (20 psi), provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches (1:48), unless otherwise indicated on Drawings.

2.7 INSULATION ACCESSORIES

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatible with membrane roofing.
- B. Provide factory preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.
- C. Insulation Fasteners and Induction Welding Plates: Factory-coated steel fasteners and galvalume coated steel plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening TPO membrane and insulation materials to substrate, and acceptable to membrane roofing system manufacturer. Note: Attachment of TPO membrane and insulation at field of roof areas to be done with TPO Induction Welding Plates.
  - 1. TPO Induction Welding Plate: Round specially coated galvalume plate with a recessed center and raised flat bonding surface specifically designed for induction welding application.
- D. Urethane Adhesive: Manufacturer's two component polyurethane adhesive formulated to adhere insulation to substrate, where required.
- E. Wood Nailer Strips.

2.8 EDGE METAL COMPONENTS

- A. Coping Metal System at Parapet Wall Conditions: Provide manufacturer's factory fabricated metal coping consisting of anchor bar and a snap-on cap components. Provide product manufactured and marketed by single-source membrane supplier that is included in the No Dollar Limit warranty.
- B. All exposed sheet metal flashing to be minimum 24 gauge with Kynar 500 or Hylar 5000. Match existing colors.

- C. Drip & Rake Edge Metal Components: Provide TPO membrane clad drip and rake edge components where required, including at gutter drip edge conditions. Drip and rake edge components to include a continuous cleat on the outside exterior edge.
- D. Refer to Drawings for additional information on locations, types of materials, and dimensions, where these materials are required.

## 2.9 EXPANSION JOINT COMPONENTS

- A. Expansion Joints: Provide factory fabricated weatherproof, exterior covers for expansion joint openings consisting of flexible rubber membrane, supported by a closed cell foam to form flexible bellows, with two metal flanges, adhesively and mechanically combined to the bellows by a bifurcation process. Provide product from single-source roofing system supplier that is included in the No Dollar Limit warranty.
- B. Refer to Drawings for additional information on locations, types of materials, and dimensions, where these materials are required.

## 2.10 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, clinch lock, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal unless otherwise indicated.
- B. Roof Drain Strainer Cover: Replace damaged roof drain strainer covers. Replacement covers to be cast iron only.
- C. Fasteners: Wood screws, annular threaded nails, self-tapping screws, bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal.
  - 1. Fasteners for Stainless Steel Sheet: Series 300 stainless steel.
  - 2. Fasteners for Zinc Coated (galvanized) Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A153/A153M or ASTM F2329.
- D. Solder - For Stainless Steel: ASTM B32, Grade Sn96, with acid flux of type recommended by stainless steel sheet manufacturer.
- E. Butyl Sealant Tape: 100 percent solids, asbestos free, butyl sealant tape with release paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape ½ inch (13 mm) wide and 1/8 inch (3 mm) thick.
  - 1. Manufacturer: Schnee Morehead, Inc.; SM5227 Tacky Tape Sealant.

**PART 3 - EXECUTION****3.1 EXAMINATION GENERAL**

- A. Verify that roof openings and penetrations are in place and set and braced and that roof drains are securely clamped in place.
- B. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses and elevation height of insulation and/or cover board materials.

**3.2 RECOVER PREPARATION**

- A. Overall Roof Plan Pages and Key Plan: Refer to Drawings, including Key Plan and Overall Roof Plan, for identification of roof related work that falls under this specification.
- B. Existing BUR Roofing System to Remain in Place: Existing roofing system is to remain in place. Existing Roof Core Results: Existing roof system consists of one (1) Tremco BUR roof system with pea-gravel and insulation over plywood roof deck substrate. Maximum thickness is approximately 2-1/2”.
- C. Existing Roof Preparation: At all existing roof areas, power broom and remove any loose pea-gravel materials. Using a spud-bar remove any high-spots and make the existing roof substrate relatively smooth prior to the installation of the new cover board materials. Prepare existing roof according to roofing system manufacturer's written instructions, applicable recommendations of the roofing manufacturer, and requirements in this Section.
- D. Disable Existing Roofing System: Disable existing roof membrane system per manufacturer's written instructions and requirements.
- E. Existing Roof Base Flashings: Tear out, remove, and discard of all existing roof base flashings, counterflashings, pitch pans, pipe flashings, vents and like components necessary for application of the new cover board and roof membrane system.
- F. Existing Roof System Wet or Damaged Materials: Remove and replace with new any wet and/or compromised existing materials, including any materials identified with moisture per the roof moisture survey results. New infill materials to match the elevation height of the existing roofing system.
- G. Abandoned Equipment and/or Penetrations: Remove abandoned equipment curbs, skylights, smoke hatches, and penetrations. Where necessary, infill and install new plywood roof deck sheathing. New sheathing to match existing.
- H. Existing Equipment Curbs: Raise, (disconnect by licensed craftsmen, if necessary) all HVAC units and other equipment supported by curbs to conform with the following:
  - 1. Modify curbs as required to provide a minimum 8-inch base flashing height measured from the surface of the new membrane to the top of the flashing membrane.
  - 2. Secure top of flashing and install new metal counterflashing prior to re-installation of unit.

- I. Remove Debris Prior to New Roof Installation: Clean and remove from substrate any sharp projections, dust, debris, moisture, and other substances detrimental to new roofing installation and in accordance with roofing system manufacturer's written instructions. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove all debris from roof surface prior to new roof installation. Demolished roof system materials may not be stored on the roof surface.
- J. Unsatisfactory Conditions: Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.3 TAPERED CRICKET INSULATION INSTALLATION

- A. Protection: Coordinate installing membrane roofing system components so cover board is not exposed to precipitation or left exposed at the end of the workday.
- B. Manufacturer Installation Instructions: Comply with membrane roofing system manufacturer's written instructions for installing roof cover board.
- C. Tapered Insulation and/or Tapered Cricketing Materials: Where defined on the Drawings, install tapered insulation and/or tapered cricketing materials under area of roofing to conform to slopes indicated. Materials are initially loose laid into position.

### 3.4 COVER BOARD INSTALLATION

- A. Protection: Coordinate installation of membrane roofing system components so cover board is not exposed to precipitation or left exposed at the end of the workday.
- B. Manufacturer Installation Instructions: Comply with membrane roofing system manufacturer's written instructions for installing roof cover board.
- C. Polyiso Cover Board, Mechanically Fastened: Mechanically attach cover board using #15 High Load Fasteners or #14 All Purpose Fasteners, and rhino plates. Fastening density of cover board to be as required by manufacturer to meet uplift requirement indicated in drawings.
- D. Staggered Joints Cover Board: Install cover board with long joints in a continuous straight line. Joints should be staggered between rows, abutting edges and ends per manufacturer's written instructions. Fill gaps exceeding 1/4 inch with cover board.
  - 1. Cut and fit cover board within 1/4 inch of nailers, projections, and penetrations.
- E. Trim surface of cover board where necessary at roof drains so completed surface is flush and does not restrict flow of water.

### 3.5 ROOFING MEMBRANE INSTALLATION, GENERAL

- A. Install roofing membrane in accordance with roofing system manufacturer's written instructions, applicable recommendations of the roofing manufacturer and requirements in this Section.

- B. Coordinate installation of roofing system so insulation and other components of the roofing membrane system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is imminent.
  - 1. Provide tie-offs at end of each day's work to cover exposed roofing membrane sheets and insulation.
  - 2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system.
  - 3. Remove and discard temporary seals before beginning work on adjoining roofing.

### 3.6 INDUCTION WELDED TPO ROOFING MEMBRANE INSTALLATION

- A. Install roofing membrane over area to receive roofing according to roofing system manufacturer's written instructions.
- B. Unroll roofing membrane and allow to relax before installing.
- C. Accurately align roofing membranes and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- D. Apply roofing membrane with side laps shingled with roof slope, where possible.
- E. Seams: Clean seam areas, overlap roofing membrane, and hot-air weld side and end laps of roofing membrane according to manufacturer's written instructions to ensure a watertight seam installation.
  - 1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roofing membrane.
  - 2. Verify field strength of seams a minimum of twice daily and repair seam sample areas. Remove and repair any unsatisfactory sections before proceeding with Work.
  - 3. Repair tears, voids, and lapped seams in roofing membrane that do not meet requirements.
- F. Induction Welding Installation:
  - 1. Perform calibration and set-up as detailed by the Induction Welder Owner's Manual
  - 2. Center the Induction Welder over the first plate in pattern and activate the weld.
    - a. Induction Welder to be centered over the plate to create a 100% bond.
    - b. If an error occurs during activation, refer to the induction welder owner's manual for corrective action.
  - 3. Prior to every use, clean face of Heat Sink Magnet.
  - 4. Place Heat Sink Magnet over the welded plate.
    - a. Keep Heat Sink Magnet in place at least 45 seconds while the assembly cools.
  - 5. Repeat process for each plate.
- G. Perimeter and Corner Membrane Enhancements: Perimeter and corner membrane enhancements are required at all exposed roof edge perimeters and corners.

1. Formulas for determining dimensions of perimeters and corners are as follows: Use 10% of the lesser plan dimension, or 40% of the roof elevation height, whichever is the lesser.
2. Use rhino plates and the induction welding process for creating perimeter and corner enhancements.

H. At drains, spread sealant or mastic bed over deck drain flange and securely seal roofing membrane in place with clamping ring.

### 3.7 MEMBRANE BASE FLASHING INSTALLATION

- A. Install sheet flashings and preformed flashing accessories and adhere to substrates in accordance with membrane roofing system manufacturer's written instructions.
- B. Apply solvent-based bonding adhesive at required rate and allow to partially dry. Do not apply bonding adhesive to seam area of flashing.
- C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.
- D. Clean seam areas and overlap and firmly roll sheet flashings into the adhesive.
- E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

### 3.8 DRIP AND RAKE EDGE FLASHINGS:

- A. Drip and Rake Edge Metal Flashings: At drip and rake edge conditions, including where gutter conditions exist, install new TPO membrane clad drip and rake edge metal flashings, where required.
- B. Drip and rake edge materials to incorporate a continuous cleat installed on the outside vertical face.
- C. Flash in and make watertight using 6-inch wide TPO Cover Strip.
- D. Refer to Drawings for additional information on locations, types of materials, and dimensions, where these materials are required.

### 3.9 COPING METAL AT PARAPET WALL CONDITIONS:

- A. At parapet wall conditions where coping metal is required, install new coping metal materials.
- B. Refer to Drawings for additional information on locations, types of materials, and dimensions, where these materials are required.

### 3.10 EXPANSION JOINT INSTALLATION

- A. At top of wall expansion joint conditions where they presently existing, install expansion joint covers; Type TPO EJ/WC Heat Welded.

- B. Install in accordance with manufacturer's written instructions.
- C. Refer to Drawings for additional information on locations, types of materials, and dimensions, where these materials are required.

3.11 WALKWAY PAD INSTALLATION

- A. TPO Hot-Air Weldable Walkway Pads: Install walkway pads at locations indicated on the Architectural Roof Plan Pages.
- B. Install in accordance with manufacturer's written instructions.

3.12 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform roof tests and inspections and to prepare test reports.
- B. Final Roof Inspection: Arrange for roofing system manufacturer's Registered Roof Observer (RRO) to inspect roofing installation on completion and submit report to Consultant.
  - 1. Notify Consultant or Owner 48 hours in advance of date and time of inspection.
- C. Repair or remove and replace components of roofing system where test results or inspections indicate that they do not comply with specified requirements.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.13 PROTECTION AND CLEANING

- A. Protect roofing system from damage and wear during remainder of construction period.
- B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 075423

## SECTION 076200 - SHEET METAL FLASHING AND TRIM

### 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. Formed roof-drainage sheet metal fabrications (For composite shingle roofing areas only See Section 075423 TPO Membrane Roofing for sheet metal flashing and trim associated with TPO roofing areas)

#### 1.3 COORDINATION

- A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.
- B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each of the following
  - 1. Underlayment materials.
  - 2. Elastomeric sealant.
  - 3. Butyl sealant.
  - 4. Epoxy seam sealer.
- B. Shop Drawings: For sheet metal flashing and trim.
  - 1. Include plans, elevations, sections, and attachment details.
  - 2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled Work.
  - 3. Include identification of material, thickness, weight, and finish for each item and location in Project.
  - 4. Include details for forming, including profiles, shapes, seams, and dimensions.
  - 5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
  - 6. Include details of termination points and assemblies.
  - 7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.

8. Include details of roof-penetration flashing.
9. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, flashings, and counterflashings.
10. Include details of special conditions.
11. Include details of connections to adjoining work.
12. Detail formed flashing and trim at scale of not less than

C. Samples for Verification: For each type of exposed finish.

1. Sheet Metal Flashing: 12 inches (300 mm) long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.

### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.
- B. Product Certificates: For each type of roof edge flashing that is ANSI/SPRI/FM 4435/ES-1 tested and FM Approvals approved.
- C. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- D. Evaluation Reports: For roof edge flashing, from ICC-ES showing compliance with ANSI/SPRI/FM 4435/ES-1.
- E. Sample Warranty: For special warranty.

### 1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.
- B. Special warranty.

### 1.7 QUALITY ASSURANCE

- A. Fabricator Qualifications: 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.
  1. For roof edge flashings that are ANSI/SPRI/FM 4435/ES-1 tested and FM Approvals approved, shop shall be listed as able to fabricate required details as tested and approved.

### 1.8 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.

1. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
  2. Protect stored sheet metal flashing and trim from contact with water.
- B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

## 1.9 WARRANTY

- A. Special Warranty on Finishes: 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 Delta E units when tested in accordance with ASTM D2244.
    - b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
    - 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 PERFORMANCE REQUIREMENTS

- A. Sheet metal flashing and trim assemblies, including cleats, anchors, and fasteners, 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. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual: Architectural Metal Flashing, Condensation and Air Leakage Control, and Reroofing" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. SPRI Wind Design Standard: Manufacture and install roof edge flashings tested in accordance with ANSI/SPRI/FM 4435/ES-1 and capable of resisting the following design pressure:
1. Design Pressure: As indicated on Drawings.
- D. Thermal Movements: 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. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

## 2.2 SHEET METALS

- A. Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
  1. Exposed Coil-Coated Finish:
    - a. Three-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (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.
  2. Color: As selected by Architect from manufacturer's full range.
  3. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil (0.013 mm).

## 2.3 UNDERLAYMENT MATERIALS

- A. Felt: ASTM D226/D226M, Type II (No. 30), asphalt-saturated organic felt; nonperforated.
- B. Synthetic Underlayment: Laminated or reinforced, woven polyethylene or polypropylene, synthetic roofing underlayment; bitumen free; slip resistant; suitable for high temperatures over 220 deg F (111 deg C); and complying with physical requirements of ASTM D226/D226M for Type I and Type II felts.
  1. Source Limitations: Obtain underlayment from single source from single manufacturer.
- C. Self-Adhering, High-Temperature Sheet Underlayment: Minimum 30 mils (0.76 mm) thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer in accordance with underlayment manufacturer's written instructions.
  1. Source Limitations: Obtain underlayment from single source from single manufacturer.
  2. Low-Temperature Flexibility: ASTM D1970/D1970M; passes after testing at minus 20 deg F (29 deg C) or lower.
- D. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. (0.16 kg/sq. m) minimum.

## 2.4 MISCELLANEOUS MATERIALS

- A. Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as 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. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
    - b. Blind Fasteners: High-strength aluminum or stainless steel rivets suitable for metal being fastened.
    - c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
  - 2. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel in accordance with ASTM A153/A153M or ASTM F2329.
- C. Sealant Tape: Pressure-sensitive, 100 percent solids, 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.
- D. Elastomeric Sealant: ASTM C920, elastomeric polyurethane polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- E. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- F. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.
- G. Bituminous Coating: Cold-applied asphalt emulsion in accordance with ASTM D1187/D1187M.
- H. Asphalt Roofing Cement: ASTM D4586, asbestos free, of consistency required for application.

## 2.5 FABRICATION, GENERAL

- A. Custom fabricate sheet metal flashing and trim to comply with details indicated and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required.
  - 1. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
  - 2. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
  - 3. Verify shapes and dimensions of surfaces to be covered and obtain field measurements for accurate fit before shop fabrication.

4. Form sheet metal flashing and trim to fit substrates without excessive oil-canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
5. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

**B. Fabrication Tolerances:**

1. 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 indicated on Drawings and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.
2. Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified.

**C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.**

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

**D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal in accordance with cited sheet metal standard to provide for proper installation of elastomeric sealant.**

**E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.**

**F. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard and by FM Global Property Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.**

**G. Seams:**

1. Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
2. Fabricate nonmoving seams 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.**

## **2.6 ROOF-DRAINAGE SHEET METAL FABRICATIONS**

**A. Hanging Gutters:**

1. Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required.
2. Fabricate in minimum 96-inch- (2400-mm-) long sections.

3. Furnish flat-stock gutter brackets and flat-stock gutter spacers and straps fabricated from same metal as gutters, of size recommended by cited sheet metal standard, but with thickness not less than twice the gutter thickness unless noted otherwise on drawings.
  4. Fabricate expansion joints, expansion-joint covers, and gutter accessories from same metal as gutters.
  5. Gutter Profile: Style H in accordance with cited sheet metal standard.
  6. Expansion Joints: Lap type.
  7. Accessories: Wire-ball downspout strainer.
  8. Gutters with Girth up to 15 Inches (380 mm): Fabricate from the following materials:
    - a. Aluminum: 0.032 inch (0.81 mm) thick.
  9. Gutters with Girth 16 to 20 Inches (410 to 510 mm): Fabricate from the following materials:
    - a. Aluminum: 0.040 inch (1.02 mm) thick.
- B. Downspouts: Fabricate round downspouts to dimensions indicated on Drawings, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors.
1. Fabricated Hanger Style: Fig. 1-35D in accordance with SMACNA's "Architectural Sheet Metal Manual."
  2. Fabricate from the following materials:
    - a. Schedule 40: Galvanized steel downspouts

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with installer present, for compliance with requirements for installation tolerances, substrate, 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.
  3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION OF UNDERLAYMENT

- A. Felt Underlayment: Install felt underlayment, wrinkle free, using adhesive to minimize use of mechanical fasteners under sheet metal flashing and trim.
1. Install in shingle fashion to shed water.
  2. Lap joints not less than 2 inches (50 mm).

- B. Synthetic Underlayment: Install synthetic underlayment, wrinkle free, in accordance with manufacturers' written instructions, and using adhesive where possible to minimize use of mechanical fasteners under sheet metal.
  - 1. Lap horizontal joints not less than 4 inches (100 mm).
  - 2. Lap end joints not less than 12 inches (300 mm).
- C. Self-Adhering, High-Temperature Sheet Underlayment:
  - 1. Install self-adhering, high-temperature sheet underlayment; wrinkle free.
  - 2. Prime substrate if recommended by underlayment manufacturer.
  - 3. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures.
  - 4. Apply in shingle fashion to shed water, with end laps of not less than 6 inches (150 mm) staggered 24 inches (600 mm) between courses.
  - 5. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps and edges with roller.
  - 6. Roll laps and edges with roller.
  - 7. Cover underlayment within 14 days.
- D. Install slip sheet, wrinkle free, over underlayment before installing sheet metal flashing and trim.
  - 1. Install in shingle fashion to shed water.
  - 2. Lapp joints not less than 4 inches (100 mm).

### 3.3 INSTALLATION, GENERAL

- A. Install sheet metal flashing and trim to comply with details indicated and recommendations of cited sheet metal standard that apply to installation characteristics required unless otherwise indicated on Drawings.
  - 1. Install fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
  - 2. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of sealant.
  - 3. Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement.
  - 4. Install sheet metal flashing and trim to fit substrates and to result in watertight performance.
  - 5. Install continuous cleats with fasteners spaced not more than 12 inches (300 mm) o.c.
  - 6. Space individual cleats not more than 12 inches (300 mm) apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
  - 7. Install exposed sheet metal flashing and trim with limited oil-canning, and free of buckling and tool marks.
  - 8. Do not field cut sheet metal flashing and trim by torch.
  - 9. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by

painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

1. Coat concealed side of uncoated-aluminum and stainless steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
  2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim.
1. Space movement joints at maximum of 10 feet (3 m) with no joints within 24 inches (600 mm) of corner or intersection.
  2. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with sealant concealed within joints.
  3. Use lapped expansion joints only where indicated on Drawings.
- D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- F. Seal joints as required for watertight construction.
1. Use sealant-filled joints unless otherwise indicated.
    - a. Embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant.
    - b. Form joints to completely conceal sealant.
    - c. When ambient temperature at time of installation is between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way.
    - d. Adjust setting proportionately for installation at higher ambient temperatures.
      - 1) Do not install sealant-type joints at temperatures below 40 deg F (4 deg C).
  2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."
- G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter.
1. Pretin edges of sheets with solder to width of 1-1/2 inches (38 mm); however, reduce pretinning where pretinned surface would show in completed Work.
  2. Do not solder metallic-coated steel and aluminum sheet.
  3. Do not pretin zinc-tin alloy-coated copper.
  4. Do not use torches for soldering.
  5. Heat surfaces to receive solder, and flow solder into joint.
    - a. Fill joint completely.
    - b. Completely remove flux and spatter from exposed surfaces.

6. Stainless Steel Soldering:
    - a. Tin edges of uncoated sheets, using solder for stainless steel and acid flux.
    - b. Promptly remove acid-flux residue from metal after tinning and soldering.
    - c. Comply with solder manufacturer's recommended methods for cleaning and neutralization.
  7. Copper Soldering: Tin edges of uncoated sheets, using solder for copper.
  8. Copper-Clad Stainless Steel Soldering: Tin edges of uncoated sheets, using solder for copper-clad stainless steel.
- H. Rivets: Rivet joints in uncoated aluminum zinc where necessary for strength.

### 3.4 INSTALLATION OF ROOF-DRAINAGE SYSTEM

- A. Install sheet metal roof-drainage items to produce complete roof-drainage system in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.
- B. Hanging Gutters:
1. Join sections with joints sealed with sealant.
  2. Provide for thermal expansion.
  3. Attach gutters at eave or fascia to firmly anchor them in position.
  4. Provide end closures and seal watertight with sealant.
  5. Slope to downspouts.
  6. Fasten gutter spacers to front and back of gutter.
  7. Anchor and loosely lock back edge of gutter to continuous cleat or as otherwise indicated on drawings.
  8. Anchor back of gutter that extends onto roof deck with cleats spaced not more than 24 inches (600 mm) apart.
  9. Anchor gutter with gutter brackets spaced not more than 36 inches (910 mm) apart to roof deck unless otherwise indicated, and loosely lock to front gutter bead.
  10. Install gutter with expansion joints not exceeding, 50 feet (15.2 m) apart. Install expansion-joint caps.
- C. Downspouts:
1. Join sections with 1-1/2-inch (38-mm) telescoping joints.
  2. Provide hangers with fasteners designed to hold downspouts securely to walls.
  3. Locate hangers at top and bottom and at approximately 60 inches (1500 mm) o.c.
  4. Provide elbows at base of downspout to direct water away from building.
  5. Connect downspouts to underground drainage system.

### 3.5 INSTALLATION OF ROOF FLASHINGS

- A. Install sheet metal flashing and trim to comply with performance requirements[, sheet metal manufacturer's written installation instructions, and cited sheet metal standard.

1. Provide concealed fasteners where possible, and set units true to line, levels, and slopes.
2. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

**B. Roof Edge Flashing:**

1. Install roof edge flashings in accordance with ANSI/SPRI/FM 4435/ES-1.
2. Anchor to resist uplift and outward forces in accordance with recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch (75-mm) centers.
3. Anchor to resist uplift and outward forces in accordance with recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for FM Approvals' listing for required windstorm classification.

**C. Pipe or Post Counterflashing:** Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches (100 mm) over base flashing. Install stainless steel draw band and tighten.

**D. Counterflashing:** Coordinate installation of counterflashing with installation of base flashing.

1. Insert counterflashing in reglets or receivers and fit tightly to base flashing.
2. Extend counterflashing 4 inches (100 mm) over base flashing.
3. Lap counterflashing joints minimum of 4 inches (100 mm).
4. Secure in waterproof manner by means of snap-in installation and sealant unless otherwise indicated.

**E. Roof-Penetration Flashing:** Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with butyl sealant and clamp flashing to pipes that penetrate roof.

### 3.6 INSTALLATION OF WALL FLASHINGS

- A.** Install sheet metal wall flashing to intercept and exclude penetrating moisture in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Opening Flashings in Frame Construction:** Install continuous head, sill, jamb, and similar flashings to extend 4 inches (100 mm) beyond wall openings.

### 3.7 INSTALLATION 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 indicated on Drawings and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

### 3.8 CLEANING

- 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.

### 3.9 PROTECTION

- A. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended in writing by sheet metal flashing and trim manufacturer.
- C. Maintain sheet metal flashing and trim in clean condition during construction.
- D. 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, as determined by Architect.

END OF SECTION 076200

**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes the insulated, translucent sandwich panel system and accessories as shown and specified. Work includes providing and installing:
  - 1. Flat insulated, translucent sandwich panels
  - 2. Aluminum clampite installation system

**1.2 SUBMITTALS**

- A. Submit manufacturer's product data. Include construction details, material descriptions, profiles, and finishes of components.
- B. Submit shop drawings. Include plans, elevations, and details.
- C. Submit manufacturer's color charts showing the full range of colors available for factory finished exposed aluminum.
  - 1. When requested, submit samples for each exposed finish required, in same thickness and material indicated for the work and in size indicated below.
    - a. Sandwich panels: 7" x 12" units
    - b. Factory finished aluminum: 3" long sections
- D. Submit Installer Certificate, signed by installer, certifying compliance with project qualification requirements.
- E. Submit product reports from a qualified independent testing agency indicating each type and class of panel system complies with the project performance requirements, based on comprehensive testing of current products. Previously completed reports will be acceptable if for current manufacturer and indicative of products used on this project.
  - 1. Reports required (if applicable) are:
    - a. Flame Spread and Smoke Developed (UL 723) – Submit UL Card
    - b. Burn Extent (ASTM D 635)
    - c. Color Difference (ASTM D 2244)
    - d. Impact Strength (UL 972)
    - e. Bond Tensile Strength (ASTM C 297 after aging by ASTM D 1037)
    - f. Bond Shear Strength (ASTM D 1002)
    - g. Beam Bending Strength (ASTM E 72)
    - h. Insulation U-Factor (NFRC 100)
    - i. NFRC System U-Factor Certification (NFRC 700)
    - j. NFRC Visible Light Transmittance (NFRC 202)
    - k. Solar Heat Gain Coefficient (NFRC or Calculations)
    - l. Condensation Resistance Factor (AAMA 1503) (Thermally Broken, insulated panels only)
    - m. Air Leakage (ASTM E 283)
    - n. Structural Performance (ASTM E 330)
    - o. Water Penetration (ASTM E 331)

- p. Fire Penetration of Exterior Wall Assemblies Using a Direct Flame Impingement Exposure (ASTM E2707)
- q. Fall Through Resistance (ASTM E 661 and OSHA Standard 29 CFR1926.502(i))
- r. Class A Roof Covering Burning Brand (UL 790)
- s. UL Listed Class A Roof System (UL 790) – Submit UL Card

### 1.3 CLOSEOUT SUBMITTALS

- A. Provide field maintenance manual to include in project maintenance manuals.

### 1.4 QUALITY ASSURANCE

- A. Manufacturer's Qualifications:

- 1. Material and products shall be manufactured by a company continuously and regularly employed in the manufacture of specified materials for a period of at least ten consecutive years and which can show evidence of those materials being satisfactorily used on at least six projects of similar size, scope, and location. At least three of the projects shall have been in successful use for ten years or longer.
- 2. Panel system must be listed by an ANSI accredited Evaluation Service, which requires quality control inspections and fire, structural, and water infiltration testing of sandwich panel systems by an accredited agency.
- 3. Quality control inspections shall be conducted at least once each year and shall include manufacturing facilities, sandwich panel components, and production sandwich panels for conformance with AC177 "Translucent Fiberglass Reinforced Plastic (FRP) Faced Panel Wall, Roof and Skylight Systems" as issued by the ICC-ES.

- B. Installer's Qualifications: Installation shall be by an experienced installer, which has been in the business of installing Kalwall panel systems for at least two consecutive years and can show evidence of satisfactory completion of projects of similar size, scope, and type.

### 1.5 PERFORMANCE REQUIREMENTS

- A. The manufacturer shall be responsible for the configuration and fabrication of the complete panel system.
  - 1. When requested, include span analysis data.
  - 2. Standard panel system shall have less than 0.01 cfm/ft<sup>2</sup> air leakage by ASTM E 283 at 6.24 PSF (50 mph) and no water penetration by ASTM E 331 at 15 PSF; and structural testing by ASTM E 330.
- B. Thermal Movements: Allow for thermal movements from ambient- and surface-temperature changes. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  - 1. Temperature Change (Range): 110 deg F (43 deg C), ambient; 150 deg F (66 deg C), material surfaces.

**1.6 DELIVERY, STORAGE AND HANDLING**

- A. Deliver panel system, components, and materials in manufacturer's standard protective packaging.
- B. Store panels on the long edge; several inches above the ground, blocked and under cover in accordance with manufacturer's storage and handling instructions.

**1.7 WARRANTY**

- A. Provide manufacturer's and installer's written warranties agreeing to repair or replace panel system work, which fails in material or workmanship, within one year from the date of delivery. Failure of material or workmanship shall include deterioration of finish on metal in excess of normal weathering; and defects in accessories; insulated, translucent sandwich panels; and other components of the work.

**PART 2 - PRODUCTS****2.1 MANUFACTURER**

- A. Kalwall Corporation, Tel: (800) 258-9777 – Fax: (603) 627-7905 – Email: [info@kalwall.com](mailto:info@kalwall.com)

**2.2 PANEL COMPONENTS**

- A. Face Sheets:
  - 1. Translucent faces: Manufactured from glass fiber reinforced thermoset resins, formulated specifically for architectural use.
    - a. Thermoplastic (e.g. polycarbonate, acrylic) faces are not acceptable.
    - b. Face sheets shall not deform, deflect, or drip when subjected to fire or flame.
  - 2. Interior face sheets:
    - a. Flame spread: Underwriters Laboratories (UL) listed, which requires periodic unannounced retesting, with flame spread rating no greater than 25 and smoke developed no greater than 450 when tested in accordance with UL 723.
    - b. Burn extent by ASTM D 635 shall be no greater than 1”.
  - 3. Exterior face sheets:
    - a. Color stability: Full thickness of the exterior face sheet shall not change color more than 3 CIE Units DELTA E by ASTM D 2244 after 3 years outdoor South Florida weathering at 5° facing south as measured on a white sample, with and without a protective film or coating to ensure long-term color stability. Color stability shall be unaffected by abrasion or scratching.
    - b. Strength: Exterior face sheet shall be uniform in strength, impenetrable by hand held pencil and repel an impact minimum of 230 ft. lbs. without fracture or tear when impacted by a 3-1/4” diameter, 5 lb. free-falling ball per UL 972.
    - c. Erosion Protection: Integral, embedded-glass erosion barrier.
  - 4. Appearance:
    - a. Face sheets shall not vary more than  $\pm 10\%$  in thickness and be uniform in color.

- B. Grid Core:

1. Thermally Broken Composite I-beam grid core shall be of 6063-T6 or 6005-T5 alloy and temper with provisions for mechanical interlocking of muntin-mullion and perimeter. Width of I-beam shall be no less than 7/16".
2. I-beam Thermal break: Minimum 1", thermoset fiberglass composite. Poured and de-bridged thermal break is not acceptable.

C. Laminate Adhesive:

1. Heat and pressure resin type adhesive engineered for structural sandwich panel use, with minimum 25-years field use. Adhesive shall pass testing requirements specified by the International Code Council "Acceptance Criteria for Sandwich Panel Adhesives".
2. Minimum tensile strength of 750 PSI when the panel assembly is tested by ASTM C 297 after two exposures to six cycles each of the aging conditions prescribed by ASTM D 1037.
3. Minimum shear strength of the panel adhesive by ASTM D 1002 after exposure to four separate conditions:
  - a. 50% Relative Humidity at 68° F: 540 PSI
  - b. 182° F: 100 PSI
  - c. Accelerated Aging by ASTM D 1037 at room temperature: 800 PSI
  - d. Accelerated Aging by ASTM D 1037 at 182° F: 250 PSI

## 2.3 PANEL CONSTRUCTION

- A. Provide sandwich panels of flat fiberglass reinforced translucent face sheets laminated to a grid core of mechanically interlocking I-beams. The adhesive bonding line shall be straight, cover the entire width of the I-beam and have a neat, sharp edge.
1. Thickness: 2-3/4 inches
  2. Grid Core Insulation: Fill panel cores with air
  3. Panel U-factor by NFRC certified laboratory:
    - a. 2-3/4" thermally broken grid U-0.75
  4. Skylight Size: Match Existing
- B. Standard panels shall deflect no more than 1.9" at 30 PSF in 10'-0" span without a supporting frame by ASTM E 72.
- C. Panels shall meet the conditions of acceptance according to ASTM E2707 Fire Penetration of Exterior Wall Assemblies Using a Direct Flame Impingement Exposure:
1. Absence of flame penetration through the wall assembly at any time.
  2. Absence of evidence of glowing combustion on the interior surface of the assembly at the end of the 60-min observation period.
  3. Absence of evidence of flame, glow, and smoke if the test is terminated prior to the completion of the 60-min observation period.
- D. Thermally broken, insulated panels: Minimum Condensation Resistance Factor of 80 by AAMA 1503 measured on the bond line.
- E. Skylight System shall meet the fall through requirements of OSHA Standard 29 CFR1926.502(i).

**2.4 ALUMINUM CLAMPTITE INSTALLATION SYSTEM**

- A. Aluminum clamptite installation system:
  - 1. Extruded aluminum 6063-T6 and 6063-T5 alloy and temper clamp-tite screw type closure system.
- B. Sealing tape: Manufacturer's standard, pre-applied to aluminum clamptite installation system at the factory under controlled conditions.
- C. Fasteners: 300 series stainless steel screws for aluminum clamptite installation system, excluding final fasteners to the building.
- D. Finish:
  - 1. Manufacturer's factory applied finish, which meets the performance requirements of AAMA 2604. Color to be selected from manufacturer's standards.

**PART 3 - EXECUTION****3.1 EXAMINATION**

- A. Installer shall examine substrates, supporting structure, and installation conditions.
- B. Do not proceed with panel installation until unsatisfactory conditions have been corrected.

**3.2 PREPARATION**

- A. Metal Protection:
  - 1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by sealant manufacturer for this purpose.
  - 2. Where aluminum will contact concrete, masonry, or pressure treated wood, protect against corrosion by painting contact surfaces with bituminous paint or method recommended by sealant manufacturer.

**3.3 INSTALLATION**

- A. Install the panel system in accordance with the manufacturer's fabrication drawings and suggested installation instructions.
  - 1. Anchor component parts securely in place by permanent mechanical attachment system.
  - 2. Accommodate thermal and mechanical movements.
  - 3. Seal aluminum clamptite installation system as shown on the manufacturer's fabrication drawings and suggested installation instructions.
- B. Install joint sealants at perimeter joints and within the panel system in accordance with manufacturers fabrication drawings and suggested installation instructions.

3.4 FIELD QUALITY CONTROL

- A. Water Test: Installer to test a representative section of installed materials according to procedures in AAMA 501.2.
- B. Repair or replace work that does not pass testing or that is damaged by testing and retest work.

3.5 CLEANING

- A. Clean the panel system, interior and exterior, immediately after installation.
- B. Refer to manufacturer's written recommendations.

END OF SECTION 084523

## SECTION 230719 – HVAC PIPING INSULATION

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Piping insulation.
- B. Flexible removable and reusable blanket insulation.
- C. Jackets and accessories.
- D. Engineered wall outlet seals and refrigerant piping insulation protection.

#### 1.2 RELATED REQUIREMENTS

- A. Section 07 84 00 – Firestopping.

#### 1.3 REFERENCE STANDARDS

- A. ASTM B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate 2014.
- B. ASTM B209M – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric) 2014.
- C. ASTM C177 – Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus 2019.
- D. ASTM C195 – Standard Specification for Mineral Fiber Thermal Insulating Cement 2007 (Reapproved 2013).
- E. ASTM C534/C534M – Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form 2016.
- F. ASTM C547 – Standard Specification for Mineral Fiber Pipe Insulation 2019.
- G. ASTM C795 – Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel 2008 (Reapproved 2018).
- H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2019b.
- I. ASTM E96/E96M – Standard Test Methods for Water Vapor Transmission of Materials 2016.

- J. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen 2004 (Reapproved 2012).
- K. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference 2000 (Reapproved 2016).
- L. ASTM E2178 – Standard for Test for Surface Burning Characteristics of Building Materials 2013.
- M. UL 723 – Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

## PART 2 PRODUCTS

### 2.1 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

### 2.2 GLASS FIBER, RIGID

- A. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
  - 1. K Value: ASTM C177. 0.24 at 75 degrees F.
  - 2. Maximum Service Temperature: 850 degrees F.
  - 3. Maximum Moisture Absorption: 0.2 percent by volume.
- B. Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film with aluminum jacket; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.
- C. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.
- D. Vapor Barrier Lap Adhesive: Compatible with insulation.
- E. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.

### 2.3 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

- A. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
  - 1. Minimum Service Temperature: Minus 40 degrees F.
  - 2. Maximum Service Temperature: 180 degrees F.
  - 3. Connection: Waterproof vapor barrier adhesive.

- B. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

## 2.4 JACKETS

- A. Aluminum Jacket: ASTM B209 (ASTM B209M) formed aluminum sheet.
  - 1. Thickness: 0.025 inch sheet.
  - 2. Finish: Embossed.
  - 3. Joining: Longitudinal slip joints and 2 inch laps.
  - 4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
  - 5. Metal Jacket Bands: 3/8 inch wide; 0.015 inch aluminum.

## 2.5 ENGINEERED WALL OUTLET SEALS AND REFRIGERANT PIPING INSULATION PROTECTION

- A. Pipe Penetration Wall Seal: Seals HVAC piping wall penetrations with compression gasket wall mounted rigid plastic outlet cover.
  - 1. Outlet Cover Color: Gray.
  - 2. Water Penetration: Comply with ASTM E331.
  - 3. Air Leakage: Comply with ASTM E283.
  - 4. Air Permeance: Comply with ASTM E2178.

## PART 3 EXECUTION

### 3.1 EXAMINATION

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

### 3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Exposed Piping: Locate insulation and cover seams in least visible locations.
- D. Insulated pipes conveying fluids below ambient temperature; insulate entire system.
- E. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
- F. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.

- G. Glass fiber insulated pipes conveying fluids above ambient temperature.
1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
  2. Insulate fitting, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- H. Inserts and Shields:
1. Application: Piping 1-1/2 inches diameter or larger.
  2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
  3. Insert location: Between support shield and piping and under the finish jacket.
  4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be fabricated.
  5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.
- I. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 07 84 00.
- J. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with aluminum jacket.
- K. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness and adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

### 3.3 REFER TO DRAWINGS FOR PIPE INSULATION SCHEDULE

SYSTEM	PIPE SIZE (INCHES)	PIPE MATERIAL (NOTE 1)	JOINT TYPE (NOTE 1)	SHUT-OFF VALVE TYPE (NOTE 4)	INSULATION TYPE (NOTE 2,3)	INSULATION THICKNESS (INCHES)	INSULATION CONDUCTIVITY (BTU-IN/H-FT <sup>2</sup> -°F)	JACKET (NOTE 5)	NOTES
COIL CONDENSATE DRAIN	3/4 - 1 1/4	TYPE L COPPER	SOLDER OR PRESS	BRONZE BALL, SS TRIM	--				
HEATING WATER PIPING	3/4 - 1 1/2	TYPE L COPPER	SOLDER OR PRESS	BRONZE BALL, SS TRIM	MINERAL FIBER	1 1/2	0.25 - 0.29		
HEATING WATER PIPING	1 1/2 - 2	TYPE L COPPER	SOLDER OR PRESS	BRONZE BALL, SS TRIM	MINERAL FIBER	2	0.25 - 0.29		
HEATING WATER PIPING	2 1/2 - 10	SCHED. 40 STEEL	FLANGED OR WELDED	DUCTILE IRON, BUTTERFLY	MINERAL FIBER	2	0.25 - 0.29		
REFRIGERANT LIQUID - BURIED	3/8 - 3/4	B280 ANNEALED COPPER	BRAZED	--	CELLULAR GLASS	1	0.29	BITUMINOUS	6
REFRIGERANT LIQUID	3/8 - 3/4	B280 ANNEALED COPPER	BRAZED	--	ELASTOMERIC	1/2	0.20 - 0.26	ALUMINUM	6
REFRIGERANT GAS - BURIED	3/8 - 1-1/8	B280 ANNEALED COPPER	BRAZED	--	CELLULAR GLASS	1	0.29	BITUMINOUS	6
REFRIGERANT GAS	3/8 - 1-1/8	B280 ANNEALED COPPER	BRAZED	--	ELASTOMERIC	1/2	0.20 - 0.26	ALUMINUM	6
REFRIGERANT GAS	1-3/8 - 1-5/8	B280 ACR B HARD COPPER	BRAZED	--	CELLULAR GLASS	1	0.29	BITUMINOUS	6
REFRIGERANT GAS	1-3/8 - 1-5/8	B280 ACR B HARD COPPER	BRAZED	--	ELASTOMERIC	1/2	0.20 - 0.26	ALUMINUM	6

**NOTES:**

1. REFER TO SPECIFICATIONS FOR FURTHER PIPE MATERIAL, JOINT AND INSTALLATION REQUIREMENTS. PUSH TO CONNECT / PUSH ON TYPE CONNECTIONS ARE NOT ALLOWED.
2. REFER TO SPECIFICATIONS FOR FURTHER INSULATION REQUIREMENTS. INSULATION R-VALUE SHALL MEET ASHRAE 90.1-2019 REQUIREMENTS.
3. INSULATION APPLIED TO PIPING LOCATED IN RETURN AIR PLENUMS SHALL MEET ASTM E84 2550 FLAME AND SMOKE SPREAD RATING, AND COMPLY WITH NFPA STANDARD 96A.
4. REFER TO SPECIFICATIONS FOR FURTHER VALVE REQUIREMENTS.
5. EXPOSED PIPING INSIDE THE BUILDING AND ALL OUTDOOR PIPING TO HAVE EMBOSSED ALUMINUM JACKET READY FOR FIELD PAINT.
6. REFRIGERANT PIPING FITTINGS AND JOINTS IN VRV SYSTEM SHALL BE MANUFACTURER'S SPECIFIC FITTINGS.

END OF SECTION

APPENDIX A            ROOF ASSESSMENT AND MOISTURE SURVEY  
(see next page)



# **ROOF MOISTURE STUDY**

## **Fir Grove Elementary School**

**6300 SW Wilson Ave. Beaverton, OR 97008**



**Prepared by:**

**WGBM**

**Po Box 3108 Salem, Or 97302**

**Prepared for:**

**RWDI**

**421 SW 6th Avenue, Suite 450,  
Portland OR 97240**

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The roof area is roughly 70,000 sf and it has an Tremco Burmastic 200 system with a fiberboard coverboard and Polyisocyanurate insulation over a plywood roof system.

**WGBM Moisture Study Limits:** \* WGBM: we are not roof experts or Registered Roof Consultants (RRC or RRO). We are water leak investigation experts. We focus on the exterior of building envelopes or roof and walls. We support owners, roofing consultants, manufactures and roofing companies. We do not make actual recommendations on the condition of the membrane or insulation as to when or if it needs to be replaced. Our study is limited to finding possible moisture in the roofing system. The roofing consultant or the manufacturer’s representative or architect needs to determine what level of moisture is acceptable . The following is excerpted from ANSI/SPRI/RCI NT-1, Commentary Section “C.9.1.9: An evaluation of the acceptability of moisture contents within installed roofing materials is a highly subjective matter, and should be conducted on the basis of experience, practicality, and judgment. The suitability of the product with highly elevated moisture content above equilibrium may not be suitable as a substrate for roofing material applications as determined by a roof expert or roof material manufacturer.”



## FIR GROVE ELEMENTARY ROOF MOISTURE STUDY FOR RWDI

The roof area is roughly 70,000 sf and it has a Tremco Burmastic gravel top system. The gravel topping creates some difficulties as gravel is often of varying depths. Thicker gravel areas act as heat sink, and holding heat longer and taking longer to heat up, similar to roof areas that have wet insulation. This can create false positives and is why we recommend taking nuclear moisture meter measurements in combination with thermal imaging and core sampling to calibrate the results. We were limited to pin moisture meters to verify with the cores. The ANSI/SPRI Nuclear meter standard recommends gravimetric analysis.

### Findings:

A three-stage moisture study, consisting of UAS (Drone) thermal mapping, nuclear gauge readings, and a field pin moisture meter content testing was performed on this facility. The first stage thermal map was calibrated by the second stage non-destructive testing using a Troxler 3216 nuclear gauge. The third stage was the physical sampling of the roof system materials and pin meter testing for relative moisture content by 5 cores. All infrared thermal images, nuke meter, and pin meter readings are relative. Only gravimetric laboratory analysis can accurately quantify or determine the amount of moisture found at the location of the corresponding nuke meter reading and the amount of moisture content in each area. (Gravimetric was not done.) See Page 4 invasive test methods and the ANSI and ASTM recommendations.

The thermal imaging, nuke readings, and cores show that the majority of the roof is ambient or Equilibrium Moisture Content (EMC) dry. The areas that are potentially “wet” have been highlighted on the following pages. From our nuke meter readings and cores with pin meter readings we would estimate that most of the roof is EMC dry. The only way to accurately calibrate the Infrared anomalies and the nuke readings is by gravimetric laboratory analysis. The two lowest readings we had were 5 & 6 on the roof. We have found on this type of roof these lower readings 5-9 should be ambient dry. Built up roofs typically have a higher base reading and a larger variance in moisture meter readings that is still considered ambient or EMC dry. This being said we suspect that most of the areas under 10 are dry. Core # 2 on Roof #1 had a nuke meter reading of 16 and the pin meter read 0% moisture. There were a few anomalies and higher nuke readings around the HVACs, vents and pipe penetrations that can be either moisture or additional layers of BUR mastic. We highlighted these areas on the following pages. On Roofs # 1 & 2 there were have anomalies that are around older repairs that may or may not have some hidden moisture. As per suggested in the ANSI/SPRI NUCLEAR standard the most accurate moisture verification is by oven drying or gravimetric lab analysis. We leave the level of moisture verification up to the discretion of the roofing consultant and the manufacturers representative. That being said on page 4 under ASTM D7954 Note 10 states “It is permitted to check the insulation material of each core specimen immediately after extraction from the roofing system to provide a quick indication of its moisture condition with a pin-type resistance moisture meter.” The quick indication of 0% moisture was found on all the cores. There are numerous areas on the roof deck that have heavy gravel and this can hide or gives false positives on moisture content. We suspect there can be some areas above EMC at these locations. We highlighted these areas on the following pages.

### Normal range of roofing materials

All materials used in a roof contain hydrogen or moisture. There is a “normal moisture” content range. This range fluctuates with the surrounding relative humidity of the air. The ambient moisture content goes up and down reflecting the current relative humidity surrounding the roofing materials. All components of the roof have their own ambient or Equilibrium Moisture content (EMC) range of moisture. Much like a wood deck can hold more water than a concrete deck and concrete deck can hold more water than a metal deck. The same is true for different types of insulation and protection or coverboards. Infrared Thermal mapping and Nuclear scanning both require cores to calibrate the results. \* A more detailed discussion of moisture surveys is on page 4, and moisture content range what is wet or dry is on page 14.

**WGBM Moisture Study Limits:** \* WGBM: we are not roof experts or Registered Roof Consultants (RRC or RRO). We are water leak investigation experts. We focus on the exterior of building envelopes or roof and walls. We support owners, roofing consultants, manufactures and roofing companies. We do not make actual recommendations on the condition of the membrane or insulation as to when or if it needs to be replaced. Our study is limited to finding possible moisture in the roofing system. The roofing consultant or the manufacturer’s representative or architect needs to determine what level of moisture is acceptable. The following is excerpted from ANSI/SPRI/RCI NT-1, Commentary Section “C.9.1.9: An evaluation of the acceptability of moisture contents within installed roofing materials is a highly subjective matter, and should be conducted on the basis of experience, practicality, and judgment. The suitability of the product with highly elevated moisture content above equilibrium may not be suitable as a substrate for roofing material applications as determined by a roof expert or roof material manufacturer.”

WGBM provides this roof moisture study as an instrument of service for the exclusive use of RWDI and Beaverton School district the owners of the Fir Grove Elementary school building. Attempts have been made to verify reported information to the extent possible through our observations and the noted nondestructive testing techniques. It should also be noted that our conclusions and recommendations are limited by our visual observations and cores performed with pin moisture meters which are relative readings of moisture. If information provided in this report is contrary to facts known by other readers or field conditions change from the time of our survey, WGBM should be notified so that an assessment of this information can be made in the context of this report. To those examining this report it should be kept in mind that all moisture studies are a glimpse in time and are current as of the date of moisture study performed by WGBM. A roofing system can develop a leak at almost anytime and cause the information provided in this moisture study to change or become out of date.

**BASICS OF INFRARED ROOF MOISTURE SURVEYS** During the day, the sun radiates energy onto the roof and it’s substrate. During the night areas of the roof that are of a wet retain this heat longer than that of the dry areas. Infrared imagers can detect this variance of heat and "see" the warmer, wet areas, during the "window" of uneven heat dissipation. During the day areas that are wet resist this heat gain longer than dry areas. Infrared im-agers can also detect this heat difference and “see” the cooler, wet areas during the day. \* In BUR roofs with of multiple layers, patches or heavy gravel also retain heat longer. See IR limitations.

**Infrared limitations:**

Infrared Thermography (IR) can locate and measure temperature anomalies, IR is not capable of determining the cause of a particular anomaly in a wall or roof assembly. The anomaly can be caused by many issues besides water leakage. For example, the anomaly could be a vent or fan, thermal bridging or solar loading of thicker materials (gravel). The cause must usually be confirmed by physical verification. Some roofs and insulation types or combina-tions do not absorb any water or very little. These roofs leak straight into the building. Even roofs which have insulation types that do absorb water, some do not exhibit a good infrared signal. Even with a strong infrared signal, fac-tors on the roof can affect the analysis and interpretation of the data. Some of these factors: water between multiple layers, seams or overlaps, old patches, heavy flood coats, reflective coatings, heat-producing equipment under the roof –or heat blowing down onto the roof, stains can cause false positive where the images that appear to have moisture but in fact no leakage is present. There can also be obstruction from, HVAC equipment etc. that affects the infra-red signals. Therefore is required that a selection anomalies be investigated and a number of the anomalies have moisture meter readings and core samples to verify.

**Verification methods: Non-invasive and Invasive**

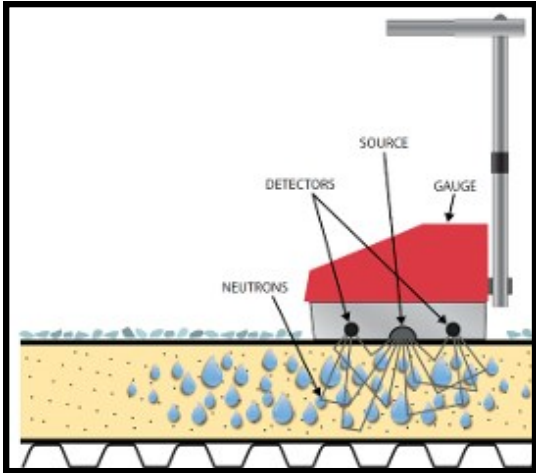
**Noninvasive methods:** The Troxler Nuclear roof scanner gauge emits fast neutrons which are then thermalized, or slowed, by hydrogen ions (moisture) present in the roofing assembly. The resulting numerical readout displayed by the meter is a relative measurement of moisture present in the material at the point of survey. It is important to note that elevated readings can be influenced by sources of hydrogen other than moisture content, i.e. bitumen thickness, wood deck, etc. **See photos below.**

**Invasive test methods:** Cores and gravimetric lab testing, or cores and moisture meter probes. Moisture meters may be used to indicate the presence of moisture in roofing systems provided that they are correlated with the core sam-ple moisture contents. Such meters may be used to compliment, but not replace invasive verification through opening the roof or core samples. \* **See ASTM D7954 Note 5 &10 below. Gravimetric analysis is recommended.**

**ANSI standard ANSI/SPRI/RCINT-1 Detection and Location of Latent Moisture in Building Roofing Systems by Nuclear Thermalization. 2012** **6.0 Verification and Quantification** 6.1 General ... The field data (numeric readout) is only relative and shall be quantified by core cuts. Three or more cores shall be extracted with a core extracted at low, intermediate and high readings.. 6.2 Gravimetric Analysis ... the different elements of the roof assembly shall be analyzed separately. 6.2.2 Determination of moisture content by dry weight shall be made for each core. (DRY WEIGHT = GRAVIMETRIC) See page 14.

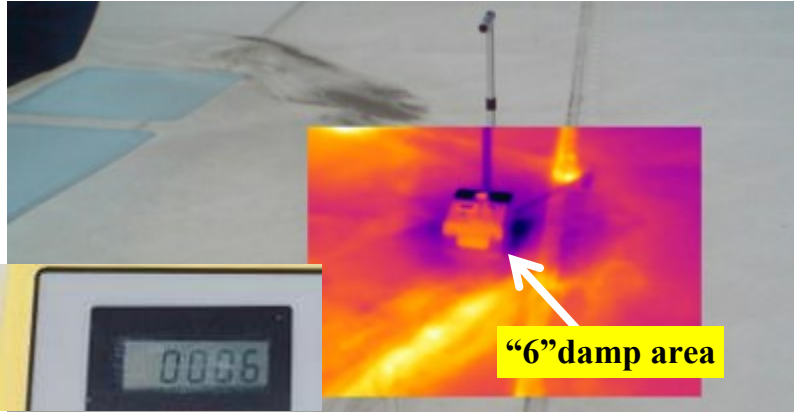
**ASTM D7954 Standard Practice for Moisture Surveying of Roofing and Waterproofing Systems**

9.2.2 Core samples taken for calibration purposes shall consist of specimens of the roofing or waterproofing system at least 2 in. [50 mm] in diameter to include roofing or waterproofing membrane and all materials from the top sur-face down to the deck. 9.2.3 Core samples shall be taken by cutting through the system down to the deck and shall be evaluated by appropriate methods to determine composition, condition, and moisture content. (see Note 5). Typi-cally, core samples taken from dry reference locations shall be retained for gravimetric analysis in accordance with Test Method C1616 at the verification stage (see Section 11). **NOTE 5**—Readings obtained by a resistance-pin-type moisture meter to evaluate moisture conditions of core samples are relative and, typically, need to be correlated with moisture content value at the verification stage (see Note 9). The pin-type resistance meter readings should be rec-orded so they can be correlated with moisture content measurements obtained by gravimetric analysis at the verification stage of the procedure. **NOTE 9**—When oven drying gypsum-based products, it is important that the oven tem-perature does not exceed 110 +/-5 °F [45 6 3 °C] so as to avoid driving off chemically bound water in the gypsum. 11.3.1 For “Dry” Reference Location—Quantify the moisture content of the core samples taken from the “dry” refer-enced location used for calibration of the scanner by gravimetric analysis. **NOTE 10**—It is permitted to check the insulation material of each core specimen immediately after extraction from the roofing system to provide a quick in-dication of its moisture condition with a pin-type resistance moisture meter.

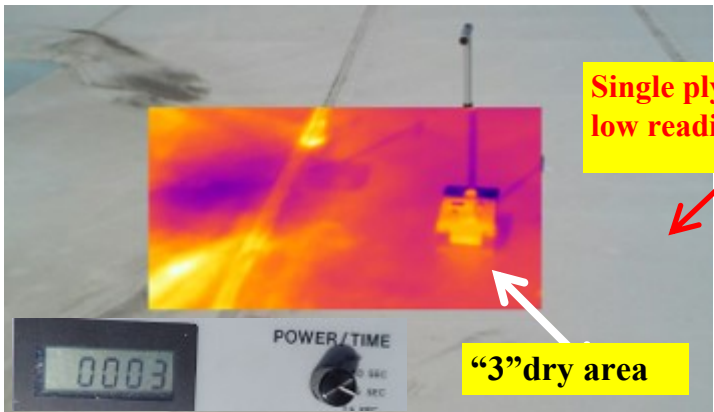


WGBM

**We go to a location that has an infrared anomaly and check the moisture content with our Troxler Nuclear meter for both the anomaly “moisture” and a suspected dry area.**



ROOF MOISTURE STUDY

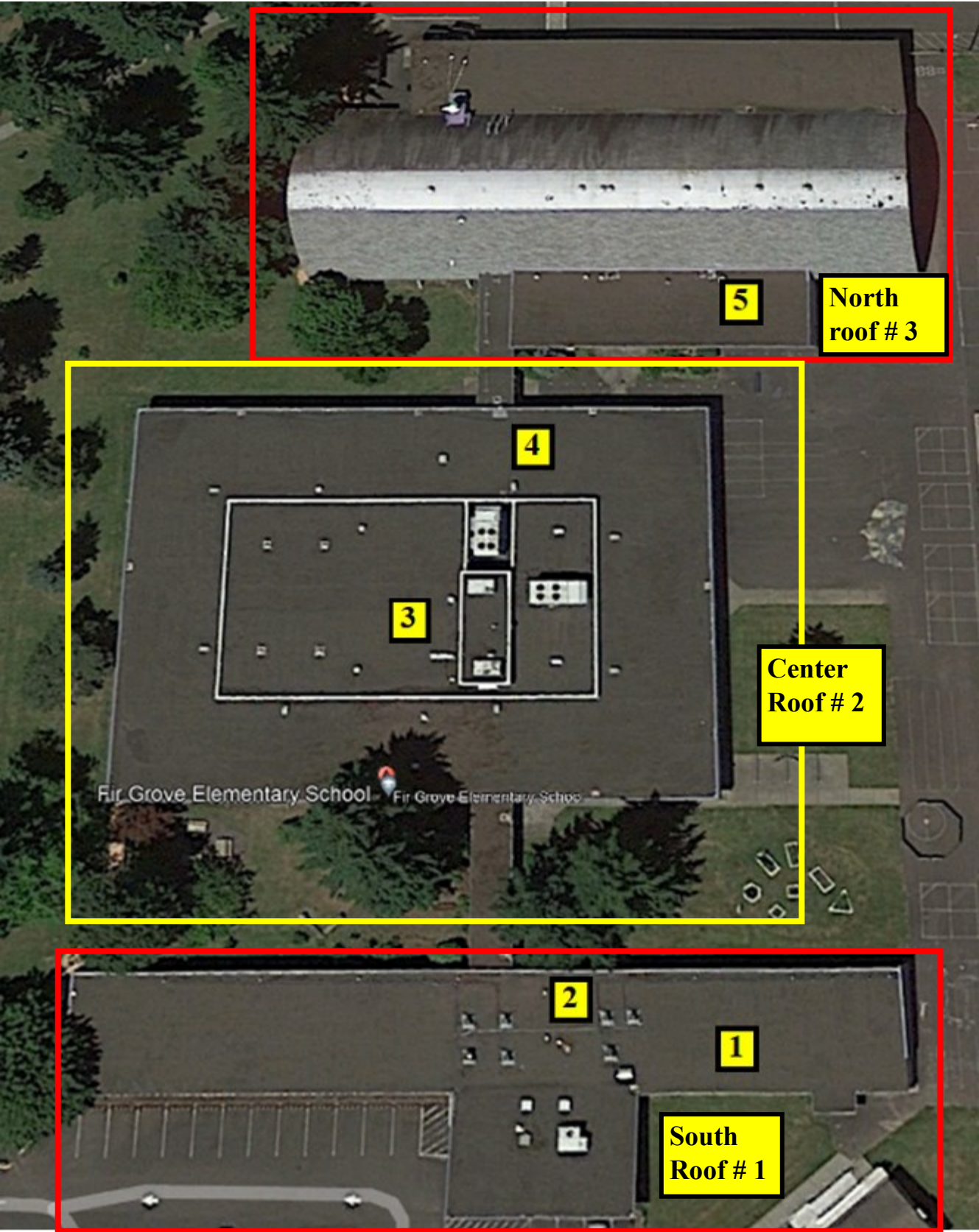
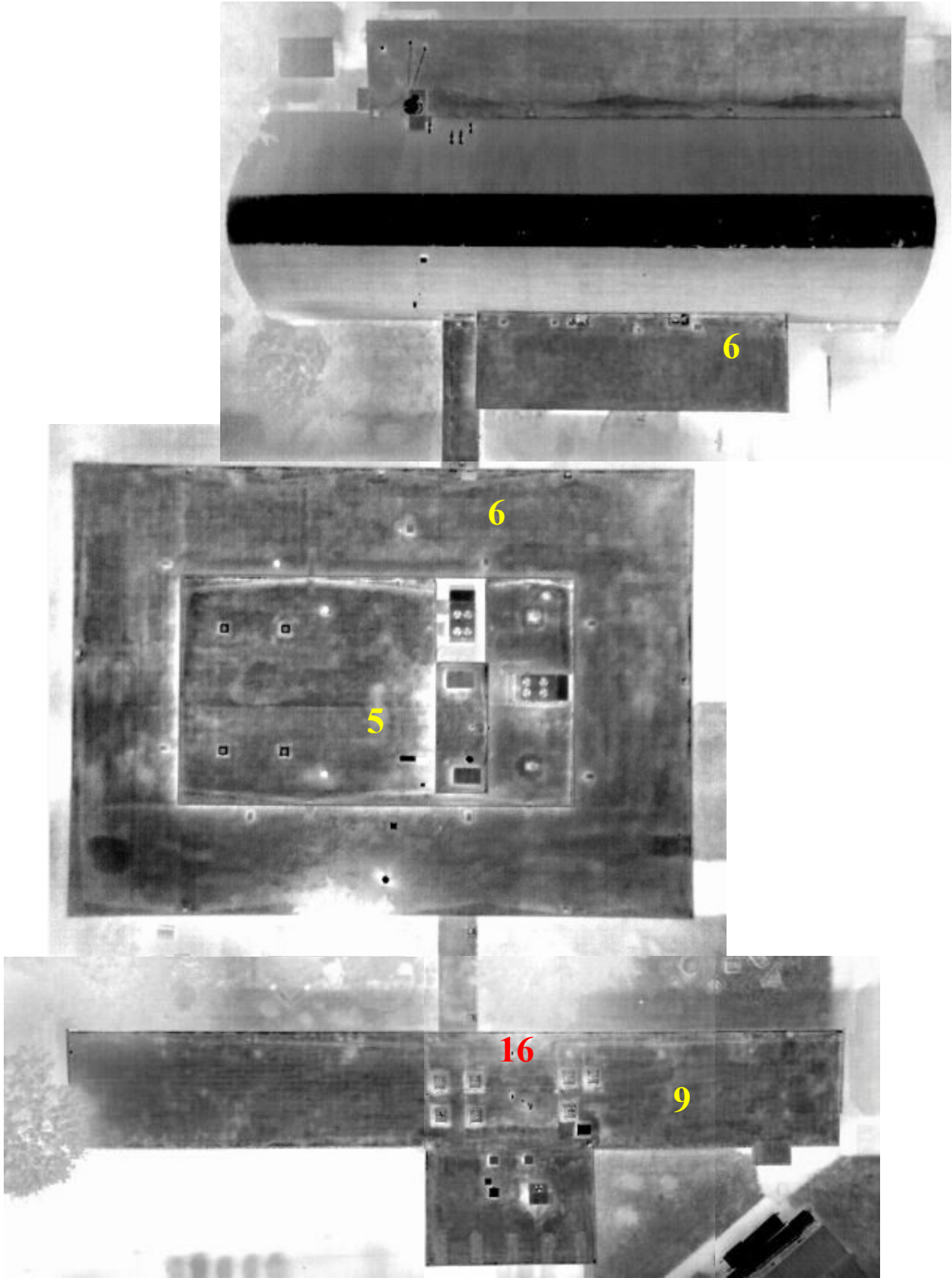


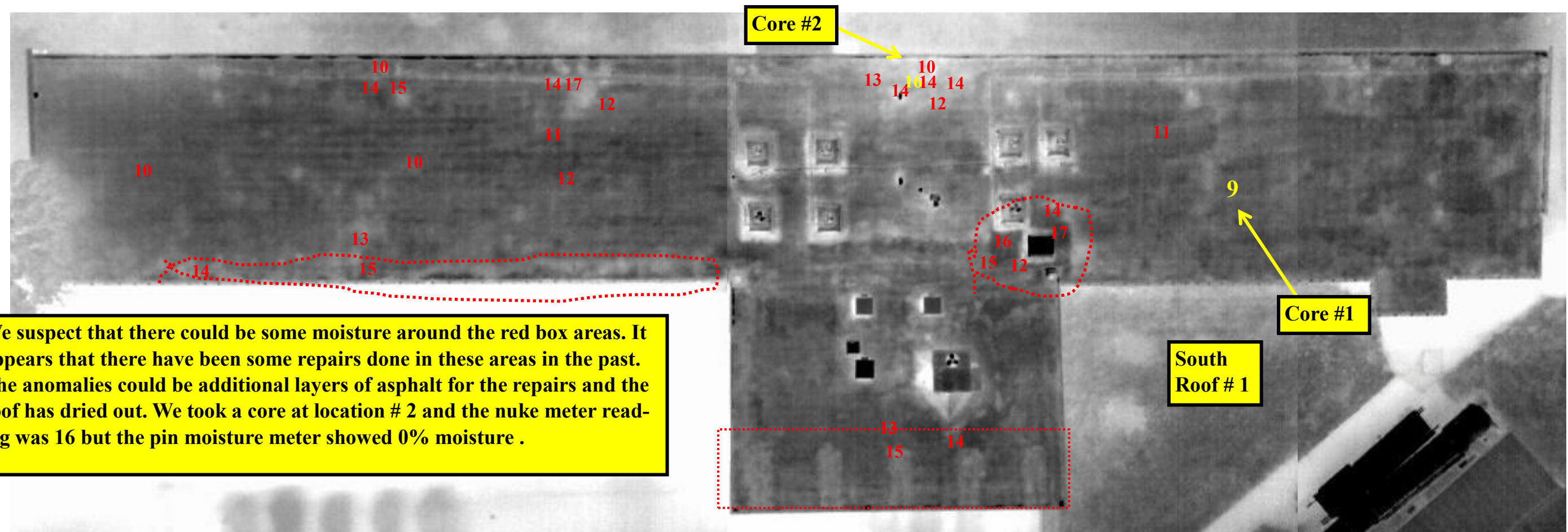
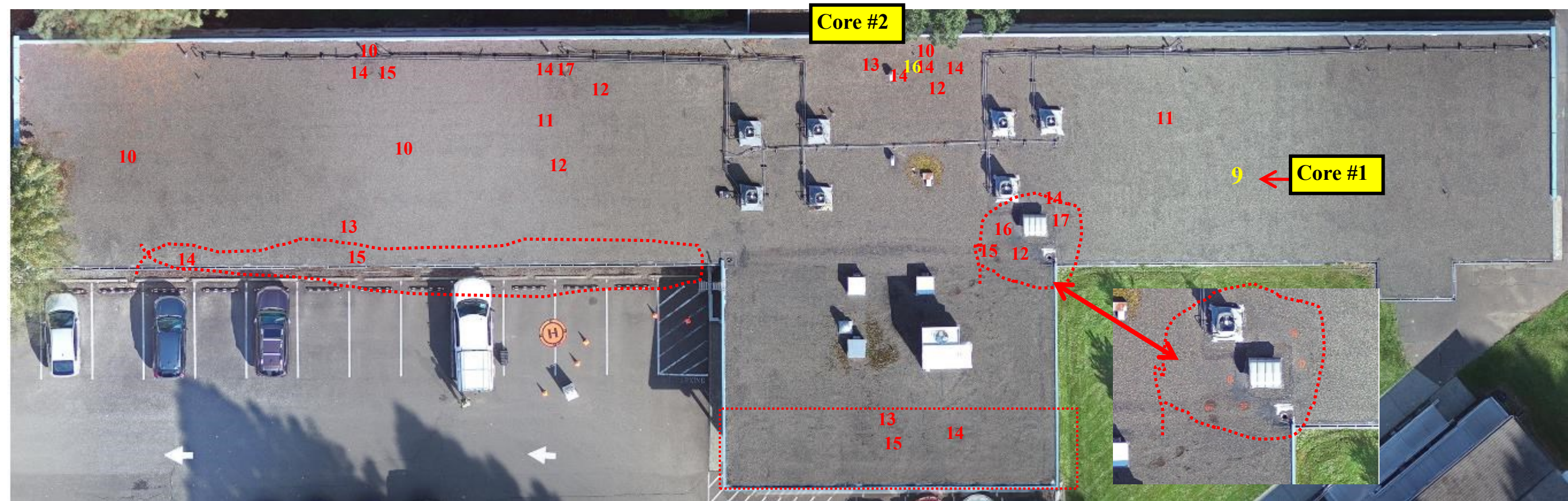
OF FIR GROVE ELEMENTARY SCHOOL



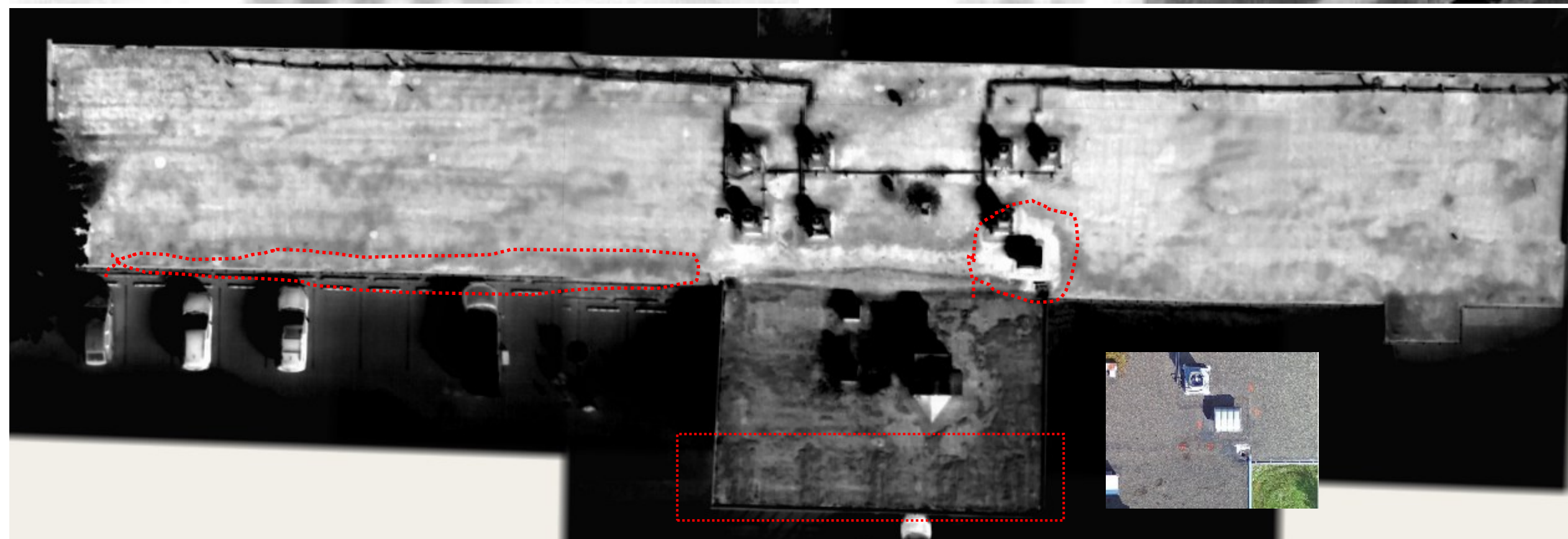
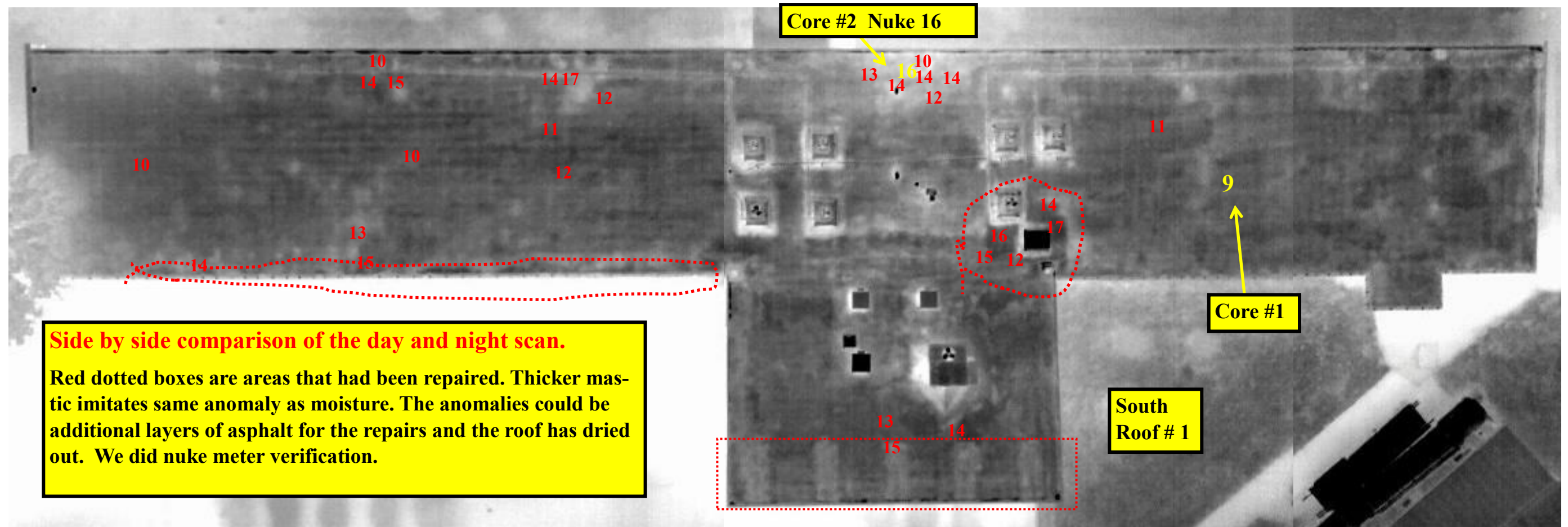
FOR RWDI

There were five core locations. The quick indication of 0% moisture was found on all the cores. We started on the South Roof # 1 and did cores# 1&2 on the center roof #2 we did cores # 3 & 4 and on the north roof #3 we did core #5. See pages 11-15 for details.

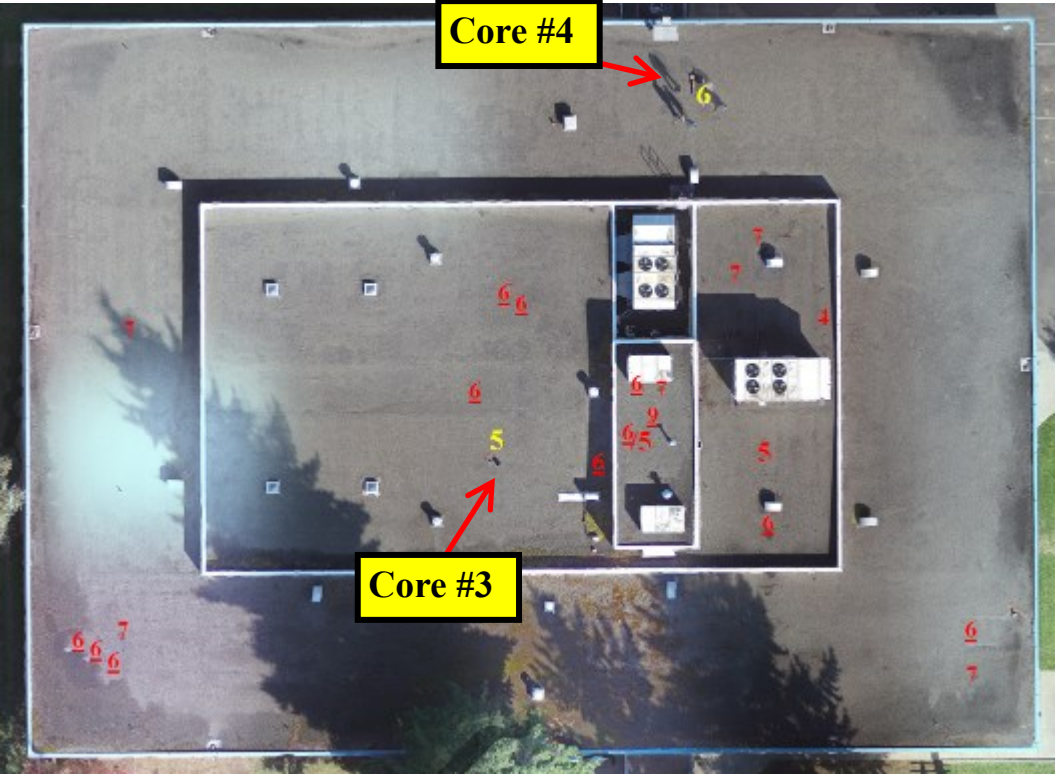
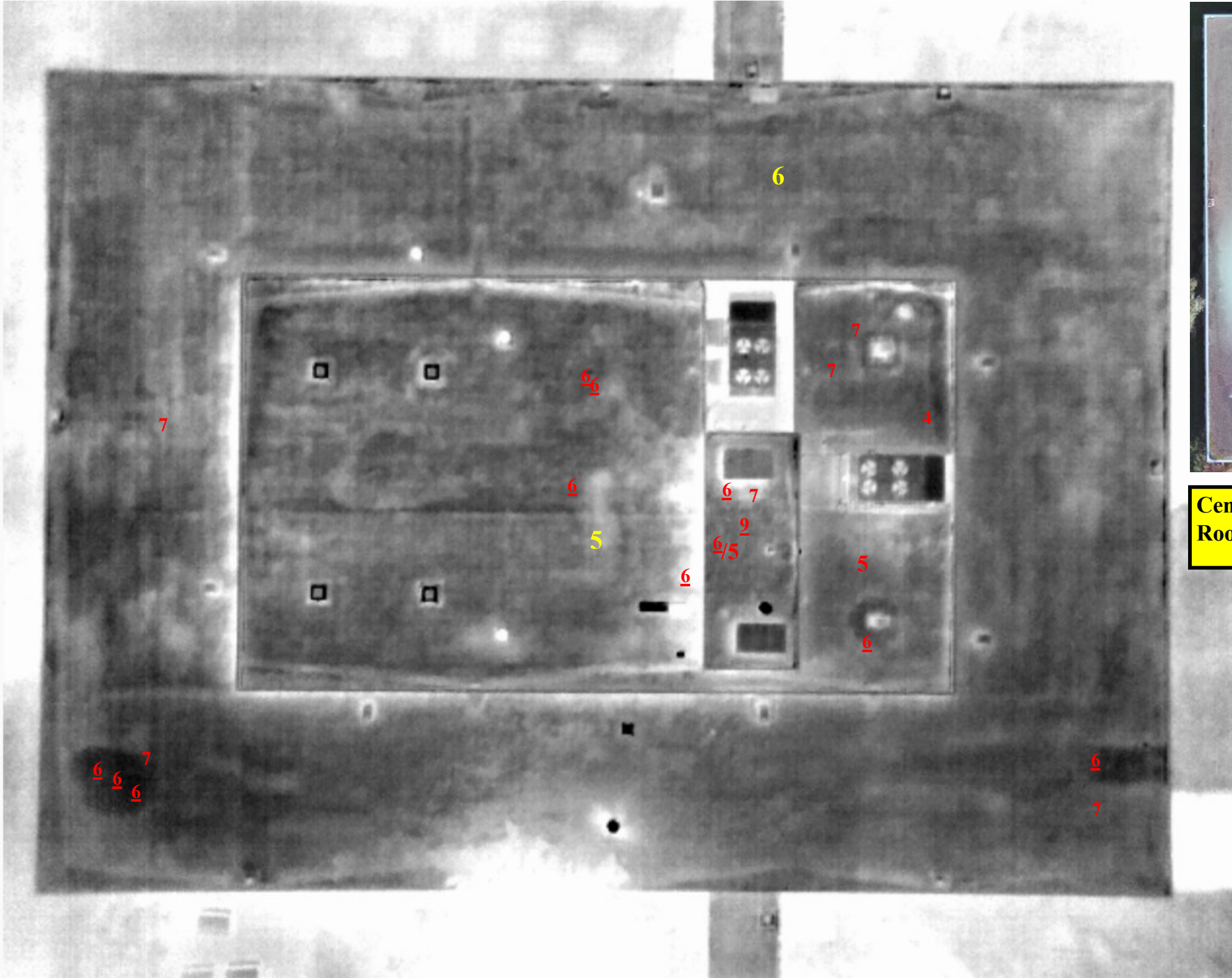




We suspect that there could be some moisture around the red box areas. It appears that there have been some repairs done in these areas in the past. The anomalies could be additional layers of asphalt for the repairs and the roof has dried out. We took a core at location # 2 and the nuke meter reading was 16 but the pin moisture meter showed 0% moisture .

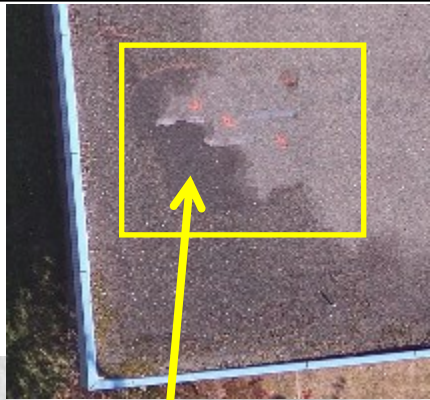


Center roof #2 Below is a nighttime thermal image with the nuke eraddinss and core locations.



Center  
Roof # 2

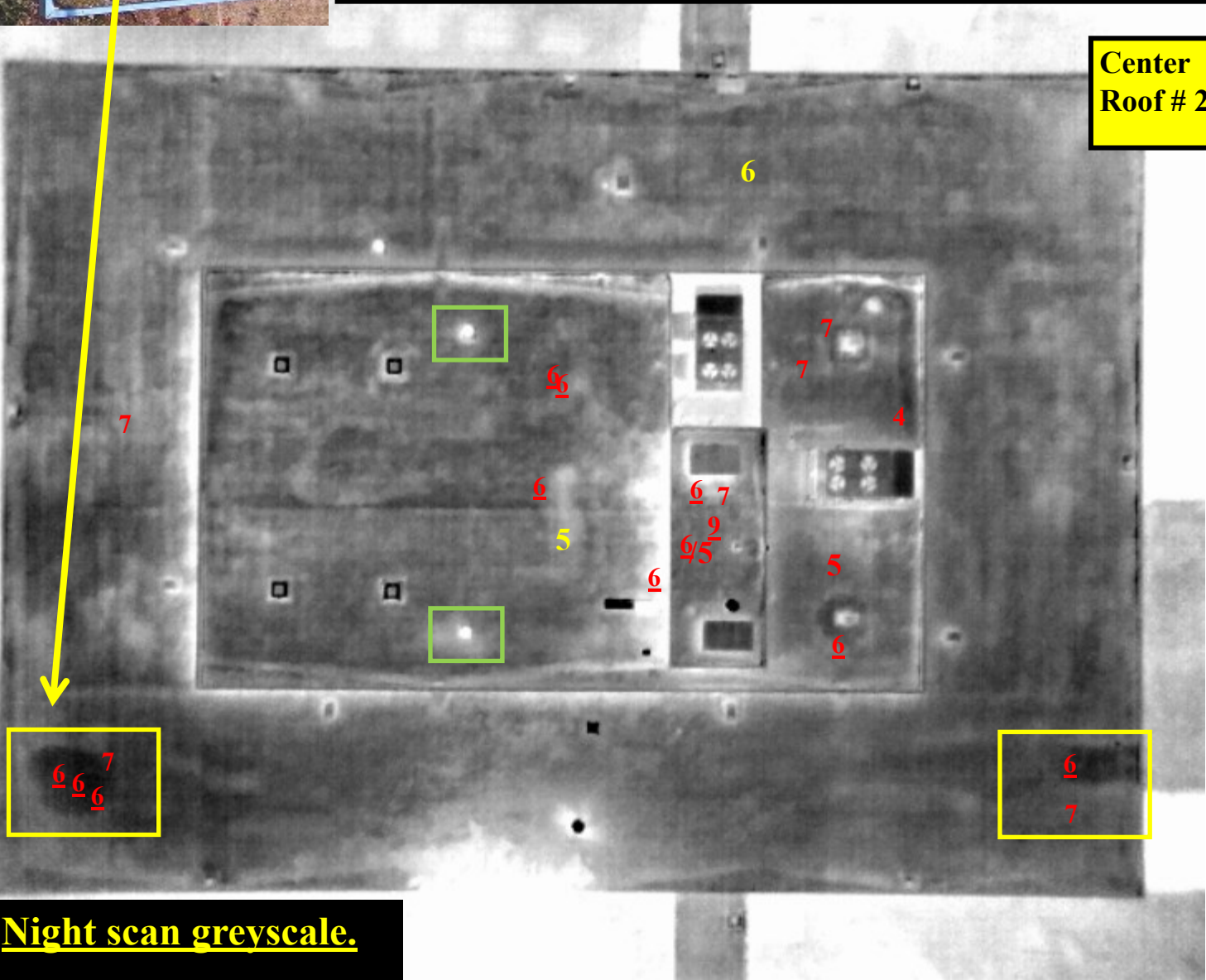
Below are nighttime and daytime thermal images. The daytime thermal image is more challenging because the dew from the night before has not completely dissipated as shown on the visible photo above see red dotted outlines. The yellow boxes were anomalies that we suspected as possible moisture when studying the thermal map so as to determine locations to test with the nuke moisture meter. There were signs of repairs at these locations and this may be cause of the anomaly as we did not have higher than normal nuke readings. \*There was not a vapor barrier as shown on page 15 core # 4. If these are older repairs research as shown that over time the roof could dry out to the interior in areas with out a vapor barrier. \* (ORNL Andre Desjarlais “Recovering Over a Wet Roof”) Once repaired, the wet roof dried out 17% in a year in area with no vapor retarder.



**Side by side comparison of the day and night scan.**  
Yellow boxes are areas that had been repaired. Thicker mastic imitates same anomaly as moisture. Nuke verification.  
Green boxes show that the vent in the night scan was not moisture as the daytime scan there is not a corresponding anomaly.



Center  
Roof # 2

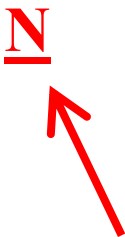


**Night scan greyscale.**

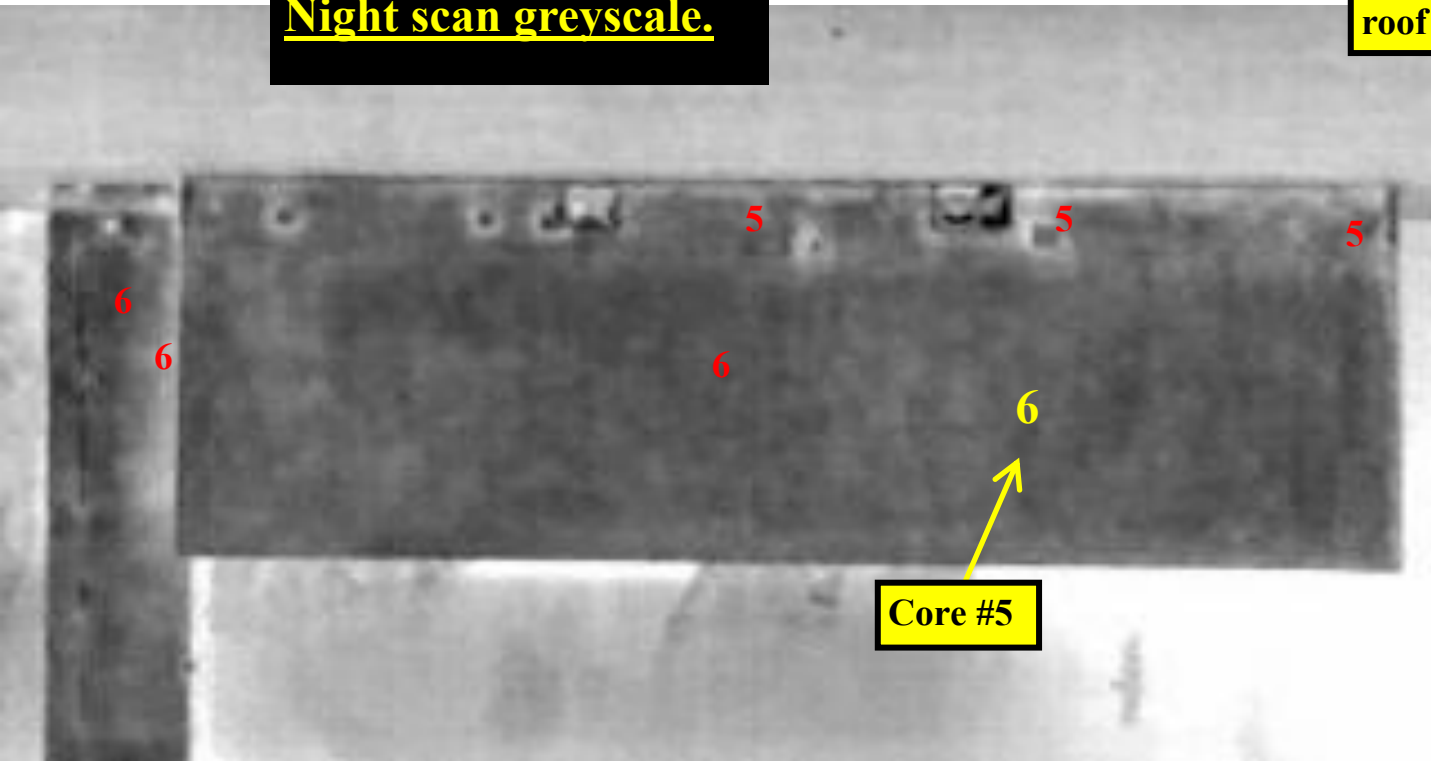


**Day-time scan greyscale:**

The thermal image on the left side is a night time scan in grey scale. The thermal image on the lower right is a daytime scan. Both images show very even conditions or few anomalies. The anomalies we see around the vents and drains are consistent with thicker layers of asphalt for the extra flashing layers at these locations. We have also overlaid the nuke moisture readings and the #5 core location. The thermal photo on the lower left also has the nuke moisture reading locations. Core # 5 with a Nuke reading 6 showed dry on the pin moisture meter.

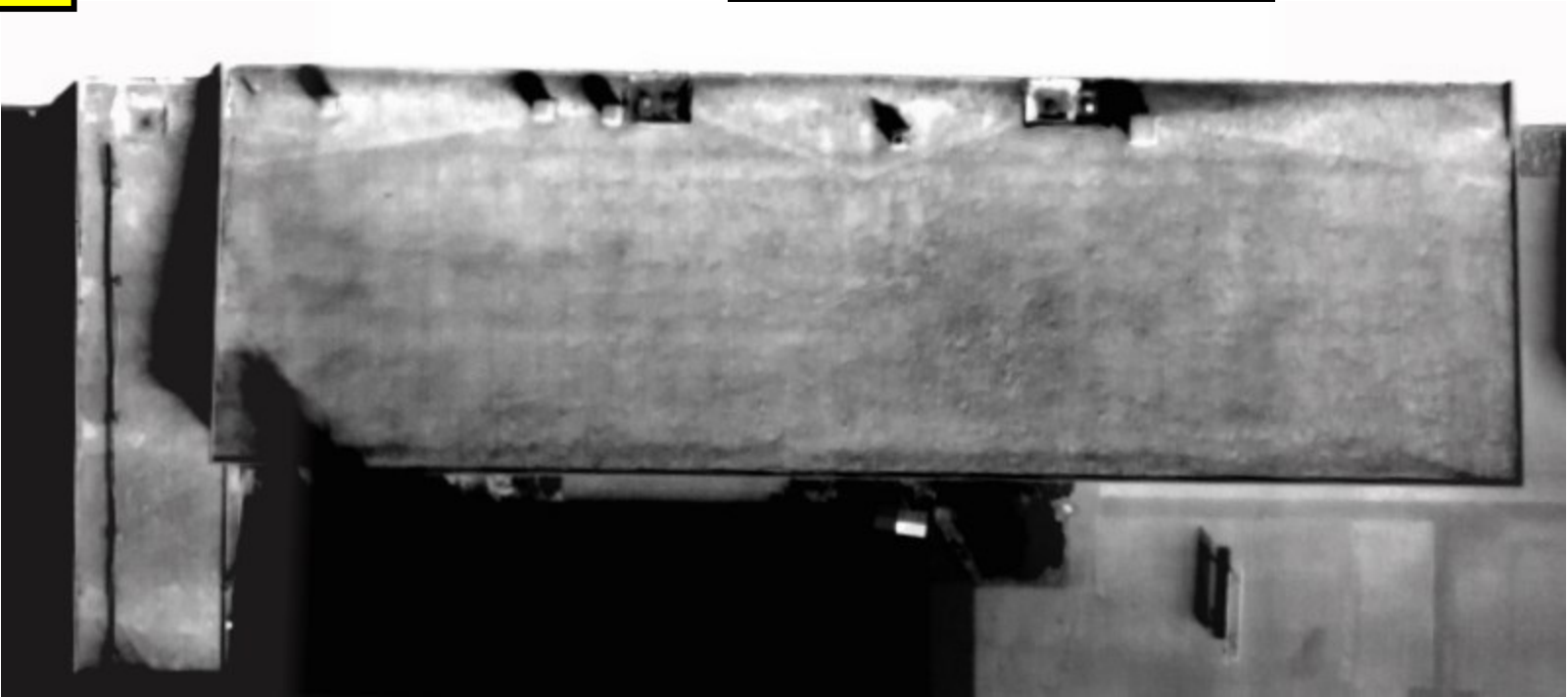


**Night scan greyscale.**



**North  
roof # 3**

**Day-time scan greyscale:**

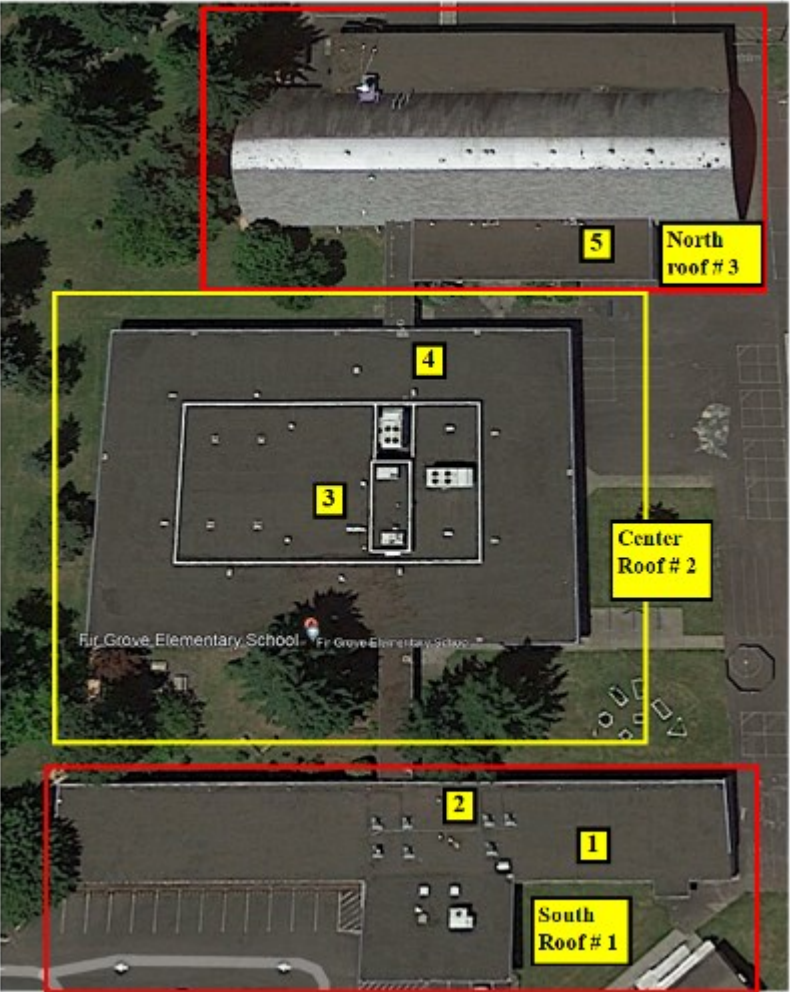


Fir grove Core #1 nuke reading 9 .	Fiberboard pin meter reading	0%	Dry
Wood deck moisture reading 0% Dry	Polyiso Insulation meter reading	0%	Dry

Fiberboard 0.0 %

Polyiso 0.0 %

Wood deck 0%



Fir grove core #2 nuke reading 16	Fiberboard pin meter reading	0%	Dry
Wood deck moisture reading 0% Dry	Polyiso Insulation meter reading	0%	Dry
* Higher nuke reading could have been from thicker BUR at the location			

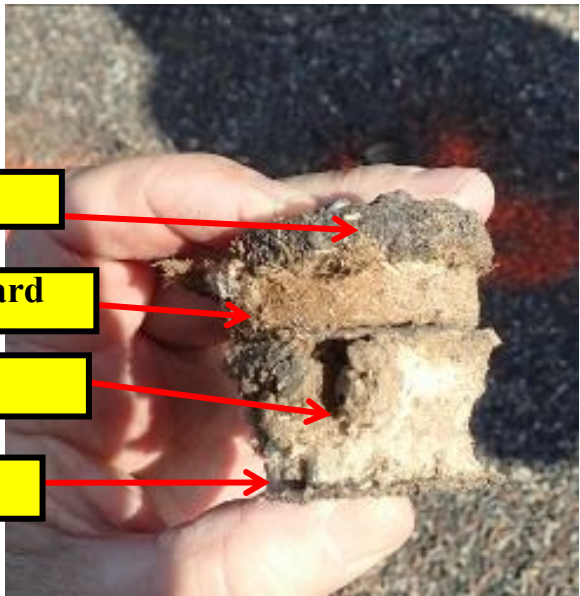
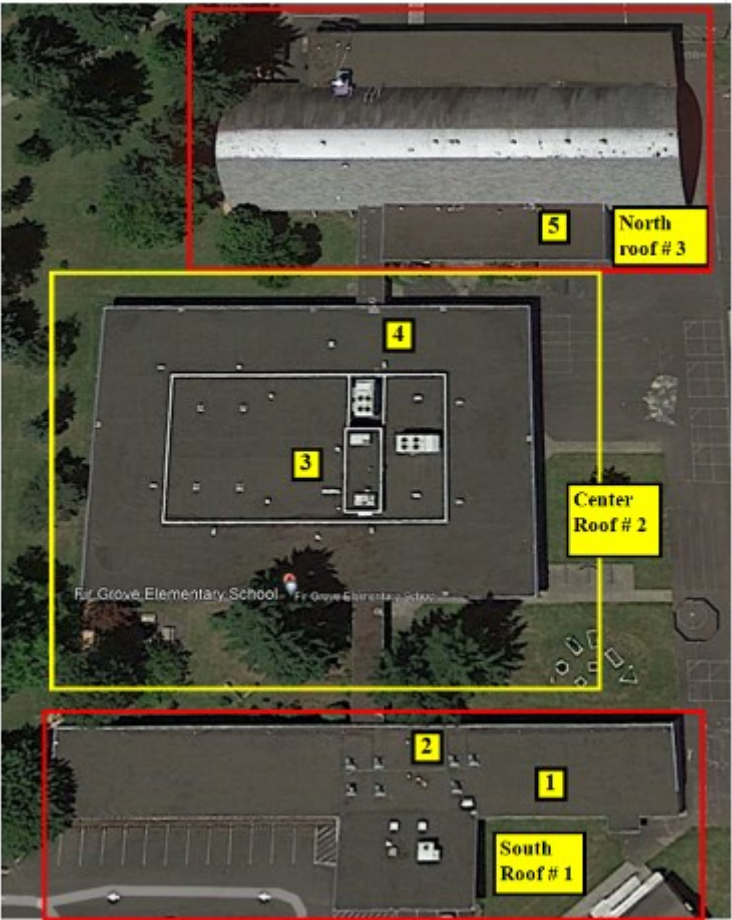
Fiberboard 0.0 %



Polyiso 0.0 %



Wood deck 0%



Fir grove core #3 nuke reading 5.	Fiberboard pin meter reading	0%	Dry
Wood deck moisture reading 3.5% Dry	Polyiso Insulation meter reading	0%	Dry

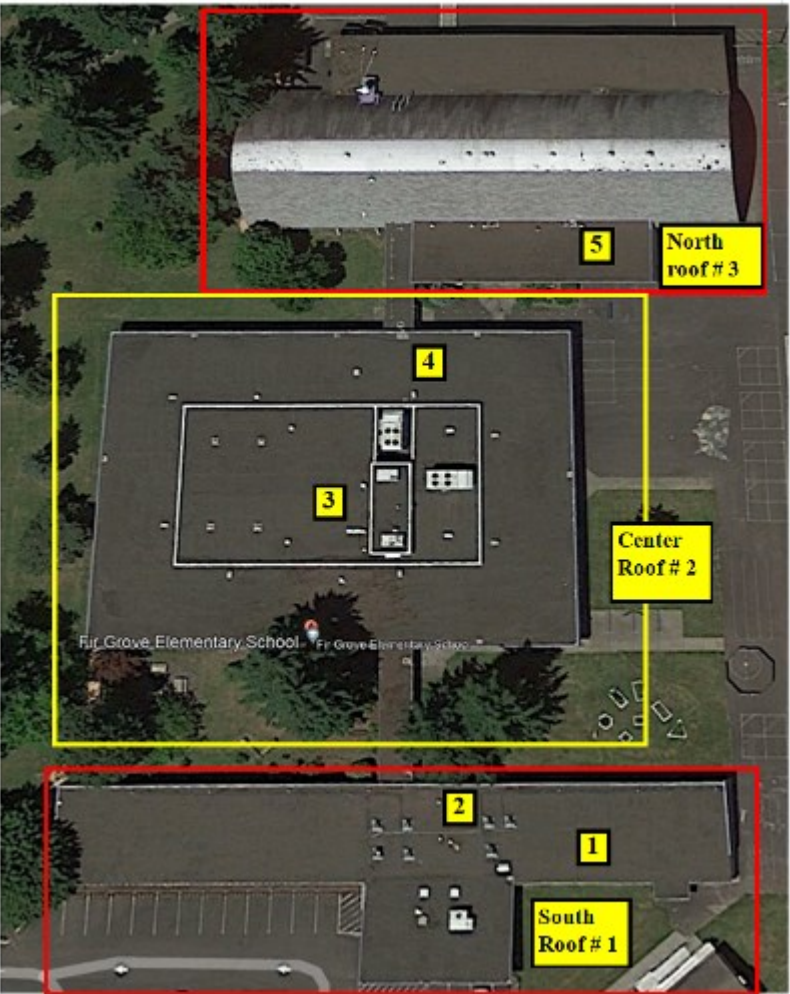
Fiberboard 0.0 %



Polyiso 0.0 %



Wood deck 3.5%



Fir grove core #4 nuke reading 6.	Fiberboard	pin meter reading	0%	Dry
Wood deck moisture reading 0% Dry	Polyiso Insulation	meter reading	0%	Dry

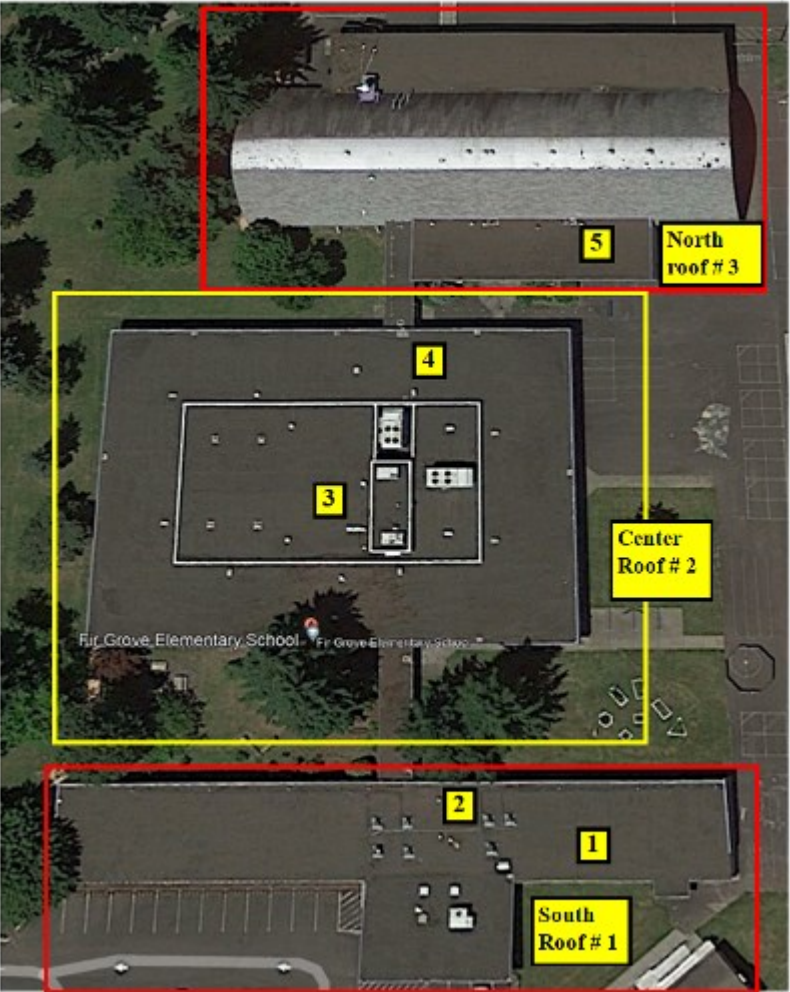
Fiberboard 0.0 %



Polyiso 0.0 %



Wood deck 0%



Fir grove core #5 nuke reading 6	Fiberboard pin meter reading	0%	Dry
Wood deck moisture reading N/A Dry	Polyiso Insulation meter reading	0%	Dry

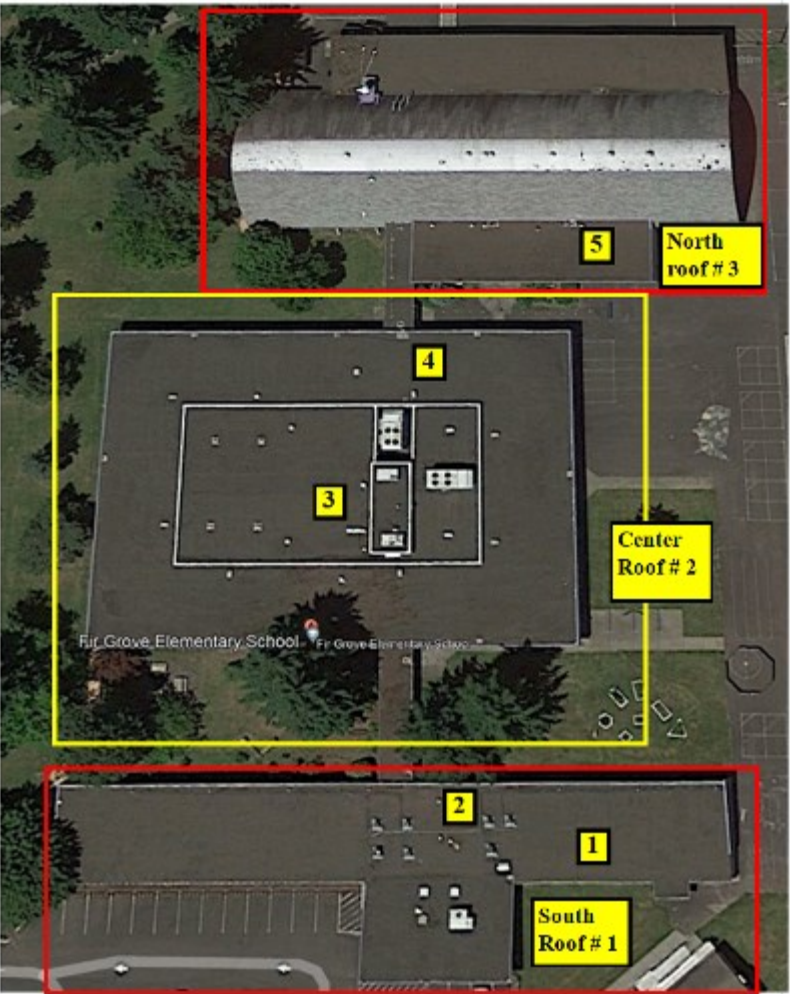
Fiberboard 0.0 %



Polyiso 0.0 %



Wood deck N/A



WET OR DRY CONDITION:

A dry condition for new roofing materials is defined by ANSI/SPRI/RCI – NT-1, as moisture content results that are below the Equilibrium Moisture Content (EMC). According to Table 3 of ANSI/SPRI/RCI NT-1, the EMC for Fiberboard is 12% and Polyisocyanurate (Polyiso) foam insulation is 3.0 percent by-weight when stabilized at a relative humidity of 90 percent and 75°F; Gravimetric Moisture Content results above this threshold. Would be considered wet. “C.9.1.9: An evaluation of the acceptability of moisture contents within installed roofing materials is a highly subjective matter, and should be conducted on the basis of experience, practicality, and judgment.

EMC Fiberboard 12%

National Bureau of Standards NBS Tech note 965/ ANSI SPRI NT-1

	<u>Equilibrium (EMC)</u>	<u>Max Saturation</u>
<u>Roofing Material</u>	<u>Moisture Content</u>	<u>Moisture Content</u>
Organic Felt Asphalt	2.5- 4% by weight	75%
Fiber Board	12% by weight	430%
Polyiso Insulation	3%	520%
Wood	18% (19% by code)	139% healthy *578% Severely degraded
Degradation assessment of waterlogged wood. Iowa state university Guo Menglin.		

EMC PolyIso Insulation 3%

Table 3  
Moisture Content of Roofing Materials  
See commentary

Type Material	Equilibrium Moisture Content at 90% RH 75° F	Maximum Moisture Content Obtained by Immersion
Organic Felt Membrane	1.0%	20%
Fiberboard	12.0%	430%
Perlite Board	4.0%	580%
Glass Fiber	2.0%	610%
Urethane	6.0%	520%
Expanded Polystyrene	3.0%	540%
Lightweight Concrete	6.0%	110%
Dry Asphaltic Fills	0.1%	60%
Cellular Glass	0.01%	30%
Extruded Polystyrene	0.5%	10% to 15%

Source: Anderson, Richard G., "Dry Range and Wet Range Moisture Content of Roofing Materials as Found in Existing Roofs." *Proceedings of the 1985 International Symposium on Roofing Technology: A Decade of Change and Future Trends in Roofing*, National Roofing Contractors Association, Chicago, 1985

Table 4  
Equilibrium Moisture Content and  
Moisture Content at 80% TRR  
See commentary

(TRR = thermal resistance ratio)

Insulation	Equilibrium M.C. (% of dry weight)		Moisture Content (% of dry weight) at 80% TRR
	at 45% RH	at 90% RH	
Cellular Glass	0.1	0.2	23
Expanded Polystyrene [16 kg/m³ (1 .0 pcf)]	1.9	2.0	383
Extruded Polystyrene	0.5	0.8	185
Fibrous Glass	0.6	1.1	42
Isocyanurate	1.4	3.0	262
Perlite	1.7	5.0	17
Phenolic	6.4	23.4	25
Urethane	2.0	6.0	262

Source: Griffin, C.W., and Fricklas, R.L., *Manual of Low-Slope Roof Systems*, Fourth Edition. The McGraw-Hill Companies, Inc., New York, 2006, Table. 5.2, pg.81.