

Hiteon Elementary School HVAC Upgrades

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SUMMARY

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: Hiteon Elementary School – HVAC & Electrical Upgrade

1. Project Location: 13800 SW Brockman Street,, Beaverton, OR 97225

B. Owner: Hiteon Elementary School

C. Owner's Representative: Beaverton School District

1. Contact: Jeff Hamman, Project Manager (503) 356-4571

D. Owner's Commissioning Agent: GLUMAC

1. Contact: Jeremy Braithwaite, PE (503) 345-6216

E. Mechanical and Electrical Engineer: System Design Consultants, Inc..

1. Contact: Kelly Johnson (503) 248-0227

F. Asbestos Abatement: T R C

1. Contact: Ron Landolt (503) 387-3251

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. General upgrade of the building mechanical systems including associated electrical work, structural support and architectural patch and repair work required to accommodate mechanical upgrades.

1.4 ACCESS TO SITE

A. General: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use 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.

SUMMARY**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: Limit work in the existing building and site as follows:
1. Weekdays: 6:00 a.m. to 5:00 p.m. (Custodian until 6:00 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 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.

SUMMARY

- 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

UNIT PRICES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for unit prices.
- B. Related Section:
 - 1. Division 01 Section "Contract Modification Procedures" for procedures for submitting and handling Change Orders.

1.2 DEFINITIONS

- A. Unit price is an amount incorporated in the Agreement, applicable during the duration of the Work as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

1.3 PROCEDURES

- A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.
- B. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.
- C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.
- D. Schedule:
 - 1. A "Schedule of Unit Prices" is included at the end of this section.
 - 2. Include as part of each unit price, miscellaneous devices, appurtenances and similar items incidental to or required for a complete system whether or not mentioned as part of the unit price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

PROJECT MANAGEMENT AND COORDINATION**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 provisionsto 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

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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 sub-framing 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

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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 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

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- 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. Pre-installation Conferences: Conduct a pre-installation 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.

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- 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.

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- 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-Building;
 - 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**

PROJECT MANAGEMENT DATABASE (E-BUILDER)**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 documentfiles.

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 teamresponsible.
 - 2. Contractor’s project manager or lead member of Contractor’s projectstaff.
 - 3. Others as deemed appropriate by Owner’s Representative.

1.4 SYSTEM REQUIREMENTS:

- A. System Configuration:
 - 1. PC system 500 MHz Intel Pentium III or equivalent AMDprocessor.
 - 2. 128 MB Ram.
 - 3. Display capable of SVGA (1024 x 768 pixels) 256 colors display.
 - 4. 101 key keyboard.

PROJECT MANAGEMENT DATABASE (E-BUILDER)

5. Mouse or other pointing device.
- 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. Most current version of Microsoft Internet Explorer (current version is a free distribution for download). This specification is not intended to restrict the host server or client computers provided that industry standard HTTP clients ay access the published content.
 - b. Most current version of Adobe Acrobat Reader (Current version is a free distribution for download).
 - c. Other plug-ins specified by e-Builder as applicable to the system (current versions are a free distribution for download from www.e-builder.net).
 - d. Users are recommended to have a properly licensed version of the standard Microsoft Office Suite (current version must be purchased) or theequivalent.
- 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 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 projectrecords.
 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.

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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 emailclient.
- 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

CONSTRUCTION PROGRESS DOCUMENTATION**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

SUBMITTAL PROCEDURES**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 provided by Architect/Consultant.
- 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 5 days for review of each resubmittal.

SUBMITTAL PROCEDURES

- 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.

SUBMITTAL PROCEDURES

- 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.

SUBMITTAL PROCEDURES

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.

SUBMITTAL PROCEDURES

- 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:

SUBMITTAL PROCEDURES

- 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.

SUBMITTAL PROCEDURES

- 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

SECURITY PROCEDURES**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 will receive an ID badge and a hard hat sticker 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

SECURITY PROCEDURES

- 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
 - Sadomasochistic 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 projectsite.

PART 2 - PRODUCTS (Not Used)**PART 3 - EXECUTION (Not Used)****END OF SECTION**

BASIC HVAC REQUIREMENTS**PART 1 - GENERAL****1.1 OTHER REQUIREMENTS**

- A. The Bidding, General and Supplementary of this project manual and specific section as noted apply to the work specified in Mechanical Division 23 which encompasses Sections 23 00 00 through 23 36 00. This Section 23 00 00 applies to all sections of Mechanical Division 23.

1.2 SCOPE

- A. It is the intent of these specifications and the accompanying drawings to describe complete mechanical systems installations for all building areas, new and renovation.
- B. Furnish and install all material, labor and equipment in accordance with these documents.
- C. Include all incidental items and work not specifically shown or specified but required by good practice in a complete system.
- D. The drawings and specifications are complementary. What is called for in one shall be called for in both.
- E. The drawings are diagrammatic but should be followed as closely as possible. Where required by jobsite conditions, relocate and provide fittings, etc., as required. Provide an allowance in the contract bid to furnish additional pipe and ductwork fittings required for coordination with structure and other construction trades.
- F. Prepare and submit a utility coordination plan noting any disruptions of existing building services for approval by the school district, attaching any sketches, drawing excerpts, or step-by-step sequences / schedules required to fully-explain the proposed activities. Submit the coordination plan 2 weeks in advance of the planned activities.
- G. Immediately notify the school district representative if existing mechanical elements are damaged or have been inadvertently damaged during the course of construction.
- H. Coordinate cost accounting for the items identified in the plans and specifications as SB 1149 EEM measures. Provide separate discrete costs for all labor and materials associated with the installation of those items and appurtenances required for the proper operation as contained within the contract documents.
1. EEM #3 – Install VFD's on selected air handling systems in B-Wing and C-Wing: All labor and materials, including electrical wiring, DDC controls and systems programming directly required for the replacement of existing motors with VFD compliant, high efficiency motors and the addition of variable frequency drives (VFD's).
 - Supply air fans SF-1, SF-2 and SF-4.
 - Return fan RF-1.
 2. EEM #4 – Replacement of existing pneumatic controls with direct digital controls (DDC) in A-Wing, B-Wing and C-Wing. All labor and materials required for the demolition of existing pneumatic controls and installation of new DDC controls including hardware, software, programming and training.
 3. EEM #5 – Install VFD's on air handling systems ASU-1 and ASU-2 and upgrade system components, including rooftop heat pumps with DDC controls: All labor and materials, including electrical wiring, DDC controls and systems programming directly required for the installation of DDC controls and replacement of existing motors with VFD compliant, high efficiency motors and the addition of variable frequency drives (VFD's).

BASIC HVAC REQUIREMENTS**1.3 DEFINITIONS**

- A. Project Manager: The individual(s) designated by Beaverton School District as their authorized representative(s) for the project coordination, construction and closeout phases.
- B. Or approved equal: Requires approval prior to bid date.
- C. Indicated:
1. The term "indicated" is a cross reference to details, notes, or schedules on the drawings, other paragraphs or schedules in the specifications, and similar means of recording requirements in the Contract Documents.
 2. Where terms such as "shown," "noted," "scheduled," and "specified" are used instead of "indicated," it is for the purpose of helping the reader locate the cross reference, and no limitation of location is intended except as specifically noted.
- D. Directed, Requested, Etc.: Where not otherwise explained, terms such as "directed," "requested," "authorized," "selected," "approved," "required," "accepted," and "permitted" mean "directed by the Engineer," "requested by the Engineer," etc. However, no such implied meaning will be interpreted to extend the Engineer's responsibility into the Contractor's area of construction supervision.
- E. Site or Project Site: The space available to the Contractor for the performance of the work, either exclusively or in conjunction with others performing the work as part of the project. The extent of the project site is shown on the project drawings and is not identical with the description of the land upon which the project is to be built.
- F. Approved:
1. Where used in conjunction with the Project Manager's response to submittals, requests, applications, inquiries, reports and claims by the Contractor, the meaning of the term "approved" will be held to the limitations of the Project Manager's responsibilities and duties as specified in the General and Supplementary Conditions.
 2. In no case will "approval" by the Project Manager be interpreted as a release of the Contractor from responsibilities to fulfill requirements of the Contract Documents.
- G. Provide: The term "provide" means to furnish and install, complete and ready for the intended use.

1.4 STANDARDS AND CODES

- A. Provide all equipment and material and perform all work in accordance with all local, state and national codes and regulations.
- B. For work on this project, comply with the latest edition of the appropriate standards published by the following:
- | | | |
|-----|---|--------|
| 1. | Air Diffusion Council | ADC |
| 2. | American Gas Association | AGA |
| 3. | Air Movement and Control Association | AMCA |
| 4. | American National Standards Institute | ANSI |
| 5. | Air-Conditioning and Refrigeration Institute | ARI |
| 6. | Acoustical Society of America | ASA |
| 7. | American Society of Heating, Refrigerating and Air-Conditioning | ASHRAE |
| 8. | American Society of Mechanical Engineers | ASME |
| 9. | American Society for Testing and Materials | ASTM |
| 10. | Washington County, Oregon. | |

BASIC HVAC REQUIREMENTS

11.	National Environmental Balancing Bureau	NEBB
12.	National Electrical Manufacturers Association	NEMA
13.	National Fire Protection Association	NFPA
14.	Sheet Metal and Air Conditioning Contractors' National Association	SMACNA
15.	Underwriters' Laboratories	UL
16.	Oregon Structural Specialty Code	OSSC
17.	Oregon Mechanical Specialty Code	OMSC
18.	Oregon Plumbing Specialty Code	OPSC
19.	Oregon Energy Efficiency Specialty Code	OEESC

1.5 APPROVAL OF EQUIPMENT AND MATERIALS

- A. Manufacturer's trade names, catalog numbers and material specifications used in this specification are intended to establish the quality of equipment or materials expected. Materials and manufacturers not listed require approval prior to the bid date.
- B. Approval of substitute equipment or materials will be based upon performance, quality and other factors deemed important by the Project Manager. The Contractor will be responsible for making all changes in this and other associated work required as a result of the substitution. Additional or modified structural calculations and roof penetrations required to accommodate the substitution will be the responsibility of the contractor.

1.6 SUBMITTALS

- A. Submit a digital copy of the submittals to the Project Manager for review
- B. Furnish performance data and technical information on all materials and equipment to be used on the project.
- C. Include shop drawings with the submittals where necessary to determine clearance, where the Contractor proposes alternate equipment or material arrangements, and when requested by the Project Manager.
- D. Review of submittals or shop drawings by the Project Manager does not relieve the Contractor from the requirements of the Contract Documents unless specific approval has been requested for a given deviation.

1.7 QUALITY ASSURANCE

- A. Maintain the highest standards of workmanship throughout the project.
- B. Use the latest editions of applicable and specifically referenced standards.
- C. Inspect all material and equipment upon arrival at the site and return any which is not in new condition.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION**3.1 COORDINATION**

- A. Cooperate with other trades to assure that construction proceeds in an orderly and timely manner. Contract cost increases due to improperly sequenced work with other trades will not be allowed.
- B. Study the architectural, structural, electrical, shop and any specialty drawings as appropriate and specifications to determine required coordination.

BASIC HVAC REQUIREMENTS

- C. Prepare detailed shop drawings where necessary to assure proper fit and necessary clearance.
- D. Refer to electrical drawings to verify voltage and phase of mechanical equipment.

3.2 PERMITS, FEES AND INSPECTIONS

- A. Obtain all required permits and pay for all fees and connection charges.
- B. Schedule any required inspections.

3.3 MATERIALS AND WORKMANSHIP

- A. Furnish all materials and equipment in new condition, free from defects and of size, make, type and quality specified. Installation shall be in a neat and workmanlike manner.
- B. When two or more items of the same kind, type or class are required, use items of a single manufacturer.

3.4 MEASUREMENTS

- A. Take all measurements from reference datums established by the mechanical contractor.

3.5 DELIVERY, HANDLING AND STORAGE

- A. Receive all material and equipment at the jobsite or shop.
- B. Use proper and sufficient equipment to handle all products employed in the project.
- C. Where storage of material or equipment is necessary, it shall be a clean and weatherproof area. Seal any openings and cover the product to assure that there will be no corrosion or foreign matter introduced. Assure that it will be in new condition when placed in service.

3.6 EQUIPMENT INSTALLATION, BRACING AND SUPPORT

- A. All serviceable equipment must be accessible without obstruction or removal of piping or accessories.
- B. Install all equipment in strict accordance with the manufacturer's instructions unless otherwise indicated.
- C. The drawings in general are based upon one of the specific manufacturers listed for a particular equipment item. The other specified manufacturers and additional approved manufacturers of equipment may require deviations from the drawings to properly install the particular equipment in accordance with the manufacturer's recommendations and to provide the system results required. Provide all work necessary in the base bid price to install this equipment.
- D. Where the installation shown or specified is contrary to the manufacturer's instructions, advise the Project Manager in writing of the differences before proceeding with the installation.
- E. Anchorage to Floors, Roofs, Etc., Sway Bracing and Seismic Restraints:
 - 1. The contractor is responsible to determine the means and methods of equipment installation and support.
 - 2. Provide supports for all apparatus as specified, detailed, as required by the manufacturers of specific equipment and the project governing code authorities. Anchor all roof and base/floor mounted equipment with size and spacing of anchor bolts or other attachment means as recommended by the respective equipment manufacturer.
 - 3. Provide seismic restraints on all mechanical equipment in conformance with applicable OSSC sections. Costs for seismic calculations are to be included in the bid price.

BASIC HVAC REQUIREMENTS

4. Provide deferred submittals directly to the governing code jurisdiction for anchorage to floors, roofs, etc., sway bracing and seismic restraints. Submittals to show locations and sufficient support details as required by the governing code jurisdiction.
5. Provide supplementary drawings and calculations as required by governing code jurisdictions noting seismic support data/calculations as required for permit purposes.
6. Mechanical seismic criteria is as follows:

a. Occupancy Classification	III
b. Seismic Design Category	D
c. Component Importance Factor (Ip)	
1) General building HVAC systems	1.5
- F. Maintain a copy of the manufacturer's installation instructions at the jobsite for all equipment.

3.7 SLEEVES AND INSERTS

- A. Provide sleeves at all locations where piping and ductwork passes through building construction.
 1. Sleeves for interior walls and floors shall be 22 gauge galvanized or heavier as required.
 2. Sleeves for exterior walls shall be cast iron, wall thickness as required.
 3. Wall sleeves shall be installed in all exterior walls and all interior masonry or fire-rated walls in a manner that preserves the fire-rated or watertight integrity of the wall.
 4. Interior wall sleeves for uninsulated pipe shall allow minimum 1/4-inch clearance all around pipe for pipe movement. Allow 1-inch clearance around pipe at building expansion joints.
 5. Interior wall sleeves for insulated piping shall be selected to encompass the pipe and insulation and allow minimum 1/4-inch clearance around insulation for pipe movement. Allow 1-inch clearance around pipe and insulation at building expansion joints.
- B. Seal space between pipe and sleeve with Dow Corning Fire Stop System, 3M Brand CP25 or approved equal where piping penetrates firewall or floors. Sealant must be between pipe and sleeve; sealant between insulation and sleeve is not acceptable. Install firestop materials in complete accordance with the manufacturer's instructions and in compliance to applicable UL listings.

3.8 ACCESS DOORS AND PANELS

- A. Manufacturers: CESCO, Milcor, Elmdor. CESCO used as basis of selection.
- B. Non-rated panels: Style W, SR-1, SR-2, P, PX as required for wall or ceiling construction, 12 inch x 12 inch or larger as required for ease of access.
- C. Fire-rated panels: Style FB, U.L. listed for 1-1/2 hr for fire rated stud and masonry wall systems.
- D. Provide access panels where shown on the drawings or as required for proper access to mechanical appurtenances. Coordinate the installation of access panels is with the specific building construction penetrated. Coordinate access panel installation with manufacturer's instructions.
- E. Locate and size access doors to facilitate equipment service and optimize the safety of the maintenance personnel. Minimum access door size to be 18"x 18".

3.9 PROTECTION

- A. Protect all work, material and equipment from loss or damage until the Owner accepts the project.
- B. As the work progresses, keep all equipment covered and cap all ducts and piping that may temporarily be left unconnected.
- C. Notify all other trades of any required precautions necessary to protect the work.

BASIC HVAC REQUIREMENTS**3.10 ACCESSIBILITY**

- A. Provide convenient access by location or access panel to all equipment requiring periodic service.

3.11 ELECTRICAL WORK

- A. See Paragraph 3.20 for materials and work to be provided as a part of this Mechanical Division 23:
- B. Wherever possible, provide all interconnect wiring within or on a piece of equipment with the equipment unless shown or specified otherwise. An electrician licensed to perform this type of work shall perform all field wiring.

3.12 RELATED WORK

- A. The following work and materials are specified elsewhere:
 - 1. Pipe chases, equipment pads and foundations, trenches, painting, air louvers, louvered penthouse and access panels except as otherwise specified in this division.
 - 2. Framed openings, wood grounds and nailing strips, masonry, concrete and other architectural and structural elements.

3.13 CLEANING

- A. Maintain premises and public properties free from accumulations of waste, debris and rubbish during construction.
- B. Clean all mechanical equipment of dust, grease, iron cuttings, unnecessary stamps or shipping labels, etc.
- C. Touch up factory-painted surfaces, as necessary, with paint of matching color.

3.14 RECORD DRAWINGS

- A. Maintain one set of construction drawings at the jobsite for the sole purpose of recording work of the mechanical contract, as actually installed. Upon request, the Project Manager will make the original tracings available to the mechanical contractor for printing the drawings. The Contractor shall pay the reproduction costs.
- B. Deliver record drawings to the Project Manager promptly upon completion of the project.

3.15 OPERATION AND MAINTENANCE MANUALS:

- A. Submit a digital copy of the Operation and Maintenance Manuals to the Project Manager for approval before project completion. Include an index and tabs for major systems and equipment. Operation and Maintenance Manuals shall include the following:
- B. Directories:
 - 1. Supplier Directory: Alphabetical list of principal subcontractors and suppliers of equipment giving names, addresses and telephone numbers.
 - 2. Equipment Directory: List of equipment installed such as fans, air supply units, pumps, heating and cooling equipment, plumbing fixtures, etc., giving drawing reference numbers, location, area served, manufacturer with model number and supplier.
- C. Manufacturer's Literature:
 - 1. Show name, address and phone number of the nearest service facility authorized by the manufacturer.

BASIC HVAC REQUIREMENTS

2. Include illustrations, diagrams, and instructions for installation, startup, operation, inspections, maintenance, parts list, data sheets and other necessary materials.
3. Include complete electrical, schematic and connection diagrams for each equipment item.
4. Include the name, address and phone number of contractor(s) who furnished and who installed equipment and systems.
5. Where the literature covers more than one model, check off neatly in ink correct model number and data for the model number including all specified options.
6. In those instances where the equipment, its mode of control, or both, is job assembled for special functions, then provide written operating and maintenance instructions prepared by the assembler on 8-1/2" x 11" sheets.

D Maintenance Instructions:

1. Where instructions for maintenance are not included in the manufacturer's literature, provide supplemental data to enable proper maintenance of the equipment installed.
2. Include specific lubrication methods and recommended frequencies along with procedures and precautions for inspection and routine service.

E Copy of Written Guarantee.**F. Recommended Spare Parts Stock.****3.16 HVAC SYSTEMS TRAINING**

- A. Training must be on fully operational system, or the training must be repeated when the system is fully operational at no additional cost to the Owner. Training must be scheduled through the Beaverton School District representative at a time that is convenient to district personnel. The Beaverton School District representative must be notified of any changes, re-scheduling or modifications to the training schedule.
 1. Provide a written agenda to the attendees outlining the general scope of the training session and the building equipment involved. Submit the written training outline to the district representative prior to the training date.
 2. Maintain a start-up log notebook in the job trailer containing signed copies of the manufacturer's start-up sheets for all equipment.
 3. Training walk-throughs to be performed by a contractor field project manager or technician who is fully knowledgeable with the project specifics and has had continuous involvement during the course of the project. The individual is to be knowledgeable in the specific installation details and maintenance of the project equipment.
 4. All training to be video recorded and provided to Owner.
- B. Maintenance Training: Maintenance training will take place within 30 days after substantial completion. This session to include a detailed review of the HVAC system record drawings and equipment installation instructions. The instructor shall then walk through the building identifying the location of the equipment installed and specific function(s) related to the overall mechanical systems. The training shall include answering maintenance personnel questions, troubleshooting and diagnostics procedures, repair instructions and preventive maintenance. This training will include all maintenance staff per the Beaverton School District.

3.17 CUTTING AND PATCHING

- A. Cut work as required for installation and patch to match original conditions as directed and approved by Project Manager. Do not cut structural portion without Project Manager's approval.
- B. When masonry construction must be penetrated, provide a steel pipe sleeve in opening and grout in place in a neat manner. Leave grout surface to match existing finish.

BASIC HVAC REQUIREMENTS

- C. Prior to cutting any existing work, locate all concealed utilities to eliminate any possible service interruption or damage.
- D. Firestopping penetrations in fire-rated wall/floor assemblies.
 - 1. Contractors shall provide proper sizing when providing sleeves or core-drilled holes to accommodate the through penetrating items.
 - 2. All voids between sleeve or core-drilled hole and pipe passing through, shall be firestopped to meet the requirements of ASTM E-814 (Standard Test Method for Fire Tests of Penetration Firestop Systems).
 - 3. Fire stop penetration systems to be installed in accordance with the U.L. listed assemblies provided by the manufacturers of the products used.

3.18 CHANGE ORDERS

- A. All supplemental cost proposals by the Contractor shall be accompanied with a complete itemized breakdown of labor and materials cost without exception.
- B. Contractor's estimating sheets for the supplemental cost proposals shall be made available to the Project Manager. Labor must be separated and allocated for each item of work.

3.19 VERIFICATION OF EXISTING CONDITIONS

- A. Verify field conditions and measurements prior to the manufacture of shop fabricated materials and equipment.
- B. Produce shop drawings with details as required verifying proper installation of materials & equipment in conformance with applicable codes and the manufacturer's requirements.

3.20 SYSTEMS WIRING AND RELATED DEVICES

	FURNISHED ITEM	BY	INSTALL BY	POWER WIRING	CONTROL WIRING
1.	Division 23 Equipment Motors	Div. 23	Div. 23	Div. 26	Div. 23
2.	Remote Motors Starters, Contactors and Overload Heaters – Integral	Div. 23	Div. 26	Div. 26	Div. 23
3.	Fused & Unfused Disconnect Switches	Div. 26	Div. 26	Div. 26	-----
4.	Manual Operation Switches	Div. 26	Div. 26	Div. 26	Div. 26
5.	DDC Controls, Relays and Sensors	Div. 23	Div. 23	Div. 23	Div. 23

BASIC HVAC REQUIREMENTS

	FURNISHED ITEM	BY	INSTALL BY	POWER WIRING	CONTROL WIRING
6.	Smoke Duct Detectors	Div. 28	Div. 23	Div. 26	Div. 28

3.21 COMMISSIONING

- A. The equipment and systems referenced in this section are to be commissioned.
- B. The contractor has specific responsibilities for scheduling, coordination, startup, test development, testing and documentation. Coordinate all commissioning activities with the Commissioning Authority.

END OF SECTION

MOTOR REQUIREMENTS FOR HVAC EQUIPMENT**PART 1 - GENERAL****1.1 SUMMARY**

- A. Work included: Providing VFD compliant high efficiency motors and variable frequency drives (VFD's) as specified.

1.2 SUBMITTALS

- A. Provide submittals in accordance with Section 23 00 00.
- B. Submittals shall include manufacturer's catalog or technical data substantiating performance required.

1.3 OPERATION AND MAINTENANCE DATA

- A. Provide O&M data in accordance with Section 23 00 00.
- B. O&M data shall include:
 - 1. Manufacturer's literature.
 - 2. Maintenance instructions.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Motors: Premium efficiency, VFD compliant – Verify motor compatibility with specified VFD's prior to submittal.
- B. Variable Frequency Drives: ABB AHC Series or owner approved equal.

2.2 DESCRIPTION

- A. Motor Starters
 - 1. Premium efficiency.
 - 2. VFD compliant.
- B. Variable Frequency Drives
 - 1. The VFD package as specified herein shall be enclosed in a UL Listed Type 12 enclosure, completely assembled and tested by the manufacturer in an ISO9001 facility. The VFD tolerated voltage window shall allow the VFD to operate from a line of +30% nominal, and -35% nominal voltage as a minimum. UL Type 12 means the enclosure has been tested by UL Standards, not NEMA.
 - 2. All VFD's shall have the following standard features:
 - a. The VFD shall have integral 5% impedance line reactors to reduce the harmonics to the power line and to add protection from AC line transients. The 5% impedance may be from dual (positive and negative DC bus) reactors, or 5% AC line reactors. VFD's with only one DC reactor shall add AC line reactors. This increased impedance lower harmonic distortion (Vthd) meeting IEEE-519 guidelines.
 - b. The VFD shall include a coordinated AC transient protection system consisting of 4-120 joule rated MOV's (phase to phase and phase to ground), a capacitor clamp, and 5% impedance reactors. MOV's protects against transients that would trip a VFD off line or cause serious damage.

MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

3. All VFD's to have the following adjustments: Two (2) PID Setpoint controllers shall be standard in the drive, allowing pressure or flow signals to be connected to the VFD, using the microprocessor in the VFD for the closed loop control. The VFD shall have 250 ma of 24 VDC auxiliary power and be capable of loop powering a transmitter supplied by others. The PID setpoint shall be adjustable from the VFD keypad, analog inputs, or over the communications bus. There shall be two parameter sets for the first PID that allow the sets to be switched via a digital input, serial communications or from the keypad for night setback, summer/winter setpoints, etc. There shall be an independent, second PID loop that can utilize the second analog input and modulate one of the analog outputs to maintain setpoint of an independent process (i.e. valves, dampers, etc.). All setpoints, process variables, etc. to be accessible from the serial communication network. The setpoints shall be set in Engineering units and not require a percentage of the transducer input. Allows complete control of a system or process.
4. The VFD shall include a fireman's override input. Upon receipt of a contact closure from the fireman's control station, the VFD shall operate at an adjustable preset speed. The mode shall override all other inputs (analog/digital, serial communication, and all keypad commands) and force the motor to run at the adjustable, preset speed. "Override Mode" shall be displayed on the keypad. Upon removal of the override signal, the VFD shall resume normal operation.
5. Serial Communications
 - a. The VFD shall have an RS-485 port as standard. The standard protocols shall be Modbus, Johnson Controls N2 bus, and Siemens Building Technologies FLN. Optional protocols for LonWorks, BACnet, Profibus, Ethernet, and DeviceNet shall be available. Each individual drive shall have the protocol in the base VFD. The use of third party gateways and multiplexers is not acceptable. All protocols shall be "certified" by the governing authority. Use of non-certified protocols is not allowed. If a gateway must be used, each drive must have its own gateway in order to prevent the entire drive system from dropping off line.
 - b. Serial communication capabilities shall include, but not be limited to; run-stop control, speed set adjustment, proportional/integral/derivative PID control adjustments, current limit, accel/decel time adjustments, and lock and unlock the keypad. The drive shall have the capability of allowing the DDC to monitor feedback such as process variable feedback, output speed / frequency, current (in amps), % torque, power (kW), kilowatt hours (resettable), operating hours (resettable), and drive temperature. The DDC shall also be capable of monitoring the VFD relay output status, digital input status, and all analog input and analog output values. All diagnostic warning and fault information shall be transmitted over the serial communications bus. Remote VFD fault reset shall be possible. The following additional status indications and settings shall be transmitted over the serial communications bus – keypad "Hand" or "Auto" selected, bypass selected, the ability to change the PID setpoint, and the ability to force the unit to bypass (if bypass is specified). The DDC system shall also be able to monitor if the motor is running in the VFD mode or bypass mode (if bypass is specified) over serial communications. A minimum of 15 field parameters shall be capable of being monitored.
 - c. The VFD shall allow the DDC to control the drive's digital and analog outputs via the serial interface. This control shall be independent of any VFD function. For example, the analog outputs may be used for modulating chilled water valves or cooling tower bypass valves. The drive's digital (relay) outputs may be used to actuate a damper, open a valve or control any other device that requires a maintained contact for operation. In addition, all of the drive's digital and analog inputs shall be capable of being monitored by the DDC system.

MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

- d. The VFD shall include an independent PID loop for customer use. The independent PID loop may be used for cooling tower bypass value control, chilled water value control, etc. Both the VFD control PID loop and the independent PID loop shall continue functioning even if the serial communications connection is lost. The VFD shall keep the last good set-point command and last good DO & AO commands in memory in the event the serial communications connection is lost.
- 6. EMI / RFI filters. All VFD's shall include EMI/RFI filters. The onboard filters shall allow the VFD assembly to be CE Marked and the VFD shall meet product standard EN 61800-3 for the First Environment restricted level. Complies with 1st Environment and exceeds FCC guidelines with motor cables less than 100 feet (30 meters)
- 7. All VFD's through 50HP shall be protected from input and output power mis-wiring. The VFD shall sense this condition and display an alarm on the keypad. Prevents damage to the VFD when the electrical contractor wires the input power to motor terminals.
- 8. OPTIONAL FEATURES – Optional features to be furnished and mounted by the drive manufacturer. All optional features shall be UL Listed by the drive manufacturer as a complete assembly and carry a UL508 label.
 - a. Door interlocked, padlockable circuit breaker that will disconnect all input power from the drive and all internally mounted options.
 - b. Fused VFD only disconnect (service switch). Fast acting fuses exclusive to the VFD – fast acting fuses allow the VFD to disconnect from the line prior to clearing upstream branch circuit protection, maintaining bypass capability. Bypass designs, which have no such fuses, or that incorporate fuses common to both the VFD and the bypass will not be accepted. Three contactor bypass schemes are not acceptable.
 - c. The drive / bypass shall provide single-phase motor protection in both the VFD and bypass modes.
 - d. The following operators shall be provided:
 - 1) Bypass Hand-Off-Auto
 - 2) Drive mode selector
 - 3) Bypass mode selector
 - 4) Bypass fault reset
 - e. The following indicating lights (LED type) shall be provided. A test mode or push to test feature shall be provided.
 - 1) Power-on (Ready)
 - 2) Run enable (safeties) open
 - 3) Drive mode select damper opening
 - 4) Bypass mode selected
 - 5) Drive running
 - 6) Bypass running
 - 7) Drive fault and bypass fault
 - 8) Bypass H-O-A mode
 - 9) Automatic transfer to bypass selected
 - 10) Safety open
 - 11) Damper opening
 - 12) Damper end-switch made
 - f. The following relay (form C) outputs from the bypass shall be provided:
 - 1) System started
 - 2) System running
 - 3) Bypass override enabled
 - 4) Drive fault
 - 5) Bypass fault (motor overload or underload (broken belt))
 - 6) Bypass H-O-A position
 - g. The digital inputs for the system shall accept 24V or 115VAC (selectable). The bypass shall incorporate internally sourced power supply and not require an external control power source.

MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

- h. Customer Interlock Terminal Strip – provide a separate terminal strip for connection of freeze, fire, smoke contacts, and external start command. All external safety interlocks shall remain fully functional whether the system is in Hand, Auto, or Bypass modes (not functional in Fireman's Override 2). The remote start/stop contact shall operate in VFD and bypass modes.
- i. Dedicated digital input that will transfer motor from VFD mode to bypass mode upon dry contact closure for fireman's override. Two modes of operation are required.
 - 1) One mode forces the motor to bypass operation and overrides both the VFD and bypass H-O-A switches and forces the motor to operate across the line (test mode). The system will only respond to the digital inputs and motor protections.
 - 2) The second fireman's override mode remains as above, but will also defeat the overload and single-phase protection for bypass and ignore all keypad and digital inputs to the system (run until destruction).
- j. The VFD shall include a "run permissive circuit" that will provide a normally open contact whenever a run command is provided (local or remote start command in VFD or bypass mode). The VFD system (VFD or bypass) shall not operate the motor until it receives a dry contact closure from a damper or valve end-switch. When the VFD system safety interlock (fire detector, freezestat, high static pressure switch, etc) opens, the motor shall coast to a stop and the run permissive contact shall open, closing the damper or valve.
- k. There shall be an internal switch to select manual or automatic bypass.
- l. There shall be an adjustable current sensing circuit for the bypass to provide loss of load indication (broken belt) when in the bypass mode.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Motors: Remove and replace existing motors in the air handling fans listed in the Mechanical Equipment Schedule on drawing sheet M1.00 ready for service.
- B. Variable Frequency Drives:
 - 1. Install the drive in accordance with the recommendations of the VFD manufacturer as outlined in the installation manual.
 - 2. Certified factory start-up shall be provided for each drive by a factory authorized service center. A certified start-up form shall be filled out for each drive with a copy provided to the owner, and a copy kept on file at the manufacturer.
 - 3. Perform harmonic measurements at the point where the utility feeds multiple loads (PCC) to verify compliance with the latest revision of IEEE519-1992. Provide a report of the voltage THD and current TDD for Engineer's review prior to substantial completion. Provide labor, materials, and protection as needed to access the test points. The readings shall be taken with all drives and other loads at full load, or as close to this as field conditions allow.

3.2 COMMISSIONING

- A. The equipment and systems referenced in this section are to be commissioned.
- B. The contractor has specific responsibilities for scheduling, coordination, startup, test development, testing and documentation. Coordinate all commissioning activities with the Commissioning Authority.

END OF SECTION

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT**PART 1 - GENERAL****1.1 SUMMARY**

- A. Work included: Providing of all required hangers and supports for ductwork, piping and equipment.

1.2 SUBMITTALS

- A. Provide submittals in accordance with Section 23 00 00.
- B. Submittals shall include:
 - 1. Manufacturer's technical literature for all products used indicating service for each type of hanger.
 - 2. Include proposed pre-manufactured duct vibration isolation products.
 - 3. Submit literature or describe duct-supporting method.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Caddy, Grinnell, Super Strut. Caddy used for selection.

2.2 DESCRIPTION

- A. Pipe Hangers:
 - 1. Insulated pipe: Figures 103 and 403.
 - 2. Non-insulated copper pipe: Figure 101.
 - 3. Riser clamp, copper pipe: Figure 520.
- B. Structural Attachments: Provide all necessary structural attachments such as concrete anchors, beam clamps, hanger flanges and brackets. Hangers shall not be suspended from other piping, equipment, etc.
- C. Miscellaneous items such as hanger rod, rod couplings, turnbuckles, etc. shall be standard figure numbers of the same manufacturer as the attachments.
- D. All-thread rod used for pipe supports to be no less than 3/8-inch diameter.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Powder-actuated tools or devices are not acceptable for use at any school site.
- B. Provide hangers and supports in accordance with the instructions furnished by the manufacturers of these devices. Support ductwork as required by the OMSC and per SMACNA recommendations.
- C. Provide additional structural members where required to support piping or ductwork.
- D. Provide hangers and support devices in accordance with the equipment manufacturer's instructions for all equipment.
- E. Anchorage to Floors, Roofs, Etc., Sway Bracing and Seismic Restraints:
 - 1. The contractor is responsible to determine the means and methods of equipment installation and support.

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

2. Provide supports for all apparatus as specified, detailed, as required by the manufacturers of specific equipment and the project governing code authorities. Anchor all roof and base/floor mounted equipment with size and spacing of anchor bolts or other attachment means as recommended by the respective equipment manufacturer.
3. Provide seismic restraints on all mechanical equipment in conformance with applicable OSSC sections. Costs for seismic calculations are to be included in the bid price.
4. Provide deferred submittals directly to the governing code jurisdiction for anchorage to floors, roofs, etc., sway bracing and seismic restraints. Submittals to show locations and sufficient support details as required by the governing code jurisdiction.
5. Provide supplementary drawings and calculations as required by governing code jurisdictions noting seismic support data/calculations as required for permit purposes.

3.2 COMMISSIONING

- A. The equipment and systems referenced in this section are to be commissioned.
- B. The contractor has specific responsibilities for scheduling, coordination, startup, test development, testing and documentation. Coordinate all commissioning activities with the Commissioning Authority.

END OF SECTION

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Work included: Providing of required identification systems for HVAC equipment as noted below.

1.2 SUBMITTALS

- A. Provide submittals in accordance with Section 23 00 00.
- B. Submittals shall include list of proposed equipment tags.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. W. H. Brady Co. or Seton.

2.2 DESCRIPTION

- A. The presence of above ceiling equipment items shall be marked using self-adhesive tape markers affixed to the ceiling grid. The markers shall indicate equipment category and equipment number.
- B. Provide self-adhesive tape markers for space temperature sensors indicating corresponding HVAC system.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Attach ceiling and sensor markers to the ceiling grid noting access locations of equipment mounted above the ceiling.
- B. Attach sensor markers to the devices in an easily noted location.

3.2 COMMISSIONING

- A. The equipment and systems referenced in this section are to be commissioned.
- B. The contractor has specific responsibilities for scheduling, coordination, startup, test development, testing and documentation. Coordinate all commissioning activities with the Commissioning Authority.

END OF SECTION

TESTING, ADJUSTING AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

- A Work Included: Providing system balance work as specified.

1.2 OPERATION AND MAINTENANCE DATA

- A. Provide O&M data in accordance with Section 23 00 00.
- B. O&M data shall include copies of system balance data.

1.3 QUALITY ASSURANCE

- A. Contract with American Commissioning Consultants, Inc., Neudorfer Engineers Inc., Accurate Balancing Agency Inc., Air Balancing Specialty Inc., Precision Test and Balance Inc., Northwest Engineering Service, Inc., Smarttab, LLC or approved equal to perform the system balance work on this project.
- B. Conduct the systems balance work in accordance with standard procedures and recognized practices outlined by ASHRAE and SMACNA.
- C. Test and balance to be performed by an independent contractor specializing in HVAC systems test and balance.
- D. Balance company to be certified by NEBB or AABC and have 3-years experience of work in the Portland Metro area.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 GENERAL

- A. Verify new or clean filter installation in filter assembly before the start of testing and balancing.
- B. Record all actual equipment nameplate and operating data at the site.
- C. Provide ladders, scaffolding, and access to each system for proper testing and balancing.

3.2 PRECONSTRUCTION SYSTEMS TESTING

- A. Coordinate with the controls contractor to operate the systems as required during the systems preconstruction testing.
- B. Air Handling Units – ASU-1, ASU-2, SF-1/RF-1, SF-2, SF-4.
 - 1. Prior to demolition, measure the total existing supply and return (as applicable) air volumes in the fan / air handling unit systems noted in the Mechanical Equipment Schedule on drawing sheet M1.00.
 - 2. Prior to demolition, measure the total existing minimum outside air volume and mark the minimum outside air damper locations adequately to return the outside air volumes to the same value after project completion.

TESTING, ADJUSTING AND BALANCING FOR HVAC

- C. Air Handling Unit SF-5/RF-3: Prior to demolition, measure the total existing minimum outside air volume and mark the minimum outside air damper locations adequately to return the outside air volumes to the same value after project completion.
- D. Terminal Units.
 - 1. Prior to demolition, measure the existing maximum cooling and heating air volumes for the individual terminal units in the Terminal Unit Schedule on drawing sheet M1.00.
- E. Furnish the air handling unit data and terminal unit data to the district project manager prior for review prior to the air handling systems revisions.

3.3 FINAL SYSTEMS TESTING AND BALANCING

- A. Coordinate with the controls contractor to operate the systems as required during the systems balancing.
- B. Air Handling Units - ASU-1, ASU-2, SF-1/RF-1, SF-2, SF-4, SF-5/RF-3.
 - 1. Assure that air filters are clean, if not new, prior to beginning air balance work.
 - 2. Adjust fan speed as required for air volumes to match preconstruction volumes. Speed shall be set to the minimum to provide required air volume at furthest run without excessive static pressure.
 - 3. Adjust minimum outside air volume to the prebalance conditions.
 - 4. Include the following in the logs:
 - a. Supply, return and outside air volumes.
 - b. Supply air temperatures on full heating, cooling (as applicable) and full outside air.
 - c. Static pressure drops across fan, filters and coil.
 - d. Total pressure drops for supply and return system.
 - e. Fan speed or RPM.
 - f. Actual motor voltage, amperage, RPM and overload heater sizes.
- C. Terminal Units:
 - 1. Calibrate the new terminal units per the manufacturer's installation instructions and the direct digital controls system requirements.
 - 2. Adjust cooling (maximum) and heating (minimum) air volumes to values recorded during the preconstruction testing / Terminal Unit Schedule volumes.
 - 3. Include the heating / cooling air volumes and air pressure drops at scheduled maximum (cooling) volumes in the test and balance log.

3.4 COMMISSIONING

- A. The equipment and systems referenced in this section are to be commissioned.
- B. The contractor has specific responsibilities for scheduling, coordination, startup, test development, testing and documentation. Coordinate all commissioning activities with the Commissioning Authority.

END OF SECTION

HVAC INSULATION**PART 1 - GENERAL****1.1 SUMMARY**

- A. Work included:
 - 1. Providing of all required insulation for ductwork and piping.
 - 2. Notify the district representative prior to covering completed piping and duct systems - All piping and ductwork to be reviewed by the district representative, engineer or authorized representative prior to installation of insulation.

1.2 SUBMITTALS

- A. Provide submittals in accordance with Section 23 00 00.
- B. Submittals shall include:
 - 1. Data to show compliance with flame and smoke rating.
 - 2. Manufacturer's catalog or technical data showing performance, dimensions, materials of construction and recommended methods of installation.

1.3 QUALITY ASSURANCE

- A. Insulation materials and accessories such as adhesives, cement, etc. shall have composite fire and smoke hazard ratings, as tested by procedures indicated in NFPA 255 and U.L. 723, not to exceed a flame spread index of 25 and a smoke developed index of 50. Products or their shipping cartons shall have identification of the flame spread and smoke developed index.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Manville, Knauf, Owens-Corning, Certain-teed, or approved equal. Schuller used as basis of selection.
- B. Elastomeric Insulation Products: Armacell, Rubatex, K-Flex or approved equal.

2.2 DESCRIPTION

- A. External Duct Insulation: Manville Microlite EQ FSK formaldehyde free, fiberglass duct insulation with FSKL jacket, 0.75 lb./cu. ft. Minimum installed R-value = 2.8 / inch.
- B. Duct Lining: Manville Linacoustic 1.5-3.0 lb./cu. ft. made of glass fibers bonded with a thermosetting resin with a "Permacote" coating proving added durability and microbial growth protection. Minimum installed R-value = 4.2 / inch. No fibrous material is to be exposed to the airstream.
- C. Minimum installed R-value (external insulation and lining):
 - 1. General Service (within Building Envelope) - R = Minimum 5.
 - 2. Unconditioned Spaces - R = Minimum 8.
 - 3. Outside Building / Vented Attic Space - R = Minimum 8.
- D. Hot Water Pipe Insulation:
 - 1. Manville Micro-Lok HP rigid pre-formed fiberglass.
 - 2. Maximum conductivity (k) = 0.27 Btu per inch/hour * ft² * degree-F.
 - 3. Pipe fittings: Zeston 2000 premolded PVC covers with fiberglass blanket insulation.
 - 4. Foam filled elbows are not acceptable.

HVAC INSULATION**PART 3 - EXECUTION****3.1 INSTALLATION**

- A. Ductwork Insulation / Lining Application.
 - 1. Rectangular supply and return air ductwork within 7 feet of a gas furnace – Internally lined.
 - 2. Rectangular and round supply / return air ductwork except as noted above - Externally insulated or internally lined.
 - 3. Outside air ductwork in mechanical rooms / mezzanines – Internally lined.
- B. Ductwork Interior Lining Application.
 - 1. General Requirements: Apply internal insulation in accordance with manufacturer's recommendations and SMACNA "Duct Liner Application Standard." Apply internal insulation to flat sheet metal with continuous coverage of adhesive.
 - 2. Use adhesive on all butt edges. Install weld pins and clips on internal insulation 15" on center and no more than 2" maximum from any cut or exposed edge.
 - 3. Coat all raw duct liner edges within the ductwork. No uncoated fiberglass is allowed within the ductwork.
 - 4. Weld pins spaced maximum of 15 inch on center in both directions and within 2 inches of corners and joints. Weld pins flush with liner surface.
 - 5. Complete duct surface coated with adhesive and insulation pressed tightly thereto.
 - 6. Provide edges at terminal points with metal beading and heavily coated with adhesive.
 - 7. Heavily coat joints and corners with adhesive.
 - 8. Damaged areas replaced or heavily coated with adhesive.
 - 9. Duct dimensions shown are net inside dimension.
- C. Heating Hot Water Pipe Insulation.
 - 1. 1-1/2 inch and smaller: Provide 1-1/2 inch pipe insulation on hot water supply and return piping.
 - 2. Larger than 1-1/2 inch: Provide 2-inch pipe insulation on hot water supply and return piping.
 - 3. Insulate fittings on piping utilizing preformed pipe covering.
 - 4. Insulate all valve bodies, fittings, unions, flanges and equipment with insulation equal to the attached service piping.
 - 5. Seal all insulation to maintain a vapor barrier.

3.2 COMMISSIONING

- A. The equipment and systems referenced in this section are to be commissioned.
- B. The contractor has specific responsibilities for scheduling, coordination, startup, test development, testing and documentation. Coordinate all commissioning activities with the Commissioning Authority.

END OF SECTION

COMMISSIONING FOR HVAC

SECTION 23 08 00 – COMMISSIONING FOR HVAC

PART 1 - GENERAL

1.1 PURPOSE

- A. This Section includes the general requirements that apply to the implementation of the commissioning process.
- B. Commissioning is a systematic process that provides documented confirmation that the building systems perform according to the criteria set forth in the design intent defined in the Basis of Design and satisfy the operational needs defined in the Owner's Project Requirements.
- C. Commissioning during the construction phase is intended to achieve the following specific objectives:
 - 1. Verify that applicable equipment and systems are installed according to the manufacturer's recommendations and to industry accepted minimum standards and that they receive adequate operational checkout by the installing contractors.
 - 2. Verify and document proper performance of equipment and systems.
 - 3. Verify that O&M documentation left on site is complete.
 - 4. Verify that the Owner's operating personnel are adequately trained.

1.2 ABBREVIATIONS

A/E-	Architect and design engineers	GC-	General contractor (prime)
CxA-	Commissioning authority	MC-	Mechanical contractor
CC-	Controls contractor	OR-	Owner's Representative
CM-	Construction Manager	PFC-	Pre-functional checklist
Cx-	Commissioning	PM-	Project manager (of the Owner)
EC-	Electrical contractor	Subs-	Subcontractors to General

COMMISSIONING FOR HVAC

FTP- Functional Test Procedure

TAB- Test and balance contractor

1.3 DEFINITIONS

- A. Owner's Project Requirements (OPR): A document that details the functional requirements of a project and the expectations of how it will be used and operated. These include Project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.
- B. Basis of Design (BOD) Basis of Design: A document that records concepts, calculations, decisions, and product selections used to meet the OPR and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.
- C. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process as dictated by the Commissioning Specification.
- D. Pre-Functional Checklist (PFC): A list of items to inspect and elementary component tests to conduct to verify proper installation of equipment, provided by the CxA to the contractors. Pre-functional checklists are primarily static inspections and procedures to prepare the equipment or system for initial operation (e.g., belt tension, oil levels OK, labels affixed, gages in place, sensors calibrated, etc.). However, some pre-functional checklist items entail simple testing of the function of a component, a piece of equipment or system (such as measuring the voltage imbalance on a three-phase pump motor of a chiller system). The word pre-functional refers to before functional testing. Pre-functional checklists augment and are combined with the manufacturer's start-up checklist. Even without a commissioning process, contractors typically perform some, if not many, of the pre-functional checklist items a commissioning authority will recommend. However, few contractors document in writing the execution of these checklist items. Therefore, for most equipment, the contractors execute the checklists on their own. The commissioning authority only requires that the procedures be documented in writing and does not witness much of the pre-functional checklist completion, except for larger or more critical pieces of equipment.
- E. Sampling: Functionally testing only a fraction of the total number of identical or near identical pieces of equipment.

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- F. Functional Test Procedure (FTP): Test of the dynamic function and operation of equipment and systems using manual (direct observation) or monitoring methods. Functional testing is the dynamic testing of systems (rather than just components) under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure setpoint). Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc. The systems are run through all the control system's sequences of operation and components are verified to be responding as the sequences state. Traditional air or water test and balancing (TAB) is not functional testing, in the commissioning sense of the word. TAB's primary work is setting up the system flows and pressures as specified, while functional testing is verifying that which has already been set up. The commissioning authority develops the functional test procedures in a sequential written form, coordinates, oversees and documents the actual testing, which is usually performed by the installing contractor or vendor. FTPs are performed after pre-functional checklists and startup are complete.
- G. Issue Log (IL): A formal and ongoing record of problems or concerns – and their resolution – that has been raised by members of the Commissioning Team during the course of the Commissioning Process.

1.4 RESPONSIBILITIES

- A. Owner & Owner Representatives
1. Arrange for facility operating and maintenance personnel to attend various field commissioning activities and field training sessions.
 2. Provide final approval for the completion of the commissioning work.
 3. Ensure that any seasonal or deferred testing and any deficiency issues are addressed.
 4. Attend commissioning kickoff meetings and additional meetings as necessary.
- B. Commissioning Authority
1. The primary role of the CxA is to ensure that the commissioned systems meet the owner's project requirements and function according to the design intent. The CxA is not responsible for design concept, design criteria, compliance with codes, design or general construction scheduling, cost estimating, or construction management. The CxA may assist with problem-solving non-conformance or deficiencies, but ultimately that responsibility resides with the general contractor and the A/E.

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- a. Coordinates and directs the commissioning activities
- b. Coordinate and attend commissioning team meetings held on a periodic basis. Create a meeting agenda for distribution prior to the meeting and document the meetings minutes.
- c. Develops and updates the following commissioning documentation as necessary:
 - 1) Commissioning Plan
 - 2) Pre-functional Checklists (PFC)
 - 3) Commissioning Site Observation Reports
 - 4) Functional Test Procedures (FTP)
 - 5) Completed Functional Test Procedure (FTP) - as witnessed
 - 6) Issue Log (IL)
 - 7) Commissioning Report
- d. Reviews and provides input on the following commissioning documentation:
 - 1) Commissioning Schedule
 - 2) Commissioning Agenda and Meeting Minutes
 - 3) Equipment and Control Submittal related to commissioned systems
 - 4) Completed Pre-functional Checklists (PFC)
 - 5) Start-up Reports
 - 6) Operation and Maintenance Manuals related to commissioned systems
 - 7) Attend commissioning Kickoff meeting and other commissioning meetings.
- e. Perform site visits, as necessary, to observe component and system installations.
- f. Direct and witness functional testing as conducted by installing contractors.
- g. Analyze functional test procedures, trend logs and monitoring data to verify satisfactory operation.
- h. Tab verification as described in section 3.9 below.
- i. Deferred Testing coordination
- j. Review the Systems Manual documents created by the Contractor and compile into a final Systems Manual.

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1. The EOR shall participate in and perform commissioning process activities including, but not limited to, the following:
 - a. Attend the commissioning kickoff meeting and selected commissioning team meetings.
 - b. Provide a Basis of Design.
 - c. Participate in the resolution of system deficiencies identified during commissioning.
 - d. Participate in the resolution of design non-conformance and design deficiencies identified during Functional testing and warranty-period commissioning.

D. General Contractor

1. Contractor shall assign a representative with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to, the following:
 - a. Designate a Commissioning coordinator.
 - b. Ensure and coordinate the participation of the subcontractors in the Commissioning process.
 - c. Track completion of equipment start up and forward start up reports generated by contractor to CxA at least 7 days prior to functional testing.
 - d. Track completion of test and balance and forward test and balance report generated by contractor to CxA at least 7 days prior to the functional testing.
 - e. Coordinate the completion of the Pre-functional checklists (PFC) by the Discipline Specific Contractors and submit completed forms to the CxA for approval.
 - f. Review and accept commissioning process test procedures provided by the CxA.
 - g. Coordinate all necessary parties for scheduled functional testing.
 - h. Coordinate access to all commissioned system components as necessary for CxA to witness functional test procedures.

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- i. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
- j. Review and follow procedures outlined in the Commissioning Plan.
- k. Track completion of resolution of issues recorded in the Issue Log. Coordinate installing contractor's responses and updates to Issue Log.
- l. Integrate and coordinate commissioning process activities with commissioning schedule based upon the construction schedule. Identify other activities that may impede the commissioning process (air barrier testing, TAB, fire alarm testing, etc.)
- m. Coordinate the training of Owner personnel and provide the times and dates of training to the CxA. Provide training agendas prior to training and evaluation forms completed by training participants to the CxA.
- n. Deferred Testing participation

E. Subcontractors

- 1. Subcontractor shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to, the following:
 - a. Attend commissioning kickoff meetings and additional meetings as necessary.
 - b. Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the Owner to keep warranties in force.
 - c. Complete their related sections on the Pre-functional Checklists (PFC).
 - d. Perform the test procedures laid out in the Functional Test Procedures (FTP) for pretesting prior to final testing witness by the CxA.
 - e. Perform the test procedures laid out in the Functional Test Procedures (FTP) for witness by the CxA.
 - f. Review and follow procedures outlined in the Commissioning Plan.
 - g. Provide requested graphical trends to the CxA for demonstration of system performance and incorporation into the CxA documentation.
 - h. Include all special tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment according to these

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Contract Documents in the base bid price to the Contractor, except for stand-alone data logging equipment that may be used by the CxA.

- i. Provide information requested by CxA regarding equipment sequence of operation and testing procedures.
- j. Review test procedures for equipment installed by factory representatives.
- k. Deferred Testing participation

F. Equipment Supplier

- 1. The equipment suppliers shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to, the following:
 - a. Assist in equipment testing per agreements with Subs.
 - b. Provide information requested by CxA regarding equipment sequence of operation and testing procedures.
 - c. Review test procedures for equipment installed by factory representatives.
 - d. Attend commissioning kickoff meetings and additional meetings as necessary.

1.5 SYSTEMS TO BE COMMISSIONED

Category	Systems/Equipment
HVAC	Central Air Handling Units
	Variable Frequency Drives
	Supply Fans
	Exhaust/Return Fans
	VAV Boxes
	CO2 Sensors
	Hot Water Convectors

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Category	Systems/Equipment
	Electric Convectors
	Electric Baseboards
	Electric Wall Heaters
	Cabinet Unit Heater
Control Sequences	Economizer
	Equipment Scheduling
	Optimal Start Tuning
	Outside Air Damper Control During Unoccupied Modes
	Demand Controlled Ventilation

1.6 CODES AND STANDARDS

- A. 2019 Oregon Energy Code
- B. BCA guidelines
- C. ASHRAE commissioning guidelines
- D. ACG guidelines

COMMISSIONING FOR HVAC**PART 2 - PRODUCTS****2.1 TEST EQUIPMENT**

- A. All standard testing equipment required to perform startup and initial checkout and required functional test procedures shall be provided by the Contractor. Two-way radios shall be provided by the Contractor when necessary.
- B. Special equipment, tools, test gas, and instruments required for testing equipment shall be provided by the Contractor.
- C. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 0.5°F and a resolution of $\pm 0.1^\circ\text{F}$. Pressure sensors shall have an accuracy of $\pm 2.0\%$ of the value range being measured (not full range of meter) and have been calibrated within the last year. All equipment shall be calibrated according to the manufacturer's recommended intervals and when dropped or damaged. Calibration tags shall be affixed or certificates readily available.

PART 3 - EXECUTION**3.1 COMMISSIONING TEAM:**

- A. The members of the commissioning team consist of the Commissioning authority (CxA), the Owner's Representative (OR), the designated representative of the owner's Construction Management firm (CM), the General Contractor commissioning coordinator (GC), the architect and design engineers (AE & EOR), the designated representative of the Mechanical Contractor (MC), the designated representative of the Electrical Contractor (EC), the TAB representative, the designated representative of the Controls Contractor (CC), any other installing discipline contractors or suppliers of equipment. If known, the Owner's building or plant operator/engineer is also a member of the commissioning team.

3.2 COMMISSIONING PLAN:

- A. The CxA will develop the commissioning plan with review and input from the rest of the Commissioning Team.

COMMISSIONING FOR HVAC**3.3 COMMISSIONING KICK OFF MEETING:**

- A. An initial kick off meeting organized by the General Contractor Commissioning Coordinator (GC) and facilitated by the Commissioning Authority (CxA) during construction where the commissioning process is reviewed with the project commissioning team members.

3.4 COMMISSIONING SCHEDULE:

- A. The GC will be required to maintain a commissioning schedule that is updated periodically during the commissioning process and is presented and discussed at the commissioning meetings.
- B. Include the following typical types of milestone and predecessors:
 - 1. Utilities Available
 - 2. System Readiness (by system)
 - a. Utilities available to equipment (water, power, gas)
 - b. Equipment Startup
 - c. Controls Point to Point
 - d. Test and Balancing
 - e. Functional Test Procedures
 - 3. Conflicting construction activities (preventing Cx activities), some examples as follows:
 - a. Fire alarm testing
 - b. Air barrier testing
 - c. Air quality measuring
- C. The schedule shall be submitted to the CxA for review and discussion during the Commissioning Meetings.

3.5 COMMISSIONING MEETINGS:

- A. Periodic meeting held during construction organized and managed by the GC to plan, scope, coordinate, and schedule future activities and resolve problems with the commissioning team members.

COMMISSIONING FOR HVAC**3.6 SUBMITTALS:**

- A. Equipment documentation shall be submitted to the CxA from the GC to detail startup procedures.

3.7 STARTUPS:

- A. The CxA may be required to witness startup of selected equipment identified in the Commissioning Plan. Scheduling of these startups shall be incorporated into the Commissioning Schedule.

3.8 PRE-FUNCTIONAL CHECKLIST (PFC):

- A. The CxA will develop the PFCs with review and input from the Commissioning Team. After equipment is installed, the PFCs shall be filled out by the EC, MC, and the CC. The GC shall verify the completion of the forms prior to submitting them to the CxA. The submission of the PFC is an indication that the equipment is ready to begin functional Test Procedures (FTP).
- B. Only field individuals that have direct knowledge and witnessed that a line item task on the PFC was actually performed shall initial or check that item.

3.9 TEST DOCUMENTATION:

- A. TAB report:
 - 1. Prior to functional testing, certified and approved TAB report shall be submitted to the CxA for review.
 - 2. The CxA may verify the TAB report for verification equipment performance. At the request of the CxA, the contractor will be available on the jobsite and with the same portable measurement instrument used during balancing, start-up and to verify 10% of the report values in the field.
- B. DDC point to point (For BAS, FMS, EPMS)
 - 1. CC shall submit a point to point checkout report that verifies all the end to end device conditions. Checkout report shall verify all installation of end device, wiring between device and controller and controller software is configured correctly reflected in the software.

COMMISSIONING FOR HVAC**3.10 SITE OBSERVATIONS:**

- A. The CxA will periodically perform site visits, as necessary, to observe component and system installations. Deficiencies will be identified in the Issue Log and discussed at Commissioning Meetings.

3.11 FUNCTIONAL TEST PROCEDURES (FTPS):

- A. The CxA develops the FTPs based upon the sequence of operations laid out in the contract documents and approved control submittal and with review and input from the rest of the Commissioning Team.
- B. It is important that the GC, EC, MC, and CC review the FTPs for consistency with the current contract document requirements. Lack of coordination on the FTP may result in retesting and delay the commissioning process.
- C. Once the PFCs have been completed, the GC shall schedule testing with the CxA and Owner at least 7 days in advanced.
- D. The GC shall ensure that the systems have been pretested by the installing contractor according to the approved FTP to ensure that systems are operating properly and to avoid retesting.

3.12 SAMPLING

- A. Where there are multiple pieces (25 or more) of equipment of the same type such as VAV Terminal Units, Fan Coils, Exhaust Fans, etc. statistically significant sample testing may be performed. Of the sample, for every failed test, another will be added.
- B. When sampling is conducted a random spot check is required with sufficient sample size to provide reasonable confidence that the sampled results represent the entire population of units. The commissioning process will establish that critical equipment and systems perform properly when the building is turned over to the owner.

3.13 NON-CONFORMANCE.

- A. The CxA will record the results of the functional test on the procedure or test form. All deficiencies or non-conformance issues shall be identified on the IL.

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- B. Corrections of minor deficiencies identified may be made during the tests at the discretion of the CxA. In such cases the deficiency and resolution will be documented on the procedure form.
- C. Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures.

3.14 RETESTING:

- A. If a functional test procedure has been unable to be satisfactorily completed, it will need to be retested.
- B. Once the non-conformance has been resolved, the GC shall schedule test witnessing with the CxA and Owner at least 7 days in advanced.
- C. Cost of Retesting.
 - 1. The CxA shall include in the base contract one (1) re-test per system. Should the re-test fail, as determined by the CxA, additional testing will be recommended beyond that included in the base contract in order to consider the system completely commissioned. This additional testing will result in additional time onsite and shall be billed hourly based upon the CxA standard hourly rates and these costs will be borne by the General Contractor. The CxA will require that the responsible contractor confirm in writing that all failed systems have been re-assessed and will be ready for testing prior to commencement of re-test.
 - 2. The cost for the subcontractor to retest a prefunctional or functional test, if they are responsible for the deficiency, shall be theirs. If they are not responsible, any cost recovery for retesting costs shall be negotiated with the GC.
 - 3. The time for the CxA to direct any retesting required because a specific *prefunctional* checklist or start-up test item, reported to have been successfully completed, but determined during functional testing to be deficient, may be charged by the Owner to the GC.

3.15 DEFERRED TESTING

- A. Unforeseen Deferred Tests occur if any check or test cannot be completed due to the building structure, required occupancy condition or other deficiency, execution of checklists and functional testing may be delayed upon approval of the OR. These tests will be

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conducted in the same manner as the seasonal tests as soon as possible. Services of necessary parties will be negotiated.

- B. Seasonal Testing occur if any testing is delayed until the weather conditions are closer to the system's design. During the warranty period, seasonal testing shall be completed as part of this contract. The CxA shall coordinate this activity. Tests will be executed, documented and deficiencies corrected by the appropriate Subs, with facilities staff and the CxA witnessing. Any final adjustments to the O&M manuals and as-builds due to the testing will be made.

END OF SECTION

INSTRUMENTATION AND CONTROL FOR HVAC**PART 1 - GENERAL****1.1 SCOPE DESCRIPTION**

- A. The controls portion of this project is design build based on the project drawings and specifications.
 - 1. Coordinate with the school district project manager to visit the site to become familiar with the existing building conditions and project requirements.
 - 2. Design conduit / cable routing to minimize exposed portions of the systems. Coordinate all exposed conduit / cabling with the district project manager prior to installation.
 - 3. Retain sub-contractors as required to restore exposed building elements – Walls, ceilings, floors to preconstruction condition after project alterations.
- B. Governmental funding sources (SB 1149) requiring cost tracking / documentation will be used to fund portions of this project Coordinate and document project construction costs as noted in specification section 23 00 00, H.
- C. Furnish and install all control hardware and software necessary for a complete DDC control system revision as specified and noted on the drawings.
 - 1. All pneumatic devices are to be removed and replaced as required with DDC control devices.
 - 2. All pneumatically controlled equipment will be converted to DDC control during this project.
 - 3. No pneumatic devices with the exception of control tubing located behind walls or inaccessible ceiling areas are to remain after construction.
 - 4. Cap all pneumatic tubing entering walls and inaccessible ceiling areas behind the architectural element and patch to match the existing wall / ceiling.
- D. Furnish all modules, temperature sensors, flow sensors, control valves, control valve actuators, damper actuators and any other items necessary for a complete system and sequence of control.
 - 1. Coordinate the installation of temperature sensors, dampers and actuators to assure all work required for a complete system is included in the base bid.
 - 2. Add additional control devices not specifically noted in the contract documents required to perform the written sequence of operations. Include the price of these additional components in the base bid.
- E. The final installation will allow all school control components to be monitored / controlled at a single point by district personnel through the existing district interface.
- F. Establish communication to the new equipment through BACnet IP protocol via the MSTP controllers. Bring the system DDC points into the district server and integrate the system graphics to match Beaverton School District (BSD) standards.
- G. Provide cut and patch work as required to restore school architectural elements to existing conditions prior to project start. Include all wall / ceiling repair and paint.

1.2 QUALITY ASSURANCE

- A. Provide control work by a single company with licensed journeymen specialists in the type of work required, so that only one supplier is responsible for all control work for the project.
- B. Provide coordination with other contractors and subcontractors for work required by other trades for control work accomplishment.

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- A. In diagrams, show complete piping or ductwork system schematics with DDC, electrical and pneumatic control devices, tubing and wiring superimposed.
- B. Completely identify all control devices with manufacturer's type, number, and functional description.
- C. Uniquely identify all control tubing, wire and conduit on the drawings with a logical numbering system.
- D. Show all electric and hydronic connections of the control system to equipment furnished by others, complete to terminal points specifically identified with manufacturer's terminal designation.
- E. In booklet form, provide a bill of material and catalog data on all control device types, including control operation description, technical parameters and connection identifications. Describe the complete sequence of operation containing all information necessary for clarity and understanding of device function and system sequence of operation.
- F. Furnish a list of connected data points, including connected control unit and input device.
- G. In booklet form, provide catalog data on all description, technical parameters and connection identifications. Describe the complete sequence of operation containing all information necessary for clarity and understanding of device function and system sequence of operation.

1.4 OPERATING AND MAINTENANCE DATA:

- A. O&M Manuals in PDF format.
- B. Include a complete set of control Shop Drawings indicating as built and operating changes.
- C. Include operating and maintenance data on all equipment requiring periodic or incidental services or adjustment. Include a summary schedule for all maintenance tasks. Describe troubleshooting procedures for anticipated problems.
- D. Controls Systems Commissioning:
 - 1. Submit a complete, dated, and initialed record of all system adjustment for components of the control system.
 - 2. Indicate deviations from the specified temperatures, pressures, flows, setpoints, etc.
 - 3. Include a copy of the completed commissioning worksheets in each copy of the Operating and Maintenance Data.

PART 2 - PRODUCTS**2.1 ACCEPTABLE MANUFACTURERS AND SYSTEMS**

- A. Johnson controls by the local factory branch, Northwest Controls Company (NCC), or Automated Controls (Kirkland / Redmond, Washington).

2.2 CONTROL WIRING / COORDINATION WITH LINE VOLTAGE CONTROL

- A. Provide control wiring to all control modules, sensors and actuators required to provide the project sequences of operation.
- B. Provide control interface air handling units, unit ventilators and accessory equipment as required.
- C. All control wiring exposed in occupied areas to be in conduit. Coordinate exposed control wiring in normally occupied spaces with the school district project manager

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- D. Provide all control system related conduit within mechanical room or at equipment locations unless specifically shown to be in other divisions work.
- E. Control wiring in non-accessible ceilings, walls or floors shall be in conduit.
- F. All wiring not in conduit or control cabinets shall be rated for plenum installation.
- G. Provide conduit where required between the zone temperature sensor locations and the zone equipment. Provide all wiring / conduit in the base bid necessary for a complete operating control system.

2.3 AUTOMATION SYSTEM / DDC CONTROL DEVICES

- A. All control devices to be standard products of the specified control system and accessory devices utilized by the controls installer consistent with Beaverton School District standards.
- B. All sensors located in hallways, corridors, toilet rooms and other common spaces to have metal protective plates.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Single source responsibility of supplier shall be the complete installation and proper operation of the building automation system and control system and shall include debugging and proper calibration of each component in the entire system.
- B. Provide all controllers to accomplish the control sequences specified herein.
- C. Provide / coordinate the installation of; sensors, pipe wells, relays and any other devices and materials required to accomplish the functions described herein.
- D. Establish communication to the new equipment through BACnet IP protocol via the MSTP controllers. Bring the system DDC points into the district server and integrate the system graphics to match Beaverton School District (BSD) standards.
- E. Furnish all software, device installation, programming, technical assistance to the school district and product licenses required for complete operating control systems throughout the entire facility.
- F. All control identification points and HVAC systems graphics to conform to Beaverton School district naming standards – Verify with BSD project manager prior to initiation of programming and graphics development.
- G. Provide all temperature sensors, flow sensors, humidity sensors, IAQ sensors, control valves, control valve actuators, dampers, damper actuators, programming and other items necessary for a complete system and sequence of control for new equipment as identified in the contract drawings.
- H. All new equipment to have points as noted on Contract Drawings M1.00, M1.01 and M1.02.
- I. Program all control diagrams and sequences of operation into the system graphics to allow visual review of diagrams / sequence when viewing system programming.
- J. Furnishing and installing all control hardware and software necessary for a complete DDC control system as specified.
- K. Final installation will allow all school control components to be monitored / controlled at a single point by district personnel through a single user interface.

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- L. Coordinate the installation of automatic control valves, dry wells for fluid temperature sensors, dampers and actuators with the mechanical contractor to assure all work required for a complete system is included in the base bid.
- M. The Controls Contractor shall be responsible for field verification of site conditions and for gathering all necessary field data for all items to be provided under this contract prior to submitting his or her bid.
- N. Where work specified under other Sections of this Specification connects to equipment or systems that are listed and described in this Section, the Controls Contractor shall coordinate with other trades to provide proper connection(s) to such equipment.
- O. Identification - Provide nameplates identifying all switches, lights and starters, and each control device where the control function is not readily apparent.

3.2 SEQUENCES OF OPERATION

- A. Energy Management System Point Schedule: Provide monitoring and control functions as listed herein for each piece of equipment listed below. Provide a point list that includes each hard wired, calculated and/or resettable point.
- B. Distributed Control – The control system shall observe the concept of distributed control. Modules shall be located at each operating equipment location such that individual systems or zones shall remain functional without communication to other systems on the network.
- C. Energy Compliance:
 - 1. Provide 365 day, 24 hour occupancy scheduling.
 - 2. When controlling both heating and cooling (mechanical), provide a 5-degree deadband in which the heating energy provided to the zone is reduced to a minimum.
 - 3. Provide optimum start controls to enable a morning warm-up cycle capable of varying the unit start time to meet occupied setpoint at scheduled time of occupancy.
 - 4. Close outside air dampers as appropriate to the equipment when the units are off and during the warm-up period.
- D. General: Allow the setpoints referred to in the following sequences to be adjusted at the operator workstation (OWS) or at the local digital controller (DDC). If communication is lost to the DDC, default setpoints in the DDC are used for stand-alone control.
- E. ASU-1, ASU-2, Rooftop Heat Pump (EEM#5).
 - 1. Unoccupied:
 - a. Fans off, outside air, return air and exhaust air dampers (as applicable) indexed to full recirculation.
 - b. Heat Pump not enabled.
 - c. Electric convectors / wall heaters off.
 - d. Unoccupied Low Limit: When the space temperature drops below the night low limit set point (district standard), start the supply fan and enable the heat pump to full heating. Unit to heat until the space is 5-degrees above night low limit set point.
 - e. Roof relief vent damper is closed.
 - 2. Morning Warm-up.
 - a. The zone temperature is used to determine the amount of time needed to preheat the space to the occupied setpoint minus 1 degree F no more than 20 minutes prior to or 10 minutes after the scheduled occupied time.
 - b. The supply fan starts and runs continuously. The outside air damper closes and the return air damper opens. Reversing valve is positioned for heating. Stage on the heating.

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- c. The unit is indexed to occupied control at the scheduled start time. Disable the morning warm-up when the 3-hour rolling average outdoor air temperature, during unoccupied mode, is greater than setpoint (55 degrees F). If the morning warm-up is disabled, switch air handler to occupied mode 10 minutes prior to scheduled occupied time.
 - d. Index terminal units to heating volume.
 - e. Electric convectors / wall heaters enabled.
 - f. Based on the space temperature, the optimum start/stop function starts the air handling system and enables the convectors / wall heaters in warm-up mode so that the space temperature will reach set point at the scheduled occupancy time.
 - g. During warm-up the dampers will remain in full circulation and will cycle to appropriate ventilation mode control at occupancy time regardless of average zone temperature.
 - h. Roof relief vent damper is closed.
3. Occupied Mode.
- a. The supply fan starts and runs continuously.
 - b. Open the roof relief vent damper.
 - c. The occupied sequence of operations for the units shall consist of four separate control modes: heat pump heating, economizer cooling, heat pump cooling and ventilation.
 - d. The supply and return fans run continuously.
 - e. Heating Mode (Heat Pump):
 - 1) Modulate the supply fan VFD to the preset heating speed.
 - 2) Modulate the mixed air to the minimum position allowed by outside air setting and CO2 level, the heat pump shall operate according to the integral controls until the heating setpoint is attained.
 - 3) Modulate the terminal units to the preset heating position.
 - 4) On a continued call for heat enable the electric convectors / wall heaters to meet the heating setpoint.
 - f. Cooling Mode (Economizer cycle) - When the outdoor air is 4 degrees F (adjustable) less than the return air temperature, modulate the outside air damper between the minimum and full open position to maintain the space temperature setpoint.
 - 1) Modulate the supply fan VFD to the preset cooling speed.
 - 2) Modulate the terminal units to the preset cooling position.
 - 3) Actuators shall operate outside air and return dampers in accordance with system operating status, supply air, zone air temperatures, and outside air temperatures.
 - 4) Occupied: Modulate between minimum outside air position and 100% open to meet the cooling requirements of the zone being served.
 - g. Cooling Mode (Heat Pump): On a continued call for cooling, mixed air shall modulate to the minimum position allowed by outside air setting and CO2 level, the heat pump shall operate according to the integral controls until the cooling setpoint is attained.
4. Demand Control Ventilation Mode: The mixed air control shall modulate to control the following in the priority listed:
- a. Mixed air low limit set point (45 deg F)
 - b. CO2 high limit set point: Reset the outside air according to the following adjustable setpoints -
 - 1) 800-ppm CO2 and below - OSA at 5% maximum supply air volume.
 - 2) 1200-ppm CO2 maximum - OSA at 50% maximum supply air volume.
 - c. The mixed air set point shall be reset from (55) deg F at (70) deg F outside air to (65) deg F at (50) deg F based on an outside air temperature reset. If the outside air temperature is above the return air temperature the mixed air should be at minimum position as allowed by the minimum outside air setting and CO2 level.

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5. Safeties: The supply and return fan shall stop, the outside and exhaust air dampers shall close and control valves shall go to their normal position and an alarm shall be generated if any of the listed events occur:
 - a. Duct Smoke detector/fire alarm.
 - b. Low temperature alarm (freeze protection).
 - c. High temperature alarm.
 - d. Airflow Interlock Logic - Airflow must be proven in order to operate the compressor(s) and supplemental heat. Anytime flow is lost for more than 5-seconds, the controller will send the compressor and supplemental heat commands to 0.0 percent.
 6. Defrost Mode: Close outside air damper when unit is in defrost mode.
- F. SF-1, RF-1, Hot Water Convectors (EEM#3).
1. Unoccupied:
 - a. Fans off, outside air, return air and exhaust air dampers (as applicable) indexed to full recirculation.
 - b. Convectors hydronic valves closed,
 - c. Unoccupied Low Limit: When the space temperature drops below the night low limit set point (district standard), enable boiler operation and open the convector valves to full heating. Units to heat until the space is 5-degrees above night low limit set point.
 - d. Terminal units remain closed.
 - e. Subject to the boiler outside air lockout temperature (65), when there is a call for night low limit heating, the boiler system will be enabled.
 2. Morning Warm-up.
 - a. The zone temperature is used to determine the amount of time needed to preheat the space to the occupied setpoint minus 1 degree F no more than 20 minutes prior to or 10 minutes after the scheduled occupied time.
 - b. The supply fan starts and runs continuously. The outside air damper closes and the return air damper opens. Reversing valve is positioned for heating. Stage on the heating.
 - c. The unit is indexed to occupied control at the scheduled start time. Disable the morning warm-up when the 3-hour rolling average outdoor air temperature, during unoccupied mode, is greater than setpoint (55 degrees F). If the morning warm-up is disabled, switch air handler to occupied mode 10 minutes prior to scheduled occupied time.
 - d. Index terminal units to heating volume.
 - e. Hot water convectors enabled.
 - f. Based on the space temperature, the optimum start/stop function starts the air handling system and enables the convectors in warm-up mode so that the space temperature will reach set point at the scheduled occupancy time.
 - g. During warm-up the dampers will remain in full circulation and will cycle to appropriate ventilation mode control at occupancy time regardless of average zone temperature.
 3. Occupied Mode.
 - a. The supply and return fans start and run continuously.
 - b. The occupied sequence of operations for the units shall consist of four separate control modes: heating, economizer cooling, chilled water cooling and ventilation.
 - c. The supply and return fans run continuously.
 - d. Heating Mode (Hot Water):
 - 1) Modulate the supply fan VFD to the preset heating speed.

INSTRUMENTATION AND CONTROL FOR HVAC

- 2) Modulate the mixed air to the minimum position allowed by outside air setting and CO2 level, the heat pump shall operate according to the integral controls until the heating setpoint is attained.
 - 3) Modulate the terminal units to the preset heating position.
 - 4) On a continued call for heat enable the hot water convectors to meet the heating setpoint.
 - e. Cooling Mode (Economizer cycle) - When the outdoor air is 4 degrees F (adjustable) less than the return air temperature, modulate the outside air damper between the minimum and full open position to maintain the space temperature setpoint.
 - 1) Modulate the supply and return fan VFD's to the preset cooling speeds.
 - 2) Modulate the terminal units to the preset cooling position.
 - 3) Actuators shall operate outside air and return dampers in accordance with system operating status, supply air, zone air temperatures, and outside air temperatures.
 - 4) Occupied: Modulate between minimum outside air position and 100% open to meet the cooling requirements of the zone being served.
 - f. Cooling Mode (Chilled Water): The mixed air shall modulate to the minimum position allowed by outside air setting and CO2 level, the chiller will enable and the cooling coil valve shall modulate to meet the cooling setpoint.
 4. Demand Control Ventilation Mode: The mixed air control shall modulate to control the following in the priority listed:
 - a. Mixed air low limit set point (45 deg F)
 - b. CO2 high limit set point: Reset the outside air according to the following adjustable setpoints -
 - 1) 800-ppm CO2 and below - OSA at 5% maximum supply air volume.
 - 2) 1200-ppm CO2 maximum - OSA at 50% maximum supply air volume.
 - c. The mixed air set point shall be reset from (55) deg F at (70) deg F outside air to (65) deg F at (50) deg F based on an outside air temperature reset. If the outside air temperature is above the return air temperature the mixed air should be at minimum position as allowed by the minimum outside air setting and CO2 level.
 5. Safeties: The supply and return fan shall stop, the outside and exhaust air dampers shall close and control valves shall go to their normal position and an alarm shall be generated if any of the listed events occur:
 - a. Duct Smoke detector/fire alarm.
 - b. Low temperature alarm (freeze protection).
 - c. High temperature alarm.
- G. SF-5, RF-3 (Music Room).
1. Unoccupied:
 - a. Fans off, outside air, return air and exhaust air dampers (as applicable) indexed to full recirculation.
 - b. Unoccupied Low Limit: When the space temperature drops below the night low limit set point (district standard), enable boiler operation and open the unit heating valve to full heating. Unit to heat until the space is 5-degrees above night low limit set point.
 - c. Terminal units remain closed.
 - d. Subject to the boiler outside air lockout temperature (65), when there is a call for night low limit heating, the boiler system will be enabled.
 2. Warm-up:
 - a. At optimum warm up start period, start fans to run continuously. Index outside air, return air and exhaust air dampers (as applicable) to full recirculation. Open the heating coil valve to full heating.

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- b. Based on the space temperature, the optimum start/stop function starts the air handling system and opens the convector valves in warm-up mode so that the space temperature will reach set point at the scheduled occupancy time.
 - c. During warm-up the air handling unit dampers will remain in full circulation and will cycle to appropriate ventilation mode control at occupancy time regardless of average zone temperature.
 - 3. Occupied:
 - a. The occupied sequence of operations for the units shall consist of four separate control modes: heating, economizer cooling, chilled water cooling and ventilation.
 - b. The Fans run continuously.
 - c. Heating Mode:
 - 1) Modulate the mixed air to the minimum position allowed by outside air setting and CO2 level, the air handling unit heating valve will modulate to maintain the heating setpoint.
 - d. Cooling Mode (Economizer cycle):
 - 1) Actuators shall operate outside air and return dampers in accordance with system operating status, supply air, zone air temperatures, and outside air temperatures.
 - 2) Occupied: Modulate between minimum outside air position and 100% open to meet the cooling requirements of the zone being served.
 - 3) Air handling unit coil valves are closed.
 - e. Cooling Mode (Chilled Water): The mixed air shall modulate to the minimum position allowed by outside air setting and CO2 level, the chiller will enable and the cooling coil valve shall modulate to meet the cooling setpoint.
 - 4. Demand Control Ventilation Mode: The mixed air control shall modulate to control the following in the priority listed:
 - a. Mixed air low limit set point (45 deg F)
 - b. CO2 high limit set point: Reset the outside air according to the following adjustable setpoints -
 - 1) 800-ppm CO2 and below - OSA at 5% maximum supply air volume.
 - 2) 1200-ppm CO2 maximum - OSA at 50% maximum supply air volume.
 - c. The mixed air set point shall be reset from (55) deg F at (70) deg F outside air to (65) deg F at (50) deg F based on an outside air temperature reset. If the outside air temperature is above the return air temperature the mixed air should be at minimum position as allowed by the minimum outside air setting and CO2 level.
 - 5. Safeties: The supply and return fan shall stop, the outside and exhaust air dampers shall close and control valves shall go to their normal position and an alarm shall be generated if any of the listed events occur:
 - a. Duct Smoke detector/fire alarm.
 - b. Low temperature alarm (freeze protection).
 - c. High temperature alarm.
- H. SF-2 (Gymnasium), SF-4 (Cafeteria) (EEM#3).
 - 1. Unoccupied:
 - a. Fans off, outside air and return air dampers indexed to full recirculation. Roofcap relief air dampers closed.
 - b. Unoccupied Low Limit: When the space temperature drops below the night low limit set point (district standard), enable boiler operation and open the unit heating valve to full heating. Unit to heat until the space is 5-degrees above night low limit set point.
 - c. Subject to the boiler outside air lockout temperature (65), when there is a call for night low limit heating, the boiler system will be enabled.
 - 2. Warm-up:

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- a. At optimum warm up start period, start fans to run continuously. Index outside air and return air dampers to full recirculation – Relief air damper remains closed. Open the heating coil valve to full heating.
- b. Based on the space temperature, the optimum start/stop function starts the air handling system and opens the convactor valves in warm-up mode so that the space temperature will reach set point at the scheduled occupancy time.
- c. During warm-up the air handling unit dampers will remain in full circulation and will cycle to appropriate ventilation mode control at occupancy time regardless of average zone temperature.
- 3. Occupied:
 - a. The occupied sequence of operations for the units shall consist of four separate control modes: heating, economizer cooling, DX cooling and ventilation.
 - b. The Fans run continuously.
 - c. Relief air dampers open.
 - d. Heating Mode:
 - 1) Modulate the mixed air to the minimum position allowed by outside air setting and CO2 level, the air handling unit heating valve will modulate to maintain the heating setpoint.
 - e. Cooling Mode (Economizer cycle):
 - 1) Actuators shall operate outside air and return dampers in accordance with system operating status, supply air, zone air temperatures, and outside air temperatures.
 - 2) Occupied: Modulate between minimum outside air position and 100% open to meet the cooling requirements of the zone being served.
 - 3) Air handling unit coil valves are closed.
 - f. Cooling Mode (Chilled Water): The mixed air shall modulate to the minimum position allowed by outside air setting and CO2 level, the chiller will enable and the cooling coil valve shall modulate to meet the cooling setpoint.
- 4. Demand Control Ventilation Mode: The mixed air control shall modulate to control the following in the priority listed:
 - a. Mixed air low limit set point (45 deg F)
 - b. CO2 high limit set point: Reset the outside air according to the following adjustable setpoints -
 - 1) 800-ppm CO2 and below - OSA at 5% maximum supply air volume.
 - 2) 1200-ppm CO2 maximum - OSA at 50% maximum supply air volume.
 - c. The mixed air set point shall be reset from (55) deg F at (70) deg F outside air to (65) deg F at (50) deg F based on an outside air temperature reset. If the outside air temperature is above the return air temperature the mixed air should be at minimum position as allowed by the minimum outside air setting and CO2 level.
- 5. Safeties: The supply and return fan shall stop, the outside and exhaust air dampers shall close and control valves shall go to their normal position and an alarm shall be generated if any of the listed events occur:
 - a. Duct Smoke detector/fire alarm.
 - b. Low temperature alarm (freeze protection).
 - c. High temperature alarm.

I. SF-6 (Kitchen):

- 1. Unoccupied:
 - a. Fan off, outside air closed.

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- b. Unoccupied Low Limit: When the space temperature drops below the night low limit set point (district standard), enable boiler operation, start the unit and open the unit heating valve to full heating. Unit to heat until the space is 5-degrees above night low limit set point.
 - c. Subject to the boiler outside air lockout temperature (65), when there is a call for night low limit heating, the boiler system will be enabled.
 - 2. Warm-up:
 - a. At optimum warm up start period, start fan to run continuously. Open the hot water heating coil valve to full heating.
 - b. Start EF-13.
 - c. Based on the space temperature, the optimum start/stop function starts the air handling system and operates the unit in warm-up mode so that the space temperature will reach set point at the scheduled occupancy time.
 - 3. Occupied:
 - a. The Fans run continuously.
 - b. Heating Mode: Modulate the air handling unit heating valve to maintain the heating setpoint.
 - 4. Safeties: The supply and return fan shall stop, the outside and exhaust air dampers shall close and control valves shall go to their normal position and an alarm shall be generated if any of the listed events occur:
 - a. Duct Smoke detector/fire alarm.
 - b. Low temperature alarm (freeze protection).
 - c. High temperature alarm.
- J. SF-7 (Boys 2), SF-8 (Girls 2):
 - 1. Unoccupied:
 - a. Fan off, outside air closed.
 - b. Unoccupied Low Limit: When the space temperature drops below the night low limit set point (district standard), enable boiler operation, start the unit and open the unit heating valve to full heating. Unit to heat until the space is 5-degrees above night low limit set point.
 - c. Subject to the boiler outside air lockout temperature (65), when there is a call for night low limit heating, the boiler system will be enabled.
 - 2. Warm-up:
 - a. At optimum warm up start period, start fan to run continuously. Open the heating coil valve to full heating.
 - b. Start EF-9.
 - c. Based on the space temperature, the optimum start/stop function starts the air handling system and operates the unit in warm-up mode so that the space temperature will reach set point at the scheduled occupancy time.
 - 3. Occupied:
 - a. The Fans run continuously.
 - b. Heating Mode: Modulate the air handling unit heating valve to maintain the heating setpoint.
 - c. Cooling Mode (Chilled Water): The mixed air shall modulate to the minimum position allowed by outside air setting and CO2 level, the chiller will enable and the cooling coil valve shall modulate to meet the cooling setpoint.
 - 4. Safeties: The supply and return fan shall stop, the outside and exhaust air dampers shall close and control valves shall go to their normal position and an alarm shall be generated if any of the listed events occur:
 - a. Low temperature alarm (freeze protection).
 - b. High temperature alarm.

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- K. Exhaust Fan (Time Schedule): Fan to run during occupancy hours on its own start-stop time schedule.
- L. Exhaust Fan (Temperature Control): Fan to run on a space temperature sensor to maintain sensor setpoint.
- M. Independent Wall Heaters.
 - 1. Unoccupied:
 - a. Heater off.
 - b. Unoccupied Low Limit: When the space temperature drops below the night low limit set point (district standard), enable heater operation and allow unit to heat until the space is 5-degrees above night low limit set point.
 - 2. Warm-up - At optimum warm up start period, e
 - 3. Occupied- enable heater to maintain the heating setpoint.
 - 4. Safeties:
 - a. Low temperature alarm (freeze protection).
 - b. High temperature alarm.
- N. Chiller (CH):

1. General: Setpoints referred to in the following sequences can be adjusted at the operator workstation (OWS) or at the local digital controller (DOC). If communication is lost to the DOC, default setpoints in the DOC are used for stand-alone control.

Chiller Control: When the outside air temperature is above 70 degrees F, the DOC starts the chilled water pump and enables the chiller. When chilled water flow is proven, the chiller will be allowed to start. The chiller will operate under manufacturer controls and safeties to maintain leaving chilled water temperature. If the outside air temperature decreases below 70 degrees F, disable the chiller.

3.3 FIELD QUALITY CONTROL

- A. Startup: Implement a logical step-by-step startup and checkout of the control system. In addition, startup assistance and coordination shall be provided during startup of the mechanical equipment. Startup shall be considered complete after the entire system is operating properly.
- B. Self-commission all hardware and software provided for the project.
- C. Completed field commissioning sheets shall be included with the final "as-built" O&M manuals. These sheets shall include validation check fields for all physical and LAN inputs and outputs and graphics for each operating unit or system within the facility. Each system and point shall be listed, using logical names for future reference by the owner.
- D. Commissioning shall include calibration and verification of operation of each I/O and graphic field. Functional commissioning of software programming to meet sequences of operation as submitted and approved shall be verified on the field commissioning sheets.
- E. At the completion of the job, in the presence of an Owner's representative, thoroughly check out the entire control system by simulating each control function and determine that the system performs in accordance with the Contract Specifications.

3.4 INSTRUCTION OF OWNER PERSONNEL

- A. Provide complete list of system generated messages for system operation, including alarm messages.
- B. Modify error message wording as required by the Owner's personnel.

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- C. Locate all control components for Operating Engineer.

3.5 RECORD DRAWINGS

- A. Provide complete and accurate record drawings noting all deviations from the information furnished in the original submittals.

3.6 COMMISSIONING

- A. The equipment and systems referenced in this section are to be commissioned.
- B. The contractor has specific responsibilities for scheduling, coordination, startup, test development, testing and documentation. Coordinate all commissioning activities with the Commissioning Authority.

END OF SECTION

HVAC PIPING AND EQUIPMENT**PART 1 - GENERAL****1.1 SUMMARY**

- A. Work included:
 - 1. Remove existing control valves and installing controls contractor furnished control valves.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Black Steel Pipe:
 - 1. Pipe: Schedule 40 black steel pipe conforming to ASTM A120-82 or A53-93A.
 - 2. Fittings: 150 psi screwed malleable iron for 2 1/2" and smaller, Schedule 40 weld fittings conforming to ASTM A234 for 3" and larger.
 - 3. Standard product of manufacturer.
- B. Unions: Standard product of manufacturer.

2.2 DESCRIPTION

- A. Heating Water Piping:
 - 1. Black steel – Provide screwed, welded or flanged fittings as required.
- B. Unions: 150 malleable iron, brass to iron seat, ground joint, black or galvanized to match pipe. 200-psi wog bronze, ground joint, solder type for copper tubing. Where dissimilar metals join, dielectric unions, couplings or flanges shall be installed.

PART 3 - EXECUTION**3.1 PREPARATION - MEASUREMENTS, LINES AND LEVELS**

- A. Check dimension at the building site for the work specified in this Division.

3.2 INSTALLATION

- A. Hydronic Piping.
 - 1. Grade mains and runouts to drain.
 - 2. Provide miscellaneous valves and appurtenances as noted on the drawings.
 - 3. Provide shutoff valves at equipment and coil connections.
 - 4. Provide unions in piping at control valves, pressure reducing valves, pumps, coils, etc. if equipment is furnished without flanges for pipe connections.
 - 5. Provide manual air vents at all high points and drain valves at all low points in the piping system.
 - 6. Provide fittings and install automatic temperature control wells provided and located by the automatic temperature control contractor and where shown on the drawings.
 - 7. Provide reducers as required for changes in pipe size, equipment connections and control valves.
- B. Miscellaneous Condensate and Drain Systems:
 - 1. Install condensate system sized in conformance with the drawings.
 - 2. Slope lines in direction of flow.
 - 3. Install indirect waste fittings as shown on the Drawings, providing access as required by code
 - 4. Test piping system per this Section.

HVAC PIPING AND EQUIPMENT

- C. Pressure testing of piping:
 - 1. Piping: Test prior to concealment, insulation being applied, and connection to equipment, fixtures, or specialties. Conduct tests with all valves but those used to isolate the test section 10% closed.
 - 2. Leaks: Repair all leaks or replace defective pipe or fittings and retest until stipulated results are achieved.
 - 3. Notification: Advise the Project Manager 48 hours in advance of each test. Failure to so notify will require test to be rescheduled.
 - 4. Testing Equipment: Provide all necessary pumps, gauges, connections similar items required to perform the tests.
- D. Maintain service clearances for all equipment, valves, etc. per the respective manufacturer's requirements and as required for adequate service.
- E. Provide flexible pipe connections at all piping penetrations through building expansion joints.
- F. Provide shutoff valves at equipment connections.
- G. Install unions in all non-flanged piping connections to apparatus and adjacent to all screwed control valves, traps, and appurtenances requiring removal for servicing, so located that piping may be disconnected without disturbing the general system.
- H. Coils:
 - 1. Install coils where noted on the drawings in accordance with the manufacturer's recommendations.
 - 2. Connect the ductwork when required to the coil casing providing transitions and fittings.
 - 3. Pipe 3/4-inch condensate lines to existing floor drains in the boiler room
- I. Support all piping independently at apparatus so that the equipment shall not carry its weight.
- J. Screwed Joints: Ream pipe ends. Apply dope or tape to male threads only. Brass joints shall be made with Teflon tape only. Make up fitting with not over two threads showing beyond the fitting end.
- K. Provide reducers as required for changes in pipe size, equipment connections and valves

3.3 COMMISSIONING

- A. The equipment and systems referenced in this section are to be commissioned.
- B. The contractor has specific responsibilities for scheduling, coordination, startup, test development, testing and documentation. Coordinate all commissioning activities with the Commissioning Authority.

END OF SECTION

HVAC DUCTS AND CASINGS**PART 1 - GENERAL****1.1 SUMMARY**

- A. Work included: Providing of all required sheet metal ductwork specified or shown on the drawings.

1.2 SUBMITTALS

- A. Submittals shall include Shop Drawings of any proposed revisions to the ductwork as shown on the drawings.

PART 2 - PRODUCTS**2.1 DESCRIPTION**

- A. Provide G-60 galvanized sheet metal ductwork for supply and return air systems except as specified or shown on the drawings. Provide minimum gauge and reinforcing in accordance with Chapter Sixteen, "Duct Construction" of the Chapter 19 of the ASHRAE "Systems and Equipment" Handbook and the appropriate chapters of the latest edition of the Oregon State Mechanical Specialty Code
- B. Round duct to be sheet metal spiral duct. Snap-lack furnace type pipe is not allowed.
- C. Sheet metal duct only is to be used above hard ceiling areas.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. General.
 - 1. Construct and assemble all supply, return, outside air and general exhaust duct systems in accordance with latest edition of the "HVAC Duct Construction Standards" published by SMACNA, Chapter Sixteen, "Duct Construction" of the Chapter 19 of the ASHRAE "Systems and Equipment" Handbook and the appropriate chapters of the latest edition of the OMSC.
 - 2. Cover ductwork openings during construction after delivery to the field prior to and after installation. Seal ends, protect from moisture and running water, adequately support to keep level and at least four inches off the ground.
 - 3. Store in clean dry space or if stored outdoors cover and protect from the elements.
 - 4. Ductwork pressure classifications to be appropriate for the scheduled external system pressures.
 - B. Seal all duct penetrations through walls at both sides of the partition. No air gaps are allowed around ductwork wall penetrations.
 - C. Cross brace and reinforce ductwork and plenums with structural steel members to prevent breathing or ballooning.
- 3.2 All joints in the air distribution system shall be sealed airtight with Hardcast CCWI-181 or similar LEED^R Compliant sealant.
- 3.3 COMMISSIONING
- A. The equipment and systems referenced in this section are to be commissioned.

HVAC DUCTS AND CASINGS

- B. The contractor has specific responsibilities for scheduling, coordination, startup, test development, testing and documentation. Coordinate all commissioning activities with the Commissioning Authority.

END OF SECTION

AIR DUCT ACCESSORIES**PART 1 - GENERAL****1.1 SUMMARY**

- A. Work included: Providing of all required air duct accessories specified or shown on the drawings.

1.2 SUBMITTALS

- A. Provide submittals in accordance with Section 23 00 00.
- B. Submittals shall include: Manufacturer's catalog or technical data showing performance, dimensions, materials of construction and recommended methods of installation.

1.3 OPERATION AND MAINTENANCE DATA

- A. Provide O&M data in accordance with Section 23 00 00.
- B. O&M data shall include manufacturer's literature and maintenance instructions.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Damper regulators and end bearings: Duro-Dyne, Ventlock or approved equal. Duro-Dyne used as basis of selection.
- B. Turning vanes: Duro Dyne, Elgen All-Tight, General Sheet Metal or approved equal.
- C. Flexible connections: Duro-Dyne or approved equal. Duro-Dyne used as basis of selection.
- D. Control Dampers (Motorized): Greenheck, Ruskin, Cesco or approved equal with Belimo actuators.

2.2 DESCRIPTION

- A. Volume Dampers:
 - 1. Damper regulators and end bearings: 3/8-inch Figure SRH-288 for accessible ductwork and Figure SRC-380 for concealed ductwork.
 - 2. Volume dampers shall be fabricated of 18 gage galvanized steel and have a continuous galvanized steel shaft.
- B. Turning vanes: Airfoil double-blade turning vanes. Single-bladed, shop fabricated turning vanes are not acceptable except for supply diffuser plenums, see detail on drawings.
- C. Flexible connections: Duro-Dyne "Insulflex" insulated flexible duct connector.
- D. Control Dampers: Greenheck VCD-18 Low-Leakage Control Dampers.
 - 1. 16-gauge galvanized hat channel with corner braces.
 - 2. Galvanized steel, V-groove blade construction. Extruded vinyl blade seals.
 - 3. Edge seals and flexible metal compressible jamb seals.
 - 4. Synthetic bearings.
 - 5. Square or hex plated steel axles.
 - 6. Opposed blade operation.
 - 7. Frame mounted actuator support.
 - 8. Factory installed jackshaft for all multiple section dampers.

AIR DUCT ACCESSORIES

9. Maximum leakage rate of 4 CFM/sq. ft. at 1.0 inches w.g. when tested in accordance with AMCA Standard 500-1998.
10. Belimo actuators.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install volume dampers in all branch ducts to outlets and where shown on drawings. Provide regulators on all dampers. Assure that all dampers are aligned with their regulator pointers and left open for the air balance contractor. Permanently mark full open and full closed positions.
- B. Install turning vanes in all mitered elbows.
- C. Install flexible connections between all fans and connected ducts or plenums. Install with 2-inch space between the fan and connecting duct. Fabric should be snug, but not tight. Secure with flanged connections with accurate alignment between fan and duct.
- D. Install control dampers with actuators in accordance with manufacturer's instructions where located on the drawings and as required to complete the specified control sequences.

3.2 COMMISSIONING

- A. The equipment and systems referenced in this section are to be commissioned.
- B. The contractor has specific responsibilities for scheduling, coordination, startup, test development, testing and documentation. Coordinate all commissioning activities with the Commissioning Authority.

END OF SECTION

TERMINAL UNITS**PART 1 - GENERAL****1.1 SUMMARY**

- A. Work included: Providing of variable air volume terminal units.

1.2 SUBMITTALS

- A. Manufacturer's catalog or technical data on all equipment. Show and describe materials and methods of construction. Show and describe methods of installation.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Variable volume boxes shall be Nailor or approved equal. Nailor used as basis of selection.
- B. Approved terminal unit manufacturers must submit units with similar flow, pressure drop and noise characteristics. The sizes noted in the equipment schedule are based upon the manufacturer noted. Other approved manufacturers are required to match the performance noted, not specifically the terminal unit sizes.

2.2 DESCRIPTION

- A. Pressure independent single duct terminal units with field adjustable maximum and minimum airflow settings.
- B. Single piece terminal units with air valve factory installed. Factory run test to include the operation of air valve. Factory adhered labels, decals, and/or tags to aid in the service of the unit and indicate caution areas. Unit shall be single duct shutoff as scheduled.
- C. Units to be manufactured of corrosion protected steel, a minimum of 18-gauge metal on the high pressure side and 22-gauge metal on the low pressure side. Casing shall be insulated with 1-inch of 1.5-lb/cu ft density foiled face glass fiber insulation with R-Value of 4.1. Insulation shall meet NFPA-90A and UL 181 requirements. A metal flange shall cover the cut edges on the discharge of the unit.
- D. Actuator shaft to be of metal construction.
- E. The VAV box shall control airflow rate based on thermostat demand from minimum static pressure up to four inches static pressure within +/-5% of control volume.
- F. Provide 24 Volt transformer for controls as required – Verify with DDC controls manufacturer. Provide metal enclosure for controller.
- G. Service Access: Metal boxes with screw covers shall be provided for Class II low voltage controls.
- H. Acoustical Performance:
 - 1. Provide certified AHRI 885-08 defined discharge and radiated test data. Radiated data to use AHRI 885-08 general defined mineral fiber, gypsum board, or glass fiber nearest to the actual ceiling below the individual terminal unit. Provide sound attenuator and wraps as necessary to be maximum AHRI 885 defined and certified noise criteria value NC30.
 - 2. Provide manufacturers sound attenuator accessory: 22-gage galvanized steel with an internal acoustical liner. Test attenuators in accordance with AHRI 880 standards.
- I. Warranty: Manufacturer insured beginning at startup or 6 months from shipment, whichever begins earlier. 2 years parts and labor.

TERMINAL UNITS

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Provide the variable volume units rigidly supported from overhead structure in accordance with the manufacturer's instructions and provide additional bracing and seismic restraints as required for the seismic zone requirements.
- B. Provide a minimum of three duct diameters of straight duct ahead of the units when possible and provide duct transition from outlet size to duct size as needed.
- C. Service Clearance: Contractor is responsible for meeting service clearances insuring that all unit access panels can be removed, and that manufacture's recommended and required clearances are complied with.
- D. Connect ductwork as shown and detailed on drawings.
- E. Mount actuators furnished by the controls contractor complete and ready for control wiring.
- F. Start-up: Contractor to clean unit of dust and debris, then provide startup in coordination with control contractor and air balance contractor. Startup in accordance with VAV box and controller manufacturer recommendations.

3.2 COMMISSIONING

- A. The equipment and systems referenced in this section are to be commissioned per Section 23 08 00 – HVAC System Commissioning Requirements.
- B. The contractor has specific responsibilities for scheduling, coordination, startup, test development, testing and documentation. Coordinate all commissioning activities with the Commissioning Authority.

END OF SECTION

ELECTRICAL GENERAL PROVISIONS**PART 1 - GENERAL****1.1 DESCRIPTION**

- A. The General and Supplemental Conditions apply to this Division, including but not limited to:
1. Drawings and Specifications.
 2. Public ordinances, permits. Including but not limited to electrical and fire alarm permits.
 3. Payments and fees required by governing authorities for work included in this Division.
 4. Change orders.
- B. Division 1, General Requirements apply to this Division, including but not limited to:
1. Summary, Section 01 01 00
 2. Cutting and Patching, Section 01045
 3. Submittals, including Shop Drawings, Product Data and Samples, Section 01 30 00
 4. Construction facilities and Controls, Section 01 50 00
 5. Substitution Request Forms, Section 01 60 01
 6. Closeout Submittals, Section 01 78 00

1.2 MECHANICAL WIRING

- A. The following schedule is intended to summarize the division of work and responsibilities between Division 23 and Division 26

	ITEM	FURNISHED BY	INSTALL BY	POWER WIRING	CONTROL WIRING
1.	Division 23 Equipment Motors	Div. 23	Div. 23	Div. 26	Div. 23
2.	Motor Starters, Contactors and Overload Heaters – Integral	Div. 23	Div. 26	Div. 26	Div. 23
3.	Variable Frequency Drives (VFD's)	Div. 23	Div. 26	Div. 26	Div. 23
4.	Motor Control Centers	Div. 26	Div. 26	Div. 26	Div. 23
5.	Fused & Unfused Disconnect Switches	Div. 26	Div. 26	Div. 26	-----
6.	Manual Operation Switches	Div. 26	Div. 26	Div. 26	Div. 26
7.	Control Relays & Transformers	Div. 23	Div. 23	Div. 26	Div. 23
8.	Energy Management Control Panels	Div. 23	Div. 23	Div. 26	Div. 23
9.	Motorized Solenoid Valves	Div. 23	Div. 23	Div. 26	Div. 23
10.	Duct Mounted smoke Detectors	Div. 28	Div. 23	Div. 26	Div. 23 – Equipment Shutdown Div. 28 – Fire Alarm

ELECTRICAL GENERAL PROVISIONS

ITEM	FURNISHED BY	INSTALL BY	POWER WIRING	CONTROL WIRING
11. Fire/Smoke and Smoke Dampers	Div. 23	Div. 23	Div. 26	Div. 26 Div. 28 – Fire Alarm
Detectors	Div. 28	Div. 23	Div. 26	Div. 28 – Fire Alarm

1.3 CONTRACT DOCUMENTS

- A. The Electrical Drawings and Specifications are complementary and what is called for by one shall be as binding as if called for by both. Items shown on the Drawings are not necessarily included in the Specifications. All directives and instructions to furnish, provide, install, complete, test and methods described in these Specifications and Drawings shall be interpreted as directives to the Electrical Contractor unless clearly specified otherwise. It is the intent of these specifications and the accompanying drawings to describe complete and functional electrical systems. If errors or discrepancies are discovered, notify the Project Manager immediately.

1.4 SITE VISITATION

- A. The contractor shall visit the site prior to bidding to familiarize himself with existing conditions and all other factors which may affect the execution of the work.

1.5 CODES, ORDINANCES AND REGULATIONS

- A. The completed installation shall conform to all applicable Federal, State and Local Codes, Ordinances and Regulations.
- B. Obtain all necessary permits and inspections required by the governing authorities having jurisdiction over this work.
- C. Furnish to the Project Manager a certificate of approval from the inspection authority at the completion of the work, prior to the application for final payment.

1.6 SCOPE OF WORK

- A. The work covered by this Specification shall include furnishing all labor, materials, equipment and services to construct and install the complete electrical system as shown on the Drawings and specified herein. Verify all conditions on the job site and lay out work accordingly.
- B. The work shall include, but is not necessarily limited to, the following systems:
1. Complete power systems
 2. Grounding continuity
 3. Connection of electrical equipment furnished under other Divisions of work
 - a. Mechanical contractor will provide new VFD motors and controls on the HVAC system. Electrical will disconnect selected HVAC equipment shown on mechanical plans.
 - b. Electrical contractor will provide new conduit and wire from panel serving HVAC equipment route to new VFD controller and then to equipment location. Field verify existing feeder prior to bid
 4. Fire alarm system
 - a. Removed existing duct detectors for air handlers indicated on mechanical plans and provide new addressable duct detectors. Match existing fire alarm panel manufacturer.
 5. Demolition as required

ELECTRICAL GENERAL PROVISIONS

- C. The following equipment and work will be furnished under other Divisions of Work:
 - 1. Mechanical equipment motors and heaters, unless otherwise noted on drawings.
 - 2. Equipment control wiring beyond the provisions shown on the Electrical Drawings.

1.7 WARRANTY

- A. Provide a written one-year warranty covering the work done under this Division as required by the General Conditions. Incandescent lamps will be excluded from this warranty.
- B. Systems and Apparatus:
 - 1. Free of defects of material and workmanship and in accord with the Contract Documents.
 - 2. Built and installed to deliver its full rated capacity at the efficiency for which it was designed.
 - 3. Operate at full capacity without objectionable noise or vibration.

1.8 SUBMITTALS

- A. Refer to Division 1 requirements.
- B. Submit all electrical data in electronic PDF format, provide in individual sections, indexed by section numbers, covering all items of equipment and systems. Submit all electrical items at one time.
- C. The installation and Record Drawings called for under submittals shall show all outlets, devices, terminal cabinets, conduits, wiring and connections required for the complete system described. Drawings will be at the same sheet size and scale as the construction documents. Prints of these drawings shall be submitted prior to starting installation. The Contractor submitted drawings, when approved, will then form the basis for installation.
- D. Submittals will not be reviewed unless equipment is specifically indicated. Items not marked with model numbers and all options will be rejected and will need to be resubmitted. SDC will not try to interpret the contractor's intent.

PART 2 - PRODUCTS**2.1 APPROVALS AND SUBSTITUTIONS**

- A. The use of manufacturer's names, models and numbers in this Specification is intended to establish style, quality, appearance and usefulness. If not as specified all Items will require prior approval.
- B. Submit for the Project Manager's approval, manufacturer's detailed specifications and data sheets for all proposed substitutions. Submittals shall consist of a single sheet, or sheets, if required, for each piece of equipment and shall give the specific data needed for consideration of approval. All pertinent data listed in the Specifications and in Schedules shall be furnished, including all special features. See that all submittals are in proper order, and that all equipment will fit in the space provided.
- C. The Project Manager reserves the right to require the submission of an actual sample before the acceptance of any product as an equal to that specified.

2.2 MATERIAL APPROVALS AND SHOP DRAWINGS

- A. Submit all electrical data in electronic PDF format, provide in individual sections, indexed by section numbers, covering all items of equipment and systems. Include wiring diagrams where called for.
- B. Review and recommendations by the Project Manager or Engineer are not to be construed as change authorizations. If discrepancies between the shop drawings submitted and the Contract Documents are discovered either prior to or after the data is processed, the Contract Documents will govern. Shop drawing review will not occur without contract cost data as outline below.

ELECTRICAL GENERAL PROVISIONS**PART 3 - EXECUTION****3.1 CONTRACT COST DATA**

- A. Furnish to the Project Manager a cost breakdown of the Electrical Contract.
- B. The cost breakdown shall include separate amounts for material and labor for each category listed below. Include costs data with the shop drawings submittal.
 - 1. Feeders
 - 2. Disconnects, starters and equipment connections
 - 3. Branch circuit wiring and devices
 - 4. Fire alarm system

3.2 CHANGE ORDERS

- A. All supplemental cost proposals by the Contractor shall be accompanied with a complete itemized breakdown of labor and materials cost without exception. Contractor's estimating sheets for the supplemental cost proposals shall be included. Labor must be separated and allocated for each item of work. Material cost, as used in this section, to be Contractor's actual "invoice" cost. All discounts shall be detailed and shown on the invoice. Labor cost shall be the actual cost per manhour including all taxes and fees. The total estimated cost for any change will be considered a not-to-exceed price. The supplemental cost approval will be based on this estimate but actual change order request for payment will be based on the contractor's actual cost to perform this work and shall be accompanied with a complete itemized breakdown of labor and materials cost with backup invoices, without exception.

3.3 OPERATING AND MAINTENANCE DATA

- A. The Contractor shall provide operating instructions and maintenance data. Submit all electrical data in electronic PDF format; provide in individual sections, indexed by section numbers, covering all items of equipment and systems, for all equipment and materials called for under this Division.
- B. Submit Provide one PDF on flash drive and two (2) hard copies of the operating and maintenance data for review at least four weeks before final review of the Project. Assemble all data in a completely indexed volume or volumes and identify the size, model, and features indicated for each item.
- C. Maintenance instruction manuals shall include complete cleaning and servicing data compiled in clearly and easily understandable form. Data shall show serial numbers of each piece of equipment and complete lists of replacement parts.

3.4 ELECTRONIC INFORMATION

- A. Electronic record information in AutoCAD format will be provided to the general contractor upon request. One (1) copy of the base project construction document files will be made available to the contractor at no charge, each additional request will be provided at a cost of \$250 per request.
- B. All contractors and sub contractors requiring electrical plans will make their request for the construction documents through the general contractor.

3.5 RECORD INFORMATION

- A. Maintain one set of construction documents marked up (red-lined) on a daily basis as the work progresses, showing all changes, deviations, change orders, omissions, or other variations from the contract drawings.
- B. Record all conduits, stubups and equipment by dimensions from gridlines, below grade, above floor, etc. Show location of all access panels, rough-in for future, etc.

ELECTRICAL GENERAL PROVISIONS

- C. Make record documents available to the Project Manager for review or printing during construction.
- D. On acceptance of the contractor record drawings by the Project Manager, the contractor will transfer the record information in "AutoCAD" format to the electronic "AutoCAD" drawing files. Refer to 26 0000-3.4(A) for obtaining documents and applicable charges.
- E. Deliver record drawings files to the Project Manager promptly upon completion of the project. Record information added to the "AutoCAD" drawing files is to have compatible format, linework and lettering as the original files. All new work done by the contractor on the original drawing files is to be on a single layer noted in the revised drawing file as "RECORD".

3.6 PROTECTION OF WORK

- A. Protect all electrical work and equipment installed under this Division against damage by other trades, weather conditions or any other causes. Equipment found damaged or in other than new condition will be rejected as defective.
- B. Switchgear, transformers, panels, light fixtures and all electrical equipment shall be kept covered or closed to exclude dust, dirt and splashes of plaster, cement or paint and shall be free of all such contamination before acceptance. Enclosures and trims shall be in new condition, free of rust, scratches and other finish defects. Properly refinish in a manner acceptable to the Project Manager, if damaged.

3.7 MAINTENANCE OF SERVICE

- A. Electrical service shall be maintained to all functioning portions of the building throughout construction, except as noted below, during all normal working hours of the building occupants. Outages to occupied areas shall be kept to a minimum and be prearranged with the Project Manager or Owner's Representative. This Contractor will be liable for any damages resulting from unscheduled outages or for those not confined to the pre-arranged times.
- B. Signal and communication systems and equipment shall be kept in operation wherever these serve occupied or functional portions of the building. Outages of these facilities shall be treated the same as electrical power outages.
- C. Telephone services where required during the construction work will be maintained by the telephone company. This work shall be coordinated with the telephone company in such a manner that service, as required by the building occupants, can be readily installed and maintained.
- D. Include all costs for temporary facilities, overtime labor and necessary provisions to maintain electrical services in the initial bid proposal. Temporary wiring and facilities, if used, shall be removed and the site left clean before final acceptance.

END OF SECTION

BASIC MATERIALS AND METHODS**PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Conditions of the Contract and Section 26 00 00 apply to this Section.

1.2 COORDINATION OF WORK

- A. Conduct work in a manner to cooperate with all other trades for proper installation of all items of equipment. Consult the Drawings of all other trades or crafts to avoid conflicts with cabinets, counters, equipment, structural members, etc. In general, the architectural drawings govern but conflicts shall be resolved with the Architect prior to rough-in.
- B. Verify the physical dimension of each item of electrical equipment to fit the available space. Coordination of the equipment to fit into the available space and the access routes through the construction shall be the Contractor's responsibility.

1.3 ELECTRICAL DRAWINGS

- A. The Electrical Drawings accompanying these Specifications are design drawings and generally are diagrammatic indicating approximate locations of outlets and wiring. They do not show every offset, bend, junction box, etc., which may be required for installation to complete the system. Minor deviations in methods, circuiting and branch circuit distribution or arrangements to suit construction conditions are permissible.
- B. The intent of the branch circuiting and control shown shall not be changed nor homeruns combined without the approval of the Architect. Feeder runs shall not be combined or changed.
- C. Cross or hash marks on conduit runs indicate quantity of No. 12 copper branch circuit conductors, in addition to a grounding conductor, unless otherwise noted. Where such marks do not appear, provide minimum of two conductors with ground, minimum No. 12, size as required for loads and/or equipment being served. **Contractor is responsible to assure that the maximum voltage drop on any circuit does not exceed 5% at the load.** The contractor shall review panel schedule to verify wire/conduit size required.
- D. Conduit sizes shown or listed on the drawings are for reference only. It is the responsibility of the contractor to provide and install conduit sized per current NEC requirements.

PART 2 - PRODUCTS**2.1 MATERIALS**

- A. Electrical products installed in this project shall be listed by a recognized testing laboratory or approved in writing by the local inspection authority as required by governing codes and ordinances.
- B. Materials shall be new, of the best quality. The materials shall be manufactured in accordance with NEMA, ANSI, UL or other applicable standards.

BASIC MATERIALS AND METHODS**PART 3 - EXECUTION****3.1 INSTALLATION**

- A. Provide a completely properly operating system for each item of equipment called for under this work. Installations shall be in accord with the equipment manufacturer's instructions, the best industry practices and the contract documents. Where a conflict in these guides appear, the Architect shall be requested to provide proper clarification before work is roughed in and his decision will be final. Work installed without such clarification shall be removed and corrected by the Contractor at no cost to the Owner.
- B. Make installation in a neat, finished and safe manner, according to the latest published NECA Standard of Installation under competent supervision.

3.2 NOISE CONTROL

- A. Outlet boxes at opposite sides of partitions shall not be placed back-to-back nor straight through boxes be employed, except where specifically permitted on the Drawings by note, to minimize transmission of noise between occupied spaces.
- B. Contactors, transformers, starters and similar noise producing devices shall not be placed on walls which are common to occupied spaces unless specifically called for on the Drawings. Where such devices must be mounted on walls, common to occupied spaces, they shall be shock mounted or isolated in such a manner as to effectively prevent the transmission of their inherent noise to the occupied space.
- C. Ballasts, contactors, starters, transformers and like equipment which are found to be noticeably noisier than other similar equipment on the project will be deemed defective and shall be replaced.

3.3 EQUIPMENT CONNECTIONS

- A. Provide complete electrical connections for all items of equipment requiring such connections, including incidental wiring, materials, devices and labor necessary for a finished working installation.
- B. Verify the location and method for connecting to each item of equipment prior to roughing-in. Check the voltage and phase of each item of equipment before connecting.
- C. Make motor connections for the proper direction of rotation. Minimum size flex for mechanical equipment shall be 1/2-inch except at small control devices where 3/8-inch may be used. Exposed motor wiring shall be jacketed metallic flex with 6-inches minimum slack loop. Pump motors shall not be test run until liquid is in the system.
- D. Control devices and wiring relating to the HVAC systems will be furnished and installed under Division 15 except for provisions or items specifically shown on the Electrical Drawings or specified herein.
- E. Furnish all code required disconnects under this work, whether specifically shown or not.

3.4 EQUIPMENT SUPPORT

- A. Anchoring and bracing to the building structural elements in accord with all codes and regulations regarding seismic design conditions. The contractor is responsible to determine the means and methods of equipment installation and support. Seismic restraints for electrical and communication equipment shall bear the seal and signature of a structural engineer registered in the state of Oregon, and shall be submitted to the Architect prior to fabrication. Calculations are to be included for all connections to the structure, considering localized effects.

BASIC MATERIALS AND METHODS

- B. Each fastening device and support for electrical equipment, fixtures, panels, outlets and cabinets shall be capable of supporting not less than four times the ultimate weight of the object or objects fastened or suspended from the building structure.
- C. Support all junction boxes, pull boxes or other conduit terminating housings located above the suspended ceiling from the floor above, roof or penthouse floor structure to prevent sagging or swaying.
- D. Conduits:
 - 1. Support suspended conduits 1-inch and larger from the overhead structural system with metal ring or trapeze hangers with threaded steel rod having a safety factor of 4.
 - 2. Conduit installed in poured concrete shall be anchored to the reinforcing steel with No. 14 black iron wire.

3.5 ALIGNMENT

- A. Install panels, cabinets and equipment level and plumb, parallel with structural building lines. Switchgear panels and all electrical enclosures shall fit neatly without gaps, openings or distortion. Properly and neatly close all unused openings with approved devices.
- B. Fit surface panels, devices and outlets with neat, appropriate trims, plates or covers, without overhanging edges, protruding corners or raw edges, to leave a finished appearance.

3.6 CUTTING AND PATCHING

- A. Include cutting, patching and restoration of finishes necessary for this work. Surfaces damaged by this work and spaces around conduits passing through floors and walls shall be neatly patched and finished to match the adjacent construction, including painting or other finishes. Clean up and remove all dirt and debris. This work shall all be performed to the satisfaction of the Architect. Refer to Section 01045.

3.7 FIRESTOPPING PENETRATIONS IN FIRE-RATED WALL/FLOOR ASSEMBLIES

- A. Contractors shall provide proper sizing when providing sleeves or core-drilled holes to accommodate their through penetrating items. All voids between sleeve or core-drilled hole and pipe passing through, shall be firestopped to meet the requirements of ASTM E-814, in accordance with Section 07270 - Firestopping.
- B. Provide properly sized expansion fittings for all conduits crossing over building expansion joints

END OF SECTION

CONDUCTORS AND CONNECTORS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included:
 - 1. Deliver conductors to the job site in cartons, protective covers or on reels.
 - 2. Conductors for special systems shall be as recommended by the equipment manufacturer except as noted.

1.2 RELATED WORK

- A. Section 26 00 00: General Provisions
- B. Section 26 05 00: Basic Materials and Methods.

1.3 SUBMITTALS

- A. Shop Drawings.
- B. Product Data

PART 2 - PRODUCTS

2.1 CONDUCTORS - 600 V

- A. Type:
 - 1. No. 12 AWG minimum size unless noted otherwise.
 - 2. No. 8 and larger, stranded, Class B.
- B. Stranding: Copper, concentric or compressed
- C. Insulation: THHN, THWN, XHHW unless noted or specified otherwise.
- D. Through wiring in fluorescent fixtures shall be rated for 90 degree C.
- E. Manufacturers: Southwire, G.E., Hatfield, Anaconda, Rome or approved equal.

2.2 CORD DROPS AND PORTABLE CORDS

- A. Copper type "S" or "SO" heavy duty, rubber insulated unless otherwise noted.

2.3 CONNECTORS

- A. Branch Circuit Conductor Splices: Live spring type, Scotch-Lok, Ideal Wing Nut or self-stripping type, 3M Series 560.
- B. Cable Splices: Compression tool applied sleeves, Kearney, Burndy or approved equal with 600V heat shrink insulation.
- C. Lugs: Conductors no. 6 and larger, except on molded case circuit breakers, two hole, long barrel pressure tool set Thomas & Betts No. 54,000 series, Burndy "Hydent", Anderson Electric VCEL, or approved equal.

CONDUCTORS AND CONNECTORS**PART 3 - EXECUTION****3.1 CONDUCTORS**

- A. Pulling compounds may be used with the residue cleaned from the conductors and raceway entrances after the pull is made.
- B. Pulleys or blocks shall be used for alignment of the conductors when pulling. Pulling shall be in accordance with manufacturer's specifications regarding pulling tensions, bending radii of the cable and compounds.
- C. Conductors entering terminal or junction boxes mounted on hermetically sealed refrigeration compressor motors shall be copper.
- D. Make up and insulate wiring promptly after installation of conductors. Wire shall not be pulled in until all bushings are installed and raceways terminations are completed. Wire shall not be pulled into conduit embedded in concrete until after the concrete is poured and forms are stripped.
- E. Conductor sizes shown on the Drawings are for copper only.

3.2 CONNECTORS

- A. Control and special systems wires shall be terminated with a tool applied spade flared lug when terminating at a screw connection.
- B. All screw and bolt type connectors shall be made up tight and retightened after an eight-hour period.
- C. All tool-applied compression connectors shall be applied per manufacturer's recommendations and physically checked for tightness.

3.3 COLOR CODING

- A. Phase color code to be consistent at all feeder terminations, A-B-C left-to-right or A-B-C top-to-bottom.
- B. Switchlegs, travelers, etc. to be consistent with the phases to which connected or a color distinctive from that listed.
- C. Under 250 Volts Phase-to-Phase:
 - Phase A - Black Neutral – White
 - Phase B - Red Ground – Green
 - Phase C – Blue
- D. Over 250 Volts Phase-to-Phase:
 - Phase A - Brown Neutral - White with tracer
 - Phase B - Orange Ground – Green
 - Phase C - Yellow

END OF SECTION

GROUNDING AND BONDING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included:
 - 1. Provide complete building grounding system.
 - 2. Provide ground bus bar at each telephone demarcation and data distribution location.

1.2 RELATED WORK

- A. Section 26 00 00: General Provisions,
- B. Section 26 05 00: Basic Materials and Methods,
- C. Section 26 05 19: Conductors and Connectors
- D. Section 26 27 26: Wiring Devices and Plates

PART 2 - PRODUCTS

2.1 GROUND CONDUCTORS

- A. Bare or green insulated copper.

2.2 GROUND ROD CONNECTORS

- A. Cast, set screw or bolted type.

2.3 ELECTRODES

- A. Copper clad steel minimum 3/4-inch diameter by 8 feet long.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Grounding system will consist of the following:
 - 1. Minimum of 20' bare no. 4 copper concrete-encase grounding conductor.
 - 2. Provide bond to building steel.
 - 3. Provide bond to cold water piping within 5' of building entry.
 - 4. Provide bond to minimum of 2 ground rods.
- B. Establish a ground for each separately derived system, e.g., transformers and generators, per NEC 250-30.
- C. All grounding conductors shall be sized in accord with the National Electrical Code.
- D. Grounding conductor connectors shall be made up tight and located for future servicing and to ensure low impedance.
- E. Ground the electrical system, the cold-water service, structural steel, and transformers to the building ground grid.
- F. All feeder and service raceways shall be grounded.
- G. All plug-in receptacles shall be bonded to the boxes, raceways and grounding conductor.

GROUNDING AND BONDING

- H. Provide equipment-grounding conductor in all branch circuit, feeder and service raceways.
- I. Provide insulated grounding conductor in all branch circuit wiring serving Classrooms, Administration offices and all data locations.
- J. Provide bonding jumper between ground and neutral bus at main service.

END OF SECTION

CONDUITS, RACEWAYS, BOXES AND FITTINGS**PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Work Included:
 - 1. Provide raceways and conduits of specified types for all electrical systems wiring, except where clearly shown or specified otherwise. All fittings, boxes, hangers and appurtenances shall be included.
 - 2. Size raceways and conduits as indicated on the Drawings. Where no size is indicated, conduit may be the minimum code permitted size for the quantity of type THW conductors installed. Minimum size is 3/4".

1.2 RELATED WORK

- A. Section 26 00 00: General Provisions
- B. Section 26 05 00: Basic Materials and Methods

1.3 SUBMITTALS

- A. Shop Drawings.
- B. Product Data.
- C. Operational Instructions and Maintenance Data.

PART 2 - PRODUCTS**2.1 METALLIC CONDUITS**

- A. GRC: Threaded rigid heavy wall galvanized steel.
- B. IMC: Threaded intermediate galvanized steel.
- C. EMT: Zinc coated steel electrical metallic tubing.
- D. ARC: Threaded rigid heavy wall aluminum.
- E. Flex: Flexible metal with polyvinyl chloride jacket, at speakers and no longer than 3'-0".
- F. Liquidtight flexible conduit: Zinc steel core with smooth gray abrasion-resistant, liquid-tight PVC cover with integral ground wire wound in steel core, at speakers and no longer than 3'-0".

2.2 NON-METALLIC CONDUITS

- A. Rigid non-metallic conduit: Type II PVC schedule 40, suitable for use with 90 degrees C rated wire. Conduit shall conform to UL Standard 651 and carry appropriate UL listing for above and below ground use.

2.3 SURFACE RACEWAYS

- A. Acceptable manufacturer(s): Wiremold, Panduit as noted on drawings, or approved equal.
- B. Type, size with quantity and spacing of outlets as shown on drawings. Provide with snap-on cover, connectors, fittings and incidental items required for a complete installation. All surface raceways shall be mechanically fastened.

CONDUITS, RACEWAYS, BOXES AND FITTINGS**2.4 WIREWAYS**

- A. Troughs: Steel, painted, square in cross section, preformed knock-outs on standard spacing, hinged cover.
- B. Fittings: Tees, elbows, couplings as required for configuration shown on the Drawings.
- C. Supports: U-shaped, 1/4-inch by 1-1/2-inch steel strap, bent and prime painted.

2.5 FITTINGS

- A. GRC, IMC AND ARC:
 - 1. The conduit itself must be threaded, threaded couplings attached by any means are not allowed.
 - 2. Threaded locknuts.
 - 3. Threaded bushings: 1-1/4 inch and larger shall be of the insulated, grounding type as required under Section 26 05 26.
 - 4. Expansion fittings: O-Z/Gedney Electrical Mfg. Co. or approved equal type E expansion coupling with bonding jumper for up to four inches of movement.
- B. EMT:
 - 1. Connectors: Steel set screw or compression ring type for conduit termination, with insulated throat, suitable for conditions used.
 - 2. Couplings: Steel set screw or compression ring type, concrete tight.
- C. Weatherproof Connectors: Threaded pipe connections with waterproofing compound.

2.6 METALLIC BOXES

- A. Flush and Concealed Outlet Boxes: Galvanized stamped steel with screw ears, knock-out plugs, mounting holes, fixture studs if required, RACO or approved equal.
- B. Surface Outlet Boxes: Galvanized stamped steel same as above for use on ceilings; cast steel or aluminum with threaded hubs for use on walls.
- C. Large Boxes: Boxes exceeding 4-11/16 inches square when required shall be welded steel construction with screw cover and painted, steel gauge as required by physical size, Hoffman, Circle AW or approved equal.

2.7 NON-METALLIC BOXES

- A. PVC, molded enclosures, threaded hubs.

2.8 OTHERS

- A. Any conduits, fittings, etc. specifically not mentioned above are not approved for use.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Conceal all conduits in finished spaces and elsewhere so far as practicable. Concealed conduits shall run in a direct line with long sweep bends and offsets. GRC and IMC embedded in concrete below grade or in damp locations shall be made water-tight by painting the entire male thread with Rustoleum metal primer, or equal, before assembly.

CONDUITS, RACEWAYS, BOXES AND FITTINGS

- B. Route exposed conduit parallel or at right angles to structural building lines, and neatly offset into boxes. Conduits attached directly to building surfaces shall closely follow the surfaces. Conduit fittings shall be used to "saddle" under beams. ALL EXPOSED CONDUIT MUST HAVE ARCHITECT APPROVAL PRIOR TO INSTALLTION.
- C. Conduits, whether exposed or concealed, shall be securely supported and fastened at intervals of nominally every 8 feet and within 18 inches of each outlet, ell, fitting, panel, etc.
- D. Keep conduit and raceways closed with suitable plugs or caps during construction to prevent entrance of dirt, moisture, concrete or foreign objects. Raceways shall be clean and dry before installation of wire and at the time of acceptance.
- E. Pack spaces around conduits with oakum and seal to prevent entrance of moisture where conduits are installed in sleeves or block-outs penetrating moisture barriers.
- F. Where conduits penetrate fire rated concrete walls or floors, provide non-combustible caulking or putty 3M-fire barrier material of thickness required to equal or exceed the fire rating of wall or floor.

3.2 CONDUIT

- A. Install GRC or IMC galvanized steel conduits for wiring underground, in-cast-concrete construction, in damp locations, in hazardous areas and where subject to mechanical injury, with threaded fittings made up tight.
- B. EMT may be employed in all other dry protected locations.
- C. ARC may be used wherever EMT is acceptable, with no restriction on size.
- D. Flex is required where flexibility is necessary as at motors, transformers and recessed lighting fixtures, etc. Flex shall be jacketed type, except where concealed in dry locations and spaces such as ceiling cavities.
- E. PVC may be used underground, under interior slabs or where noted on the Drawings. Make connections with waterproof solvent cement. Provide GRC at 60 degree and larger bends and where penetrating slabs or elling up above grade in exterior locations. PVC conduit shall not be installed less than 30" under roadways or areas subject to heavy traffic. Provide a ground wire sized per code in all PVC conduits. Conductor quantities indicated in conduits do not include ground wires unless otherwise noted.
- F. Conduit stubbed from a concrete slab or wall to serve an outlet under a table or to supply a machine shall have a rigid conduit coupling flush with the surface of the slab. Provide plug where conduit is to be used in future.
- G. Conduits in above-grade slabs shall be located in the middle of the slab. The maximum size, spacing, and location of conduits in post-tensioned slabs shall be subject to approval by the structural engineer. Conduits larger than one inch shall not be run in slabs. .

3.3 RACEWAYS

- A. Surface metal raceway with snap-in cover may be used in finished spaces only as specified, or shown on Drawings.
- B. Surface metal wireways may be installed at locations to serve motor starters or other control devices where required by a multitude of wiring interconnections or physical layout.
- C. Expansion Joints:

CONDUITS, RACEWAYS, BOXES AND FITTINGS

1. All conduits crossing expansion joints where cast in concrete shall be provided with expansion-deflection fittings, equivalent to OZ/Gedney AXDX, installed per manufacturers recommendations.
 2. All conduits three inches and larger where not cast in concrete shall be rigidly secured to the building structure on opposite sides of a building expansion joint with an expansion-deflection fitting across the joint, equivalent to OZ/Gedney AXDX, installed per manufacturer's recommendations.
 3. All conduits less than three inches where not cast in concrete shall be provided with junction boxes securely fastened on both sides of the expansion joint, connected together with 15 inches of slack (a minimum of 15 inches longer than the straight line length) flexible conduit with copper green ground bonding jumper. In lieu of this flexible conduit, an expansion-deflection fitting, as indicated for conduits three inch and larger, may be installed.
- D. Seismic Joints
1. No conduits cast in concrete shall be allowed to cross a seismic joint.
 2. All conduits shall be provided with junction boxes securely fastened on both sides of the expansion joint, connected together with 15 inches of slack (a minimum of 15 inches longer than the straight line length) flexible conduit with copper green ground bonding jumper. Prior to installation, verify with Architect that the 15 inches is adequate for the designed movement, and if not, increase this length as required.

3.4 SURFACE RACEWAYS

- A. The raceway system shall provide a complete enclosure that protects the wires installed therein against damage.
- B. There shall not be any openings that exceed 1/16 inch (1.59 mm) in width on surfaces that are accessible following installation of the system.

3.5 FITTINGS

- A. Metallic raceways and conduits shall be assembled continuous and secured to boxes, panels, etc., with appropriate fittings to maintain electrical continuity. All conduit joints shall be cut square, reamed smooth with all fittings drawn up tight.

3.6 BOXES

- A. Outlet boxes shall be of code required size to accommodate all wires, fittings and devices. Provide multi-gang boxes as required to accept devices installed with no more than one device per gang. Equip all metallic boxes with grounding provisions.
- B. Flush wall switch and receptacle outlets used with conduit systems shall be 4 inches square, 1-1/2 inches or more deep, with one or two-gang plaster ring mounted vertically. Where three or more devices are at one location, use one piece multiple gang tile box or gang box with suitable device ring.
- C. Wall bracket and ceiling surface mounted lighting fixture outlets shall be 4-inch octagon, 1-1/2-inches deep with 3/8-inch fixture stud where required. Wall bracket outlets to have single gang opening where required to accommodate fixture canopy. Provide larger boxes or extension rings where quantity of wires installed requires more cubic capacity.
- D. Boxes for the special systems shall be suitable for the equipment installed. Coordinate size and type with the system supplier.

CONDUITS, RACEWAYS, BOXES AND FITTINGS

- E. Provide pull boxes where shown, or in conduit runs greater than 100 feet, or where required to limit the number of bends in any conduit to not more than three 90 degree bends or equivalent. Use galvanized boxes of code-required size with removable covers installed so that covers will be accessible after work is completed. Do not locate pull boxes or junction boxes in finished areas unless specifically shown or special permission is obtained from Architect.
- F. Boxes shall be flush with finished surfaces or not more than 1/8-inch below surface and be level and plumb. Long screws with spacers or shims for mounting devices will not be acceptable. No combustible material shall be exposed to wiring at outlets.

END OF SECTION

ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Clearly and properly identify the complete electrical system to indicate the loads served or the function of each item of equipment connected under this work.

PART 2 - PRODUCTS

2.1 LABELS

- A. Panels: Typed or pre-printed white permanent materials labels with adhesive backing, Specified Products, Inc. or equal.
- B. Equipment: Dymo-Tape, plastic tape with adhesive backing, field printed with proper tool.

PART 3 - EXECUTION

3.1 BRANCH CIRCUIT PANELBOARDS

- A. Indicate panel number with laminated plastic labels. Indicate voltage phase and feeder source, feeder wire size, and feeder breaker or fuse size with white permanent labels on the inside of the panel door.
- B. Provide machine-printed panel directories with protective, clear transparent covers, accurately accounting for every breaker installed, including spares. Schedules shall use the actual room designations assigned by name or number near completion of the work and not the space designation on the Construction Drawings. Update all existing panel schedules that are modified by this scope of work.

3.2 EQUIPMENT

- A. Label all disconnect switches, motor starters, relays, contactors, time switches indicating voltage, amperage, circuit number and equipment served with white permanent labels.
- B. Label all transformers and busways with black and yellow 4-1/2 inch high pre-printed adhesive backed materials.

3.3 SYSTEMS

- A. Complex control circuits may utilize any combination of colors with each conductor identified throughout, using wraparound numbers or letters. Use the number or letters shown where the Drawings or operation and maintenance data indicate wiring identification.
- B. Label the fire alarm and communication equipment zones, controls, indicators, etc. with machine printed labels or indicators appropriate for the equipment installed, as supplied or recommended by the equipment manufacturer.

END OF SECTION

ASBESTOS ABATEMENT CONTRACTOR SPECIFICATIONS

Hiteon Elementary School HVAC Upgrade Project 13800 SW Brockman Road Beaverton, OR 97008

Prepared for:

**Beaverton School District
16550 SW Merlo Road
Beaverton, Oregon 97006**

Submitted: September 22, 2020

Prepared By:



**4105 SE International Way, Suite 505
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TRC Project Number: **401824**

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Appendices

Appendix A – LIMITED SUPPLEMENTAL ASBESTOS SURVEY REPORT

ASBESTOS

PART 1 GENERAL - ASBESTOS

1.01 SCOPE OF WORK

- A. The asbestos abatement and disturbance work related to this Project may consist of the removal and disposal of asbestos containing materials (ACM) and presumed asbestos containing materials (PACM) within portions of Hiteon Elementary School located at 13800 SW Brockman Road in Beaverton, Oregon 97008 as part of a planned renovation project. This section is intended to provide instruction for requirements in connection with asbestos abatement or disturbance and is complementary to the other contract documents, which apply to this section by reference.
- B. For Work described in this specification, the Abatement Contractor (Contractor) shall furnish all labor, materials, equipment, tools, and any other resources necessary to complete the work in accordance with regulatory requirements and project contract documents, using best available technology and industry standard methods and procedures. The work shall include but not be limited to the removal and proper disposal of ACM and/or presumed ACM (PACM) materials should they need to be impacted by the scope of the renovation project.

Asbestos Containing Materials

The following table presents the known asbestos containing materials associated with Hiteon Elementary School:

Description	Material Location(s)	Friable / non-Friable
Floor Tile and Mastic	A Hall Area	Non-Friable
12" x 12" Beige and Yellow/Tan Floor Tile and Mastic	B Hall Area	Non-Friable
Chalkboard Mastic, Tan	Throughout	Non-Friable
Transite Panels	Custodial Office	Non-Friable
Window Glazing	Throughout	Non-Friable
Fire Doors	Throughout	Friable

The following table presents the known OSHA regulated materials, containing <1.0% asbestos associated with Hiteon Elementary School:

Description	Material Location(s)	Friable / non-Friable
Gypsum Board and Joint Compound System	Throughout	Non-Friable

Please refer to Appendix A, Limited Supplemental Asbestos Survey Report dated, July 20, 2020, for additional and more detailed information on the additional asbestos materials present at the Site.

- C. The Contractor shall be aware of all conditions of the Project and is responsible for verifying quantities and locations of all Work to be performed. Failure to do so shall not relieve the Contractor of its obligation to furnish all labor, equipment, and materials necessary to perform the Work.

- D. All Work shall be performed in strict accordance with the Project Documents and all governing codes, rules, and regulations. Where conflicts occur between the Project Documents and applicable codes, rules, and regulations, the more stringent requirement shall apply.
- E. Working hours shall be as required and approved by the Owner. ERM abatement activities including, but not limited to, work area preparation, gross removal activities, waste clean-up activities, waste removal, etc. may need to be performed during the specified time period by the Owner. The Contractor shall coordinate and schedule all Work with the facility and Owner's representative.

1.02 PERMITS AND COMPLIANCE

- A. The Contractor shall assume full responsibility and liability for compliance with all applicable Federal, State, and local laws, rules, and regulations pertaining to Work practices, protection of Workers, authorized visitors to the site, persons, and property adjacent to the Work.
- B. Perform asbestos related Work in accordance with Federal, State and Local Regulations (U.S. Environmental Protection Agency (EPA) 40 CFR 61, Occupational Health and Safety (OSHA) 29 CFR 1926 and Oregon Department of Environmental Quality (ODEQ)). Where more stringent requirements are specified, the Contractor shall adhere to the more stringent requirements.

1.03 SUBMITTALS

- A. Pre-Work Submittals: Within 10 calendar days prior to the pre-construction conference, the Contractor shall submit copies of the documents listed below to Beaverton School District's Environmental Consultant for review and approval prior to the commencement of asbestos abatement activities:
 - 1. Asbestos Removal Work Plan which includes the means, methods and protective measures which will be used to comply with all applicable Federal, State and Local rules and regulations. This plan shall be completed and signed by an EPA accredited Asbestos Project Designer.
 - 2. Current worker and contractor/supervisor training records.
 - 3. Insurance Certificates
 - a. All Certificates of Insurance must name Beaverton School District as additional insured and will comply with entities noted in the contract as additional insured. These include the following:
 - Asbestos/Pollution Liability - \$1,000,000;
 - Auto Liability - \$1,000,000 per each vehicle on site;
 - Workman's Compensation and Employers Liability - \$500,000 per accident;
 - Commercial General Liability - \$1,000,000 per occurrence with \$2,000,000 general aggregate per project
 - True Umbrella Policy - \$5,000,000

- b. All insurance will be written through companies having an A.N. rating of at least A VII or with such other companies as may reasonably be approved by Owner. All such liability insurance maintained by the Contractor or any subcontractor will include the condition that it is primary and that any such insurance maintained by Owner or any other additional insured is excess and non-contributory.
- B. On-Site Submittals: Refer to Part 3.01.C for all submittals, documentation, and postings required to be maintained on-site during abatement activities.
- C. Project Close-out Submittals: Within 30 business days of the completion of the project, the Contractor shall submit digital and hard copies of the documents listed below. The documents shall be transmitted to the Environmental Consultant for review and approval prior to the Contractor's final payment.
 - 1. Originals of all waste disposal manifests, seals, and disposal logs.
 - 2. OSHA personal air monitoring results conducted during the Work.
 - 3. Daily progress log describing in detail the areas of work and ACM/PACM affected by the day's work activities and regulated work area entry/exit logs
 - 4. Project Notifications
 - 5. Safety Meeting Logs
 - 6. Insurance Certificates
 - 7. Workers Certifications and Medical Monitoring
 - 8. Contractors Licenses

1.04 PRE-CONSTRUCTION CONFERENCE

- A. Prior to start of preparatory Work under this Contract, the Contractor shall attend a pre-construction conference attended by Owner, Architect and Environmental Consultant.
- B. Agenda for this conference shall include but not necessarily be limited to:
 - 1. Contractor's Asbestos Removal Work Plan
 - 2. Environmental Consultant's duties and functions
 - 3. Contractor's Work procedures including:
 - a. Methods of job site preparation and removal methods
 - b. Respiratory protection
 - c. Disposal procedures
 - d. Cleanup procedures
 - e. Fire exits and emergency procedures

4. Contractor's required pre-work and on-site submittals, documentation, and postings
 5. Contractor's plan for twenty-four (24) hour project security both for prevention of theft and for barring entry of unauthorized personnel into work areas
 6. Temporary utilities
 7. Storage of removed asbestos containing materials
 8. Waste disposal requirements and procedures, including waste manifest and container seals
- C. In conjunction with the conference the Contractor shall accompany the Owner, Architect and Environmental Consultant on a pre-construction walk-through of the Project site.

1.05 APPLICABLE STANDARDS AND REGULATIONS

All asbestos related work must be performed in accordance with EPA and OSHA regulations (40 CFR 61, 29 CFR 1926) and Oregon Department of Environmental Quality. Where more stringent requirements are specified, the Contractor shall adhere to the more stringent requirements.

1.06 NOTICES

- A. The Contractor shall provide notification of intent to commence asbestos abatement activities at least ten (10) working days prior to beginning abatement activities. Written notification shall be sent to the Oregon Department of Environmental Quality Department (DEQ).
- B. The Contractor shall maintain copies of notices, and provide proof of delivery and receipt.
- C. The Contractor shall be responsible for maintaining current project filings with regulatory agencies for the duration of the project.

1.07 ENVIRONMENTAL CONSULTANT

- A. The Owner shall engage the services of an Environmental Consultant (the Consultant) who shall serve as the Owner's Representative in regard to the performance of the asbestos abatement Project and provide direction as required throughout the entire abatement Project period.
- B. The Contractor is required to ensure cooperation of its personnel with the Consultant for the air sampling and Project monitoring functions described in this section. The Contractor shall comply with all direction given by the Consultant during the course of the Project.
- C. The Consultant shall review and approve all Contractor submittals.
- D. The Consultant shall staff the Project with a trained and certified person(s) to act on the Owner's behalf at the job site.
 1. The consultant's representative shall be on-site at all times the Contractor is on-site. The Contractor shall not be permitted to conduct any Work unless the consultant's representative is on-site (except for inspection of barriers and negative air system during non-working days).
 2. The consultant's representative shall have the authority to direct the actions of the Contractor verbally and in writing to ensure compliance with the Project documents and

all regulations. The consultant's representative shall have the authority to Stop Work when gross Work practice deficiencies or unsafe practices are observed, or when ambient fiber concentrations outside the removal area exceed 0.01 f/cc or background level.

- a. Such Stop Work order(s) shall be effective immediately and remain in effect until corrective measures have been taken and the situation has been corrected.
 - b. Standby time required to resolve the situation shall be at the Contractor's expense.
3. The consultant's representative shall provide the following services:
- a. Inspection of the Contractor's Work, practices, and procedures, including temporary protection requirements, for compliance with all regulations and Project specifications including provisions required by Variances, the Work Place Safety Plan and Asbestos Work Permit.
 - b. Provide abatement Project air sampling as required by applicable regulations and the Owner. Sampling will include background, work area preparation, asbestos handling, final cleaning and clearance air sampling.
 - c. Verify daily that all Workers used in the performance of the Project are certified by the appropriate regulatory agency.
 - d. Monitor the progress of the Contractor's Work, and report any deviations from the schedule to the Owner.
 - e. Monitor, verify, and document all waste load-out operations.
 - f. Verify that the Contractor is performing personal air monitoring daily, and that results are being returned and posted at the site as required.
 - g. The consultant's representative shall maintain a log on site that documents all project related and Consultant and Contractor actions, activities, and occurrences.
4. The following minimum inspections shall be conducted by the consultant's representative. Additional inspections shall be conducted as required by Project conditions. Progression from one phase of Work to the next by the Contractor is only permitted with the written approval of the consultant's representative.
- a. Pre-Construction Inspection: The purpose of this inspection is to verify the existing conditions of the Work Areas and to document these conditions.
 - b. Pre-Commencement Inspection: The purpose of this inspection is to verify the integrity of each containment system prior to disturbance of any asbestos containing material. This inspection shall take place only after the Work Area is fully prepped for removal.
 - c. Work Inspections: The purpose of this inspection is to monitor the Work practices and procedures employed on the Project and to monitor the continued integrity of the containment system. Inspections within the removal areas shall be conducted by the consultant's representative during all preparation, removal, and cleaning

activities at least twice every Work shift. Additional inspections shall be conducted as warranted.

- d. Pre-Encapsulation Inspection: The purpose of this inspection is to ensure the complete removal of ACM and/or PACM, from all surfaces in the Work Area prior to encapsulation.
 - e. Visual Clearance Inspection: The purpose of this inspection is to verify that: all materials in the scope of work have been properly removed; no visible asbestos debris/residue remains; no pools of liquid or condensation remains; and all required cleanings are complete. This inspection shall be conducted before final air clearance testing.
 - f. Post-Clearance Inspection: The purpose of this inspection is to ensure the complete removal of ACM, including debris, from the Work Area after satisfactory final clearance sampling and removal of all isolation and critical barriers and equipment from the Work Area.
- E. The Consultant shall provide abatement Project air sampling and analysis as required by applicable regulations. Sampling will include background, work area preparation, asbestos handling, and final cleaning and clearance air sampling.
- 1. Unless otherwise required by applicable regulations, the Consultant shall have samples analyzed by Phase Contrast Microscopy (PCM) for daily area and final clearance air monitoring during asbestos removal or disturbance work. Results shall be available at the Project site within 2 hours of completion of sampling. Should TEM analysis be requested/required, results will be provided within 24 hours of receipt of samples by the accredited laboratory.
 - 2. Samples shall be collected as required by applicable regulations and these specifications.
 - 3. If the air sampling during any phase of the abatement project reveals airborne fiber levels at or above .01 fibers/cc or the established background level, whichever is greater, outside the regulated Work Area, Work shall stop immediately and corrective measures required by applicable regulations shall be initiated. Notify all employers and occupants in adjacent areas. The Contractor shall bear the burden of any and all costs incurred by this delay.
 - 4. At the completion of each abatement phase, the Consultant shall prepare an interim certificate of completion for project records.

1.08 PERSONAL AIR SAMPLING

- A. The Contractor shall perform appropriate personal air monitoring in accordance with 29 CFR 1926.1101, every Work shift in each Work Area during which abatement activities occur in order to determine that appropriate respiratory protection is being worn and utilized.
- B. The Contractor shall conduct air sampling that is representative of both the 8-hour time weighted average and 30-minute short-term exposures to indicate compliance with the permissible exposure and excursion limits.
- C. The Contractor's laboratory analysis of air samples shall be conducted by laboratory accredited by the American Industrial Hygiene Association (AIHA) for PCM analysis.

- D. Results of personnel air sample analyses shall be available within 5 business days of sample collection.

1.09 PROJECT SUPERVISOR

- A. The Contractor shall designate a full-time Project Supervisor who shall meet the following qualifications:
 - 1. The Project Supervisor shall hold an Asbestos Hazard Emergency Response Act (AHERA) certification as an Asbestos Contractor/Supervisor.
 - 2. The Project Supervisor shall meet the requirements of a "Competent Person" as defined by OSHA 1926.1101 and shall have a minimum of one year experience as a supervisor.
 - 3. The Project Supervisor must be able to speak, read, and write English fluently, as well as communicate in the primary language of the Workers and immediate community.
- B. The Project Supervisor shall be responsible for the performance of the Work and shall represent the Contractor in all respects at the Project site. The Supervisor shall be the primary point of contact for the Asbestos Project Monitor.

1.10 RESPIRATORY PROTECTION

- A. Select respirators from those approved by the National Institute for Occupational Safety and Health (NIOSH), Department of Health and Human Services.
- B. High Efficiency Particulate Air (HEPA) respirator filters shall be approved by NIOSH and shall conform to the OSHA requirements in 29 CFR 1910.134 and 29 CFR 1926.1101.
- C. A storage area for respirators shall be provided by the Contractor in the clean room side of the personnel decontamination enclosure where they will be kept in a clean environment.
- D. The Contractor shall provide and make available a sufficient quantity of respirator filters so that filter changes can be made as necessary during the work day. Filters used with negative pressure air purifying respirators shall be changed regularly to comply with OSHA.
- E. Any visitor, Worker, or supervisor found in the Work Area not wearing the required respiratory protection shall be removed from the Project site.

1.11 DELIVERY AND STORAGE

- A. Store all materials at the job site in a suitable and designated area.
 - 1. Store materials subject to deterioration or damage away from wet or damp surfaces and under cover.
 - 2. Protect materials from unintended contamination and theft.
 - 3. Storage areas shall be kept clean and organized.
- B. Remove damaged or deteriorated materials from the job site. Materials contaminated with asbestos shall be disposed of as asbestos debris.

1.12 TEMPORARY UTILITIES

- A. Shut down and lock out all electrical power to the asbestos Work Areas.
- B. Provide temporary electric service with Ground Fault Circuit Interrupters (GFCI) for all electric requirements within the asbestos Work Area.
- C. Provide temporary lighting with "weatherproof" fixtures for all Work Areas.
- D. Utilize domestic water service, if available, from Owner's existing system. Provide hot water heaters with sufficient capacity to meet Project demands.

PART 2 PRODUCTS

2.01 MATERIALS

- A. All materials shall be delivered to the job site in the original packages, containers, or bundles bearing the name of the manufacturer, the brand name and product technical description, with Safety Data Sheets (SDSs) as applicable.
- B. No damaged or deteriorating materials shall be used. If material becomes contaminated the material shall be decontaminated or disposed of as asbestos-containing waste material. The cost to decontaminate and dispose of this material shall be at the expense of the Contractor.
- C. Fire retardant polyethylene sheet shall be in roll size to minimize the frequency of joints, with factory label indicating no less than six (6) mil thickness.
- D. Polyethylene disposable bags shall be no less than six (6) mils thick.
- E. A commercial grade duct tape (or equivalent) capable of sealing joints in adjacent polyethylene sheets and for the attachment of polyethylene sheets to finished or unfinished surfaces must be capable of adhering under both dry and wet conditions.
- F. Any planking, bracing, shoring, barricades and/or temporary sheet piling, necessary to appropriately perform work activities shall conform to all applicable federal, state and local regulations.

2.02 TOOLS AND EQUIPMENT

The Contractor shall provide tools and equipment that are suitable for asbestos related activities and in good working order.

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

- A. The following submittals, documentation, and postings shall be maintained on-site by the Contractor during abatement activities:

1. Asbestos worker and contractor/supervisor certification cards for each person employed in the removal, handling, or disturbance of asbestos
 2. Daily OSHA personal air monitoring results
 3. Project documents (specifications and drawings)
 4. Applicable regulations
 5. Safety Data Sheets of supplies/chemicals used on the Project
 6. Approved Abatement Work Plan
 7. List of emergency telephone numbers
 8. Daily Project Log
- B. The following documentation shall be maintained on-site by TRC Environmental Corp. during abatement activities:
1. Air sample results
 2. Project Monitor Daily Log
 3. Asbestos Survey Report
 4. A copy of ASTM Standard E1368 "Standard Practice for Visual Inspection of Asbestos Abatement Projects"
- C. Install emergency exit signage and fire extinguishers throughout the Work Area in accordance with OSHA Construction Industry Standards.
- D. Use the following engineering controls and work practices for all asbestos abatement operations, regardless of measured exposure levels:
1. Vacuum cleaners equipped with HEPA filters to collect all asbestos-containing dust and debris
 2. Wet methods to control exposures during asbestos removal and clean-up, except where proven to be infeasible
 3. Prompt clean-up and disposal of asbestos-contaminated wastes and debris in leak-proof containers
- E. Do not use any of the following equipment or work practices during asbestos abatement operations, regardless of measured exposure levels:
1. High-speed abrasive disc saws not equipped with point-of-cut HEPA ventilation or HEPA filtered exhaust air enclosures
 2. Blowing with compressed air to remove asbestos-containing materials

3. Dry sweeping, shoveling, or other dry methods to clean up asbestos-containing dust and debris
 4. Employee rotation as a means of reducing employee exposure to asbestos
- F. Protect adjacent areas, materials and surfaces from damage due to demolition operations, including but not necessarily limited to the following:
1. Water damage
 2. Dirt, dust and debris
 3. Abrasion
 4. Cuts and scratches
 5. Holes from fasteners for temporary barriers

3.02 PROTECTIVE CLOTHING

- A. Provide personnel utilized during the Project with disposable protective whole body clothing, head coverings, gloves and foot coverings. Provide disposable plastic or rubber gloves to protect hands. Cloth gloves may be worn inside the plastic or rubber for comfort, but shall not be used alone. Make sleeves secure at the wrists and make foot coverings secure at the ankles by the use of tape, or provide disposable coverings with elastic wrists or tops.
- B. Authorized visitors shall be provided with suitable protective clothing, headgear, eye protection, and footwear whenever they enter the Work Area.

3.03 SIGNS AND LABELS

- A. Provide warning signs and barrier tapes at all approaches to asbestos Work Areas. Locate signs at such distance that personnel may read the sign and take the necessary protective steps required before entering the area.
1. Provide danger signs in vertical format conforming to 29 CFR 1926.1101, minimum 20" x 14" displaying the following legend.

ASBESTOS CANCER AND LUNG DISEASE
HAZARD
AUTHORIZED PERSONNEL ONLY
RESPIRATORS AND PROTECTIVE CLOTHING
ARE REQUIRED IN THIS AREA
 2. Provide 3" wide OSHA-Approved barrier tape printed with black lettered, "DANGER ASBESTOS REMOVAL". Locate barrier tape across all corridors, entrances and access routes to asbestos Work Area. Install tape 3' to 4' Above Finished Floor AFF.
- B. Provide asbestos danger labels affixed to all asbestos materials, scrap, waste, debris and other products contaminated with asbestos.
1. Provide asbestos danger labels of sufficient size to be clearly legible, displaying the following legend:

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

2. Provide the following asbestos labels, of sufficient size to be clearly legible, for display on waste containers (bags or drums) which will be used to transport asbestos contaminated material in accordance with United States Department of Transportation 49 CFR Parts 171 and 172: (Note: Include "RQ" for friable asbestos waste only.)

RQ, (WASTE) ASBESTOS, 9, NA2212, PGIII

3. Generator identification information shall be affixed to each waste container indicating the following printed in indelible ink:
 - Generator Name
 - Facility Name
 - Facility Address
 - EPA Generator ID Number

3.04 FRIABLE ACM REMOVAL BY FULL ENCLOSURE METHOD

A. Preparation of the Work Area

1. Install critical barriers over each opening into the regulated area. The following requirements are in addition to, not in lieu of, other indicated surface and object protection requirements:
 - a. Seal each opening between the work area and adjacent areas with not less than 2 layers of 6-mil polyethylene sheeting. Use an expanding-polyurethane foam gun to seal areas with large numbers of pipes, conduits and beams. Openings include, but are not necessarily limited to, windows, skylights, doorways, elevator hoist way openings, corridor entrances, drains, ducts, grills, grates, and diffusers.
 - b. Seal intake and exhaust vents and duct seams within the regulated area with not less than 2 layers of 6-mil polyethylene sheeting.
2. HVAC System Shutdown: Owner's maintenance personnel will shut down heating, cooling, and air conditioning systems when necessary. Coordinate scheduling with Owner's personnel.
3. Protection of Surfaces and Objects: The following requirements are in addition to, not in lieu of, indicated work area sealing requirements. Cover the following surfaces and objects as follows:
 - a. Protect all surfaces beneath all removal activity. Remove moveable objects from the work area, and cover fixed objects with impermeable drop cloths or plastic sheeting with edges securely sealed with tape.
 - b. Provide clean, fresh air to mechanical equipment, where required to maintain proper performance of equipment.
 - c. Fully pre-clean all covered surfaces with amended water and a HEPA vacuum.

- d. Cover walls with not less than 2 layers of 6-mil polyethylene sheeting. Construct free-standing enclosure walls of not less than 6-mil polyethylene sheeting, with supports spaced not more than 3 feet on center.
 - e. Cover floors with not less than 2 layers of 6-mil polyethylene sheeting. Avoid seams where possible. If seams are necessary, overlap not less than 12 inches and tape joints. Extend sheeting 12 inches up the side walls leaving no seams at the wall and floor joint. Immediately repair punctures and leaks, and clean up seepage.
- 4. Cleaning: Do not use cleaning methods that raise dust, such as sweeping or using vacuum cleaners not equipped with HEPA filters. Do not disturb asbestos materials during pre-cleaning phases. Treat water removed from the enclosure as asbestos contaminated waste. Fully seal floor drains.
- 5. Deactivate or install ground-fault circuit interrupters on each electrical circuit within the enclosure.
- 6. Construct a three-chambered decontamination facility that is adjacent to and connected to the regulated area, and that consists of a dirty room, a shower room, and a clean room in series. Construct decontamination facilities that are exposed to weather of lumber and exterior grade plywood. Secure the facility when not in use.
 - a. Supply the equipment room with properly labeled, impermeable bags and containers for the containment and disposal of contaminated protective equipment.
 - b. Construct showers that comply with the requirements of 29 CFR 1910.141 (d) (3), with the shower room adjacent to both the equipment room and the clean room. Filter water waste and shower water through a 5 micron filter, or remove water from site as asbestos waste.
 - c. Equip the clean room with a locker or appropriate storage container for each employee.
- 7. Employee Decontamination Facilities
 - a. Access the work area only through an approved decontamination system. Lock or block other entrances. Seal emergency exits (for use during a fire or accident) with polyethylene sheeting and tape.
 - b. Seal the waste pass-out, except during the removal of asbestos waste from the enclosure.
 - c. Entrance to The Regulated Area: Employees shall enter the decontamination area through the clean room, remove and store clothing, and put on protective clothing and respiratory protection before passing through to the equipment room.
 - d. Exit from The Regulated Area: Employees shall exit the regulated area by removing gross contamination and debris from their protective clothing. The clothing shall be removed and disposed of in the equipment room into labeled impermeable bags or containers. Employees shall then shower and enter the clean room before changing into street clothes.

8. Local Exhaust Ventilation: Maintain portable air filtration units with a HEPA filter in use during asbestos abatement operations requiring enclosures. Units shall conform to OSHA Standard 1926.1101, Appendix F, and shall be designed in accordance with 40 CFR 61, Subpart M, Section 61.153.
 - a. Exhaust directly to building exterior. Provide a backup portable air filtration unit at each removal enclosure. Startup ventilation units prior to initiating asbestos removal operations and run until the Owner's consultant has approved their shut-down after cleaning, visual inspection, clearance sampling and tear-down.
 - b. Direct air movement within the enclosure away from the employees' work area and toward the air filtration device.
 - c. Provide not less than 4 air changes per hour within the enclosure.
 - d. Within the enclosure, through the period of its use, maintain a pressure differential of not less than minus 0.02 water gage with respect to ambient conditions outside the enclosure. Provide continuous measurement of the pressure differential at each negative pressure enclosure.
9. Visually inspect the enclosure for breeches and smoke-test for leaks before work begins, and before the start of each work shift. Make all modifications to the enclosure prior to starting removal work.

B. Work Practices

1. Immediately preceding asbestos removal, apply a fine mist of water to the asbestos materials and the surrounding area. Keep surrounding areas wet by spraying periodically with amended water. Maintain a high humidity environment to assist in fiber settling.
2. Remove asbestos material using two-person teams, on staging platforms, if necessary.
3. Remove the wet asbestos material as intact sections or components. Carefully lower the material to the floor or place directly into container. Never drop or throw asbestos material on the floor.
4. At working heights between 15 and 50 feet above the floor, place removed asbestos materials in containers at the elevated levels and lower to floor, or place onto inclined chutes or scaffolding for subsequent collection and placement into containers. Clean all debris at the completion of each workday.
5. Once the asbestos material is at ground level, pack in labeled 6-mil polyethylene bags, wet and, if appropriate, hold in drums prior to starting the next section.
6. Use 2 sealed and labeled 6-mil thick bags for storage and transportation of asbestos waste. Standing water shall be in each bag
7. Wrap large components removed intact in two layers of 6-mil polyethylene sheeting, label, and secure with tape for transport to the landfill. Comply with all wetting requirements.

8. Treat wires, hangers, steel bands, nails, screws, metal lath, tin sheeting, and similar sharp objects removed with asbestos material as asbestos waste. Place in drums for disposal.
9. Label containerized asbestos waste in accordance with OSHA, EPA, and Department of Transportation regulations, as follows:
 - a. Label each container with OSHA label that contains the following information:

**DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG
DISEASE HAZARD**
 - b. Label each container with Owner's and Asbestos Abatement Firm's names and addresses as required by NESHAP.
 - c. Label each container with Class 9 Label required by DOT and identify waste as "RQ, Asbestos NA 2212."
10. Remove containerized asbestos waste daily from site, or store on site in a locked or secured location until ready for final disposal. Obtain approval of Owner's Representative of the location of disposal containers. Outdoor waste containers shall be fully enclosed and locked. Mark vehicles used to transport waste during the loading and unloading of asbestos waste with a visible sign, as required by NESHAP.

3.05 REMOVAL OF NON-FRIABLE ASBESTOS-CONTAINING MATERIALS

A. Removal of Vinyl Floor Tile (unless rendered Friable)

1. Prior to removal, critical barriers shall be placed over openings to the regulated area.
2. Prior to removal, clean floors of dirt and debris with vacuums equipped with HEPA filter.
3. Sanding the floor or related backing is not permitted.
4. Mechanical chipping of vinyl floor tile is prohibited, except when performed in a negative pressure enclosure.
5. Thoroughly wet vinyl floor tile with water. Use a slip scraper or equivalent to loosen the floor tile from the floor. Remove the floor tile in an intact state. Keep the floor tile wet throughout the removal and cleanup.
6. Place the resilient flooring material and debris in an asbestos disposal bag. Seal the bag and place it in a properly labeled drum. Comply with the disposal and labeling requirements of this document.

B. Asbestos Mastic/Glue Removal

1. Prior to removal, critical barriers shall be placed over openings to the regulated area.
2. Clean the floor of all debris using a HEPA vacuum, wet sweeping, mopping or equivalent.

3. Remove as much mastic as possible using a Consultant approved solvent. Control odors and fumes with engineering controls.
4. Perform scraping of residual adhesive using wet methods.
5. After all debris is removed, thoroughly mop the floor and allow time to dry.
6. Properly dispose of all asbestos and solvent waste according to all applicable regulations, and comply with the disposal and labeling requirements of this Section.

C. Asbestos-Containing Siding and Transite Panels (if applicable)

1. Create a regulated work area and place impermeable drop cloths on surfaces beneath removal activity.
2. Cutting, abrading, or breaking material is not permitted.
3. Wet material with water prior to removal.
4. Carefully disassemble material such a manner as to prevent breakage.
5. Wrap and seal material in two layers 6-mil thick polyethylene, asbestos disposal bags, or equivalent. Seal bags or packages and properly label them with appropriate asbestos warning signs.

D. Non-Friable Asbestos Containing Exterior Sealant, Caulk, Putty and Window Glazing (if applicable)

1. Create a regulated work area and place impermeable drop cloths on surfaces beneath removal activity.
2. Any existing loose material shall be HEPA vacuumed prior to removal.
3. The material shall be thoroughly wetted prior to and during its removal.
4. The material should be removed as intact as possible. Manual methods shall be used.
5. Removed ACM shall be immediately bagged.
6. The removal of windows and other whole building components without disturbing the asbestos is encouraged.
7. If the material becomes friable during the abatement process, comply with the requirements for friable asbestos removal.

3.06 WORK AREA DECONTAMINATION AND CLEARANCE PROCEDURES

- A. The Asbestos Abatement Contractor's representative, in presence of Owner's consultant, shall inspect the entire work area for asbestos.
- B. If any suspect asbestos dust or debris is found, repeat final cleaning operation, until the visual inspection is satisfactory to the Owner's consultant.

- C. After final visual clearance criteria have been achieved in the work areas, the Owner's consultant will notify the Abatement Contractor to encapsulate all walls, floors, ceilings, other exposed surfaces, and decontamination facilities.
- D. Clearance air sampling will be completed by the Owner's consultant after the encapsulant has dried. Any costs associated with re-cleaning due to failed clearance results will be the sole responsibility of the Abatement Contractor. All clearance air samples shall be at or below 0.01 fibers per cubic centimeter as measured using Phase Contrast Microscopy (NIOSH 7400 method) or below 70 structures per square millimeter by Transmission Electron Microscopy (TEM) using the AHERA analytical method.
- E. After abatement clearance is given by the Asbestos Project Monitor the Abatement Contractor may remove the containment, which shall be disposed of as ACM.

3.07 WASTE DISPOSAL

- A. All waste will be transported and disposed of in compliance with DOT requirements and all applicable Federal, State and local regulations. Disposal must occur at an acceptable landfill accompanied by a waste manifest.
- B. A copy of all waste manifests shall be given to Owner upon completion of the project.

APPENDIX A

LIMITED SUPPLEMENTAL ASBESTOS SURVEY REPORT

**Hiteon Elementary School
13800 SW Brockman Road
Beaverton, Oregon 97008
Dated: July 20, 2020**

LIMITED SUPPLEMENTAL ASBESTOS SURVEY REPORT

Hiteon Elementary School

**13800 SW Brockman Road
Beaverton, OR 97008**

Prepared for:

Beaverton School District

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

Inspection Dates: June 29, 2020

Report Prepared: July 20, 2020

Prepared By:



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

TRC Project Number: 401824

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Appendices

- Appendix A – Figures
- Appendix B – Laboratory Analytical Data Sheets
- Appendix C – Prior Documentation
- Appendix D – Inspector Certification(s)

EXECUTIVE SUMMARY

TRC Environmental Corporation (TRC) was contracted by the Beaverton School District to conduct a supplemental asbestos survey, including collection of bulk asbestos samples, laboratory analysis, and preparation of a report for Hiteon Elementary School located at 13800 SW Brockman Road in Beaverton, Oregon 97008. Mr. Matt Cuda and Mr. Jason Stone, AHERA accredited building inspectors performed the survey on June 29th, 2020. The survey activities included the review of prior sampling documentation and reports provided by the District, inspection and assessment of accessible suspect building materials, collection of bulk samples of suspect asbestos containing building materials that had previously not be sampled, and submission of bulk samples for laboratory analysis.

ASBESTOS MATERIAL SUMMARY

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

The following materials sampled during this investigation and prior investigations were identified as asbestos containing materials:

- Floor Tile and Mastic (Previously Sampled)
- 12" x 12" Beige and Yellow/ Tan Floor Tile and Mastic (Previously Sampled)
- Chalkboard Mastic, Tan (Previously Sampled)
- Window Glazing (Previously Sampled)
- Transite Panels (Previously Sampled)
- Joint Compound (A-Wing, B-Wing and C-Wing)
- Fire Doors (Assumed)

The following materials sampled during this investigation and prior investigations were identified as OSHA Regulated Materials (OSHA):

- Gypsum Board and Joint Compound (Composite - Throughout)

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

INTRODUCTION

A supplemental asbestos survey was conducted by TRC at Hiteon Elementary School, located at 13800 SW Brockman Road in Beaverton, Oregon. It was reported by the client that this limited hazardous materials survey is being conducted in conjunction with their HVAC renovation project. The survey activities were performed on June 29th, 2020, and included the review of prior sampling documentation and reports as well as the inspection, assessment and bulk sampling of suspect asbestos containing building materials that had not previously been sampled. Sample locations are presented on the Sample Location Diagrams in Appendix A. Laboratory analytical results are presented in Appendix B and Prior Documentation is presented in Appendix C.

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

BACKGROUND

Asbestos Containing Materials

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

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

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

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

OSHA Regulated Materials

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

Asbestos Sampling and Analytical Procedures

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

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

The bulk samples were collected, labeled, and shipped to the certified analytical laboratory under proper COC documentation, and condition and approximate quantity assessments were performed by the accredited inspector during the inspection.

Laboratory services were provided by EMC Labs, Inc., in Phoenix, Arizona, 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
HES-01A HES-01B HES-01C HES-01D HES-01E HES-01F HES-01G HES-01H HES-01I	Built-up Roofing	Throughout	ND	N/A
HES-02A HES-02B HES-02C	Gray Roof Caulking	Throughout Roof Vents	ND	N/A
HES-03A HES-03B HES-03C	Roofing Felt Paper	Cafeteria Roof	ND	N/A
HES-04A HES-04B HES-04C	Black Roof Caulking	Edge Between Flashing and TPO Roof	ND	N/A
HES-05A HES-05B HES-05C	Gray Roofing Mastic	Roof Edge between TPO and Built-up Roofing	ND	N/A
HES-06A HES-06B HES-06C	HVAC Duct Tape	A Wing Mechanical Mezzanine	ND	N/A

ND = Non-detect

SF = Square feet

LF = Linear Feet

N/A = Not Applicable

Sample No.	Material	Sample Location	Asbestos Content	Approximate Quantity
HES-07A HES-07B HES-07C	Gray HVAC Caulking	A Wing Mechanical Mezzanine	ND	N/A
HES-08A HES-08B HES-08C	Gypsum Board and Joint Compound	Throughout A Wing	G.B. – ND J.C. – ND	N/A
HES-09A HES-09B HES-09C	Gypsum Board and Joint Compound	Throughout C Wing	G.B. – ND J.C. – 3% Chrysotile Comp – 0.5% Chrysotile	8,500 SF
HES-10A HES-10B HES-10C	Hard Fitting	C Wing Mechanical Mezzanine	ND	N/A
HES-11A HES-11B HES-11C	2' x 4' Drop-in Ceiling Tile with Fissures and Pinholes	Throughout C Wing	ND	N/A
HES-12A HES-12B HES-12C	Gray HVAC Duct Mastic	HVAC Ducts Throughout	ND	N/A
HES-13A HES-13B HES-13C	Black Mastic	Above Ceiling	ND	N/A
HES-14A HES-14B HES-14C	2' x 4' Drop-in Ceiling Tile, Pinholes	Throughout B Wing	ND	N/A
HES-15A HES-15B HES-15C	Gypsum Board and Joint Compound	Throughout B Wing	G.B. – ND J.C. – ND	N/A
HES-16A HES-16B HES-16C	2' x 4' Drop-in Ceiling Tile with Long Fissures and Pinholes	Throughout A Wing	ND	N/A
HES-17A HES-17B HES-17C	1' x 1' Ceiling Tile and Glue	Gym, Stage	Tile – ND Glue – ND	N/A

ND = Non-detect

SF = Square feet

LF = Linear Feet

N/A = Not Applicable

Asbestos Containing Materials (ACMs)

Asbestos was detected in the following materials sampled during this and prior investigations:

Material	Approximate Location(s)	Approximate Quantity
Floor Tile and Mastic	A112 (now part of library and hall)	Unknown (Previously Sampled)
12" x 12" Beige and Yellow/Tan Floor Tile and Mastic	B Hall	Unknown (Previously Sampled)
Chalkboard Mastic, Tan	C106 (Behind new whiteboard)	Unknown (Previously Sampled)

Material	Approximate Location(s)	Approximate Quantity
Joint Compound	A-Wing, B-Wing and C-Wing	Unknown (Previously Sampled)
Transite Panels	Custodial Office	40 SF
Window Glazing	Throughout	Unknown (Previously Sampled)
Fire Doors	Throughout	Assumed

OSHA Regulated Materials (<1.0%)

Material	Approximate Location(s)	Approximate Quantity
Gypsum Board and Joint Compound (Composite)	Throughout A-Wing, B-Wing and C-Wing	60,000 SF

Prior sampling data indicated a mix results from the A-Wing and B-Wing and current sample results indicated no asbestos detected in the samples from the A-Wing and B-Wing, therefore all the walls in these three areas are assumed to be OSHA regulated.

Non-Detect Materials (ND)

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

Material	Location
Built-up Roofing	Throughout
Gray Roof Caulking	Throughout Roof Vents
Roofing Felt Paper	Cafeteria Roof
Black Roof Caulking	Edge Between Flashing and TPO Roof
Gray Roofing Mastic	Roof Edge between TPO and Built-up Roofing
HVAC Duct Tape	A Wing Mechanical Mezzanine
Gray HVAC Caulking	A Wing Mechanical Mezzanine
Gypsum Board and Joint Compound	Throughout A Wing
Hard Fitting	C Wing Mechanical Mezzanine
2' x 4' Drop-in Ceiling Tile with Fissures and Pinholes	Throughout C Wing
Gray HVAC Duct Mastic	HVAC Ducts Throughout
Black Mastic	Above Ceiling
2' x 4' Drop-in Ceiling Tile, Pinholes	Throughout B Wing
Gypsum Board and Joint Compound	Throughout B Wing
2' x 4' Drop-in Ceiling Tile with Long Fissures and Pinholes	Throughout A Wing
1' x 1' Ceiling Tile and Glue	Gym, Stage
Duct Felt Tape	A Wing Penthouse, A103 Restroom
12" x 12" Floor Tile and Mastic, Light Gray and Yellow/Tan	A100, B Hall
Chalkboard Mastic, Brown	A100, A104, A108
Lay-in Ceiling Tile	A103 Restroom, B Hall (West), B Hall Main Corridor, Library
MJP Pipe Fittings	A112 (now part of Library and Hall), Main Entrance, Doors Between West B and A Wing
Cove Base and Mastic	A114 (now part of Library and Hall)
Hard Fitting	Boiler Room

Material	Location
Exterior Boiler Insulation	Boiler Room
Interior Boiler Insulation	Boiler Room
Boiler Door Gasket	Boiler Room
Chalkboard Mastic, Tan	C106
Ceramic Tile and Grout	Kitchen, Boy's Locker Room, Girl's Locker Room
Carpet Mastic and Leveling Compound	Library
Wall and Ceiling Plaster	Boy's Locker Room, Girl's Locker Room
Glued-on Ceiling Tiles	Main Corridor
Brick Mortar	Main Entrance
Sheet Flooring and Mastic, Tan	Restroom 4
Grey Sink Undercoating	Staff Room
Door Insulation, Off White	Doors between West B Hall and A Wing
Hard Fitting on Fiberglass Insulated Lines	Cafeteria Mechanical Loft

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

RECOMMENDATIONS

All identified asbestos containing and OSHA regulated materials from this investigation and previous investigations must be removed by a licensed asbestos abatement contractor prior to them being impacted by any renovation or demolition activities. Additionally, any materials uncovered during renovation or demolition activities that are not addressed in this inspection report or prior reports for the building are considered presumed asbestos containing materials and must be sampled by an accredited asbestos inspector prior to disturbance, or they must be treated as asbestos containing.

DISCLAIMER

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

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

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

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

Sincerely,
TRC Environmental Corporation

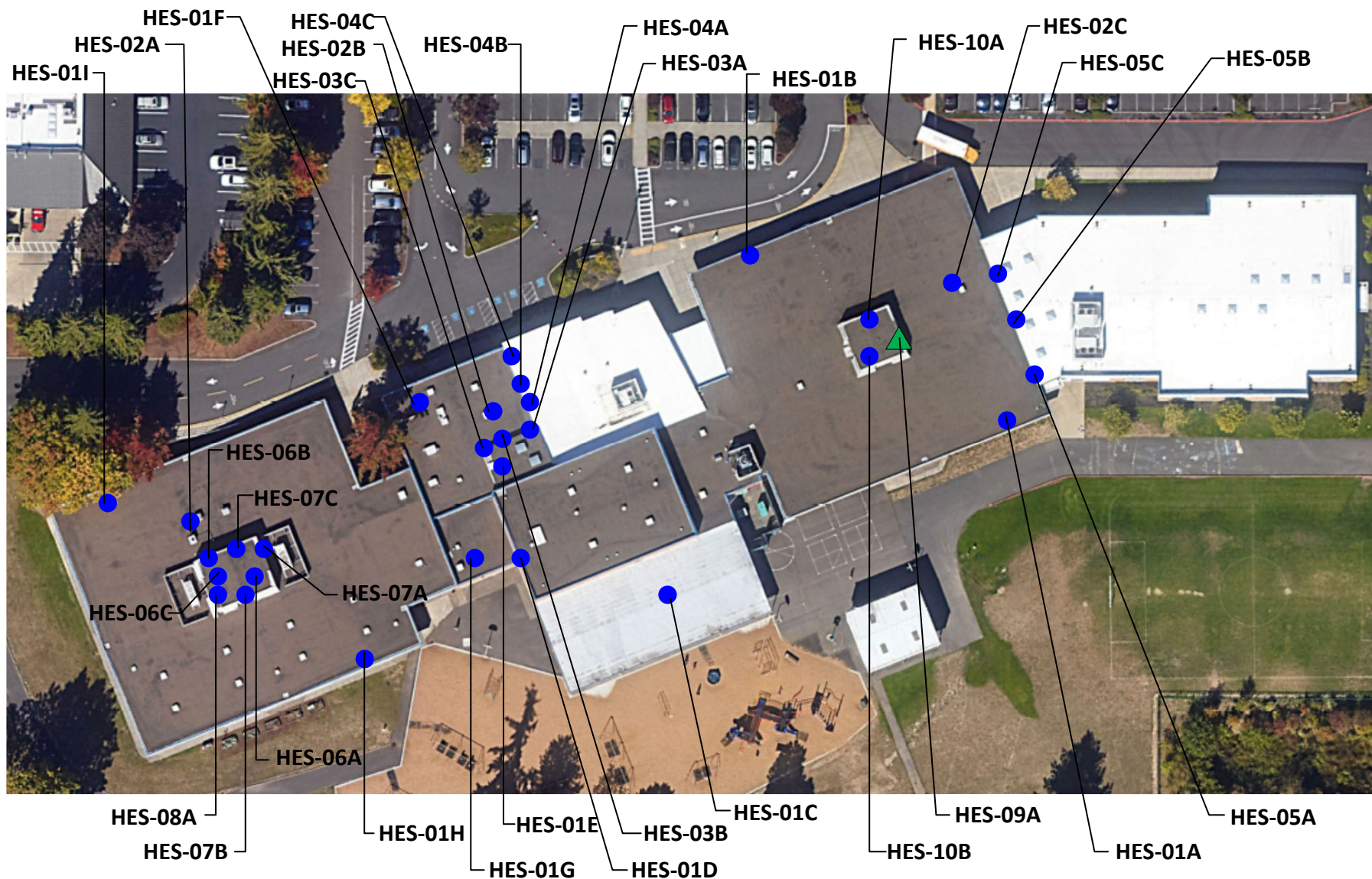


Matthew Cuda
Project Manager



Ron Landolt, CAC
NW Region BSI Practice Manager

Appendix A – Figure(s)



LEGEND

- — Non-Asbestos Sample Location
- ★ — Asbestos-Containing Sample Location
- ▲ — OSHA Regulated Sample Location

ASBESTOS SURVEY REPORT SAMPLE LOCATION DIAGRAM

HITEON ELEMENTARY SCHOOL
13800 SW BROCKMAN STREET
BEAVERTON, OREGON 970005

TRC Project No.: 401824.0001

Figure: 1.1

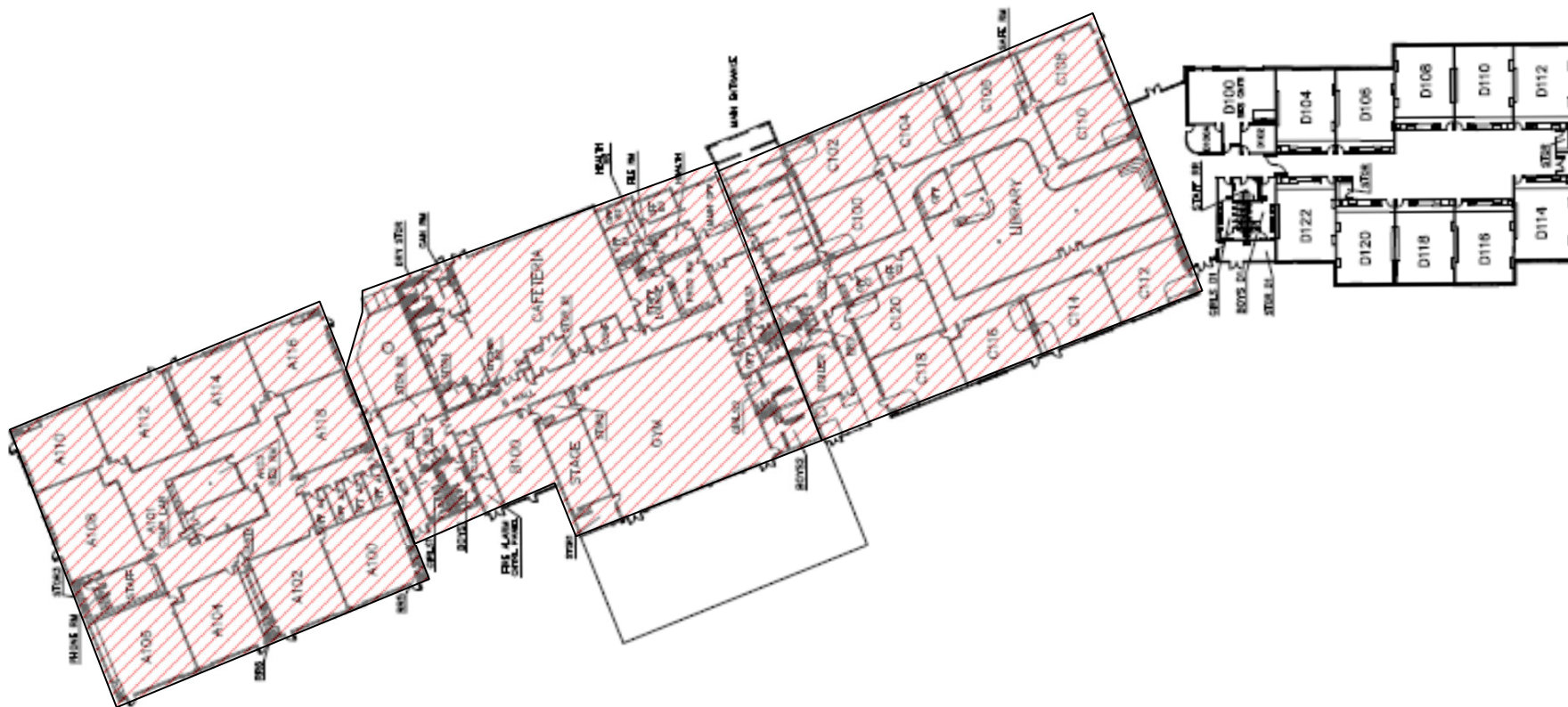
Drawn by: MC

Reviewed by: RAL

Date: July 2020



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



LEGEND



— OSHA Regulated Gypsum Board and Joint Compound (Composite <1%) – Based on a mix of current and prior sampling data.

ASBESTOS SURVEY REPORT OSHA REGULATED MATERIAL LOCATION DIAGRAM

HITEON ELEMENTARY SCHOOL
13800 SW BROCKMAN STREET
BEAVERTON, OREGON 970005

TRC Project No.: 401824.0001

Figure: 1.3

Drawn by: MC

Reviewed by: RAL

Date: July 2020



4105 SE International Way, Suite 505
Milwaukie, Oregon 97222
Phone: (5003) 387-3251 Fax: (5003) 908-1318

Appendix B – Laboratory Analytical Data Sheets

EMC LABS, INC.

9830 S. 51st Street, Suite B109, Phoenix, AZ 85044
Phone: 800-362-3373 or 480-940-5294 - Fax: (480) 893-1726

Laboratory Report

0239577

Bulk Asbestos Analysis by Polarized Light Microscopy

NVLAP#101926-0

Client:	TRC SOLUTIONS	Job# / P.O. #:	401824
Address:	4105 SE INTERNATIONAL WAY, STE 505	Date Received:	07/01/2020
	MILWAUKIE OR 97222	Date Analyzed:	07/02/2020
Collected:	06/29/2020	Date Reported:	07/07/2020
Project Name:	HITEON ELEMENTARY HVAC UPGRADE	EPA Method:	EPA 600/R-93/116
Address:		Submitted By:	MATT CUDA
		Collected By:	

Lab ID Client ID	Sample Location	Layer Name / Sample Description	Asbestos Detected	Asbestos Type (%)	Non-Asbestos Constituents
0239577-001 HES-01A	THROUGHOUT ROOF	LAYER 1 Roofing, Black	No	None Detected	Fibrous Glass 15% Synthetic Fiber 3% Cellulose Fiber 2% Carbonates Quartz Binder/Filler 80%
		LAYER 2 Roofing, Black/ Tan	No	None Detected	Cellulose Fiber 18% Fibrous Glass 2% Carbonates Quartz Binder/Filler 80%
		LAYER 3 Roofing, Black	No	None Detected	Fibrous Glass 20% Carbonates Quartz Binder/Filler 80%
		LAYER 4 Roofing, Black	No	None Detected	Fibrous Glass 20% Carbonates Quartz Binder/Filler 80%

Please see EMC Labs Sample Number 0239577-058 for Additional Layer(s)

EMC LABS, INC.

9830 S. 51st Street, Suite B109, Phoenix, AZ 85044
Phone: 800-362-3373 or 480-940-5294 - Fax: (480) 893-1726

Laboratory Report

0239577

Bulk Asbestos Analysis by Polarized Light Microscopy

NVLAP#101926-0

Client:	TRC SOLUTIONS	Job# / P.O. #:	401824
Address:	4105 SE INTERNATIONAL WAY, STE 505	Date Received:	07/01/2020
	MILWAUKIE OR 97222	Date Analyzed:	07/02/2020
Collected:	06/29/2020	Date Reported:	07/07/2020
Project Name:	HITEON ELEMENTARY HVAC UPGRADE	EPA Method:	EPA 600/R-93/116
Address:		Submitted By:	MATT CUDA
		Collected By:	

Lab ID Client ID	Sample Location	Layer Name / Sample Description	Asbestos Detected	Asbestos Type (%)	Non-Asbestos Constituents
0239577-002 HES-01B	THROUGHOUT ROOF	LAYER 1 Roofing, Black	No	None Detected	Cellulose Fiber 18% Fibrous Glass 2% Carbonates Quartz Binder/Filler 80%
		LAYER 2 Roofing, Black	No	None Detected	Cellulose Fiber 10% Fibrous Glass 7% Synthetic Fiber 3% Carbonates Quartz Binder/Filler 80%
		LAYER 3 Roofing, Black/ Tan	No	None Detected	Cellulose Fiber 90% Gypsum Quartz Binder/Filler 10%
		LAYER 4 Roofing, Black	No	None Detected	Fibrous Glass 20% Carbonates Quartz Binder/Filler 80%

Please see EMC Labs Sample Number 0239577-059 for Additional Layer(s)

EMC LABS, INC.

9830 S. 51st Street, Suite B109, Phoenix, AZ 85044
Phone: 800-362-3373 or 480-940-5294 - Fax: (480) 893-1726

Laboratory Report

0239577

Bulk Asbestos Analysis by Polarized Light Microscopy

NVLAP#101926-0

Client:	TRC SOLUTIONS	Job# / P.O. #:	401824
Address:	4105 SE INTERNATIONAL WAY, STE 505	Date Received:	07/01/2020
	MILWAUKIE OR 97222	Date Analyzed:	07/02/2020
Collected:	06/29/2020	Date Reported:	07/07/2020
Project Name:	HITEON ELEMENTARY HVAC UPGRADE	EPA Method:	EPA 600/R-93/116
Address:		Submitted By:	MATT CUDA
		Collected By:	

Lab ID Client ID	Sample Location	Layer Name / Sample Description	Asbestos Detected	Asbestos Type (%)	Non-Asbestos Constituents
0239577-003 HES-01C	THROUGHOUT ROOF	LAYER 1 Roofing, Silver	No	None Detected	Cellulose Fiber <1%
					Carbonates
					Quartz
					Binder/Filler 99%
		LAYER 2 Roofing, Black	No	None Detected	Fibrous Glass 17%
					Cellulose Fiber 3%
					Carbonates
					Quartz
					Binder/Filler 80%
		LAYER 3 Roofing, Black/ Tan	No	None Detected	Cellulose Fiber 85%
					Carbonates
					Gypsum
		LAYER 4 Roofing, Black	No	None Detected	Quartz
					Perlite
					Binder/Filler 15%
					Fibrous Glass 20%
					Carbonates
					Quartz
					Binder/Filler 80%

Please see EMC Labs Sample Number 0239577-060 for Additional Layer(s)

EMC LABS, INC.

9830 S. 51st Street, Suite B109, Phoenix, AZ 85044
Phone: 800-362-3373 or 480-940-5294 - Fax: (480) 893-1726

Laboratory Report

0239577

Bulk Asbestos Analysis by Polarized Light Microscopy

NVLAP#101926-0

Client:	TRC SOLUTIONS	Job# / P.O. #:	401824
Address:	4105 SE INTERNATIONAL WAY, STE 505	Date Received:	07/01/2020
	MILWAUKIE OR 97222	Date Analyzed:	07/02/2020
Collected:	06/29/2020	Date Reported:	07/07/2020
Project Name:	HITEON ELEMENTARY HVAC UPGRADE	EPA Method:	EPA 600/R-93/116
Address:		Submitted By:	MATT CUDA
		Collected By:	

Lab ID Client ID	Sample Location	Layer Name / Sample Description	Asbestos Detected	Asbestos Type (%)	Non-Asbestos Constituents
0239577-004 HES-01D	THROUGHOUT ROOF	LAYER 1 Roofing, Black	No	None Detected	Fibrous Glass 15% Cellulose Fiber 5% Carbonates Quartz Binder/Filler 80%
		LAYER 2 Roofing, Black/ Tan	No	None Detected	Cellulose Fiber 85% Gypsum Quartz Carbonates Perlite Binder/Filler 15%
		LAYER 3 Roofing, Black	No	None Detected	Fibrous Glass 20% Carbonates Quartz Binder/Filler 80%
		LAYER 4 Roofing, Black	No	None Detected	Fibrous Glass 20% Carbonates Quartz Binder/Filler 80%

Please see EMC Labs Sample Number 0239577-061 for Additional Layer(s)

0239577-005 HES-01E	THROUGHOUT ROOF	LAYER 1 Roofing, Black	No	None Detected	Cellulose Fiber 20% Carbonates Quartz Binder/Filler 80%
		LAYER 2 Roofing, Black	No	None Detected	Fibrous Glass 15% Cellulose Fiber 5% Carbonates Quartz Binder/Filler 80%
		LAYER 3 Roofing, Black	No	None Detected	Fibrous Glass 15% Synthetic Fiber 3% Cellulose Fiber 2% Carbonates Quartz Binder/Filler 80%

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Laboratory Report

0239577

Bulk Asbestos Analysis by Polarized Light Microscopy

NVLAP#101926-0

Client:	TRC SOLUTIONS	Job# / P.O. #:	401824
Address:	4105 SE INTERNATIONAL WAY, STE 505	Date Received:	07/01/2020
	MILWAUKIE OR 97222	Date Analyzed:	07/02/2020
Collected:	06/29/2020	Date Reported:	07/07/2020
Project Name:	HITEON ELEMENTARY HVAC UPGRADE	EPA Method:	EPA 600/R-93/116
Address:		Submitted By:	MATT CUDA
		Collected By:	

Lab ID Client ID	Sample Location	Layer Name / Sample Description	Asbestos Detected	Asbestos Type (%)	Non-Asbestos Constituents
0239577-006 HES-01F	THROUGHOUT ROOF	LAYER 1 Roofing, Black	No	None Detected	Fibrous Glass 17% Cellulose Fiber 3% Carbonates Quartz Binder/Filler 80%
		LAYER 2 Roofing, Black/ Tan	No	None Detected	Cellulose Fiber 85% Gypsum Quartz Carbonates Perlite Binder/Filler 15%
		LAYER 3 Roofing, Black	No	None Detected	Fibrous Glass 20% Carbonates Perlite Binder/Filler 80%
		LAYER 4 Roofing, Black	No	None Detected	Fibrous Glass 20% Carbonates Perlite Binder/Filler 80%

Please see EMC Labs Sample Number 0239577-062 for Additional Layer(s)

0239577-007 HES-01G	THROUGHOUT ROOF	LAYER 1 Roofing, Black	No	None Detected	Fibrous Glass 15% Synthetic Fiber 3% Cellulose Fiber 2% Carbonates Quartz Binder/Filler 80%
		LAYER 2 Roofing, Black/ Tan	No	None Detected	Cellulose Fiber 85% Gypsum Quartz Carbonates Perlite Binder/Filler 15%

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NVLAP#101926-0

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	MILWAUKIE OR 97222	Date Analyzed:	07/07/2020
Collected:	06/29/2020	Date Reported:	07/07/2020
Project Name:	HITEON ELEMENTARY HVAC UPGRADE	EPA Method:	EPA 600/R-93/116
Address:		Submitted By:	MATT CUDA
		Collected By:	

Lab ID Client ID	Sample Location	Layer Name / Sample Description	Asbestos Detected	Asbestos Type (%)	Non-Asbestos Constituents
0239577-008 HES-01H	THROUGHOUT ROOF	LAYER 1 Roofing, Black	No	None Detected	Fibrous Glass 15% Synthetic Fiber 3% Cellulose Fiber 2% Carbonates Quartz Binder/Filler 80%
		LAYER 2 Roofing, Black/ Tan	No	None Detected	Cellulose Fiber 85% Gypsum Quartz Carbonates Perlite Binder/Filler 15%
		LAYER 3 Roofing, Black	No	None Detected	Fibrous Glass 20% Carbonates Perlite Binder/Filler 80%
		LAYER 4 Roofing, Black	No	None Detected	Fibrous Glass 20% Carbonates Perlite Binder/Filler 80%

Please see EMC Labs Sample Number 0239577-063 for Additional Layer(s)

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NVLAP#101926-0

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Project Name:	HITEON ELEMENTARY HVAC UPGRADE	EPA Method:	EPA 600/R-93/116
Address:		Submitted By:	MATT CUDA
		Collected By:	

Lab ID Client ID	Sample Location	Layer Name / Sample Description	Asbestos Detected	Asbestos Type (%)	Non-Asbestos Constituents	
0239577-009 HES-011	THROUGHOUT ROOF	LAYER 1 Roofing, Black	No	None Detected	Fibrous Glass	15%
					Synthetic Fiber	3%
					Cellulose Fiber	2%
		Carbonates				
		Quartz				
		Binder/Filler	80%			
		LAYER 2 Roofing, Black/ Tan	No	None Detected	Cellulose Fiber	85%
					Gypsum	
					Quartz	
		Carbonates				
Perlite						
Binder/Filler	15%					
LAYER 3 Roofing, Black	No	None Detected	Fibrous Glass	20%		
			Carbonates			
			Perlite			
Binder/Filler	80%					
LAYER 4 Roofing, Black	No	None Detected	Fibrous Glass	20%		
			Carbonates			
			Perlite			
Binder/Filler	80%					
Please see EMC Labs Sample Number 0239577-064 for Additional Layer(s)						
0239577-010 HES-02A	ROOF	LAYER 1 Caulking, Gray	No	None Detected	Carbonates	
					Quartz	
		Binder/Filler	100%			
		LAYER 2 Coating, Silver	No	None Detected	Carbonates	
Quartz						
Binder/Filler	100%					
0239577-011 HES-02B	ROOF	Caulking, Gray	No	None Detected	Carbonates	
					Quartz	
Binder/Filler	100%					

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Project Name:	HITEON ELEMENTARY HVAC UPGRADE	EPA Method:	EPA 600/R-93/116
Address:		Submitted By:	MATT CUDA
		Collected By:	

Lab ID Client ID	Sample Location	Layer Name / Sample Description	Asbestos Detected	Asbestos Type (%)	Non-Asbestos Constituents
0239577-012 HES-02C	ROOF	Caulking, Gray	No	None Detected	Carbonates Quartz Binder/Filler 100%
0239577-013 HES-03A	ROOF	Felt, Black	No	None Detected	Fibrous Glass Synthetic Fiber Carbonates Quartz Binder/Filler 30% 10% 60%
0239577-014 HES-03B	ROOF	Felt, Black	No	None Detected	Fibrous Glass Synthetic Fiber Carbonates Quartz Binder/Filler 30% 10% 60%
0239577-015 HES-03C	ROOF	Felt, Black	No	None Detected	Fibrous Glass Synthetic Fiber Carbonates Quartz Binder/Filler 30% 10% 60%
0239577-016 HES-04A	ROOFING AT EDGE OF TPO ROOFING	Caulking, Black	No	None Detected	Carbonates Quartz Binder/Filler 100%
0239577-017 HES-04B	ROOFING AT EDGE OF TPO ROOFING	Caulking, Black	No	None Detected	Carbonates Quartz Binder/Filler 100%

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Address:		Submitted By:	MATT CUDA
		Collected By:	

Lab ID Client ID	Sample Location	Layer Name / Sample Description	Asbestos Detected	Asbestos Type (%)	Non-Asbestos Constituents
0239577-018 HES-04C	ROOFING AT EDGE OF TPO ROOFING	Caulking, Black	No	None Detected	Carbonates Quartz Binder/Filler 100%
0239577-019 HES-05A	ROOFING AT EDGE OF TPO ROOFING	Roofing Mastic, White/ Gray	No	None Detected	Talc 1% Carbonates Gypsum Quartz Binder/Filler 99%
0239577-020 HES-05B	ROOFING AT EDGE OF TPO ROOFING	Roofing Mastic, White/ Gray	No	None Detected	Talc 1% Carbonates Gypsum Quartz Binder/Filler 99%
0239577-021 HES-05C	ROOFING AT EDGE OF TPO ROOFING	Roofing Mastic, White/ Gray	No	None Detected	Talc 1% Carbonates Gypsum Quartz Binder/Filler 99%
0239577-022 HES-06A	A WING MECHANICAL MEZZANINE, VARIOUS HVAC DUCT COMPONENTS	Duct Tape, White/ Tan	No	None Detected	Cellulose Fiber 20% Carbonates Gypsum Quartz Binder/Filler 80%

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Project Name:	HITEON ELEMENTARY HVAC UPGRADE	EPA Method:	EPA 600/R-93/116
Address:		Submitted By:	MATT CUDA
		Collected By:	

Lab ID Client ID	Sample Location	Layer Name / Sample Description	Asbestos Detected	Asbestos Type (%)	Non-Asbestos Constituents	
0239577-023 HES-06B	A WING MECHANICAL MEZZANINE, VARIOUS HVAC DUCT COMPONENTS	Duct Tape, White/ Tan	No	None Detected	Cellulose Fiber	20%
					Carbonates Gypsum Quartz Binder/Filler	80%
0239577-024 HES-06C	A WING MECHANICAL MEZZANINE, VARIOUS HVAC DUCT COMPONENTS	Duct Tape, White/ Tan	No	None Detected	Cellulose Fiber	20%
					Carbonates Gypsum Quartz Binder/Filler	80%
0239577-025 HES-07A	A WING MECHANICAL MEZZANINE	Caulking, Gray	No	None Detected	Carbonates Quartz Binder/Filler	100%
0239577-026 HES-07B	A WING MECHANICAL MEZZANINE	Caulking, Gray	No	None Detected	Carbonates Quartz Binder/Filler	100%

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Project Name:	HITEON ELEMENTARY HVAC UPGRADE	EPA Method:	EPA 600/R-93/116
Address:		Submitted By:	MATT CUDA
		Collected By:	

Lab ID Client ID	Sample Location	Layer Name / Sample Description	Asbestos Detected	Asbestos Type (%)	Non-Asbestos Constituents
0239577-027 HES-07C	A WING MECHANICAL MEZZANINE	Caulking, Gray	No	None Detected	Carbonates Quartz Binder/Filler 100%
0239577-028 HES-08A	THROUGHOUT A WING	LAYER 1 Gypsum Board, White/ Brown	No	None Detected	Cellulose Fiber Fibrous Glass Gypsum Quartz Carbonates Mica 88%
		LAYER 2 Joint Compound, Off White	No	None Detected	Carbonates Mica Quartz Binder/Filler 100%
0239577-029 HES-08B	THROUGHOUT A WING	LAYER 1 Gypsum Board, White/ Brown	No	None Detected	Cellulose Fiber Fibrous Glass Gypsum Quartz Carbonates Mica 88%
		LAYER 2 Joint Compound, Off White	No	None Detected	Carbonates Mica Quartz Binder/Filler 100%

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Project Name:	HITEON ELEMENTARY HVAC UPGRADE	EPA Method:	EPA 600/R-93/116
Address:		Submitted By:	MATT CUDA
		Collected By:	

Lab ID Client ID	Sample Location	Layer Name / Sample Description	Asbestos Detected	Asbestos Type (%)	Non-Asbestos Constituents
0239577-030 HES-08C	THROUGHOUT A WING	LAYER 1 Gypsum Board, White/ Brown	No	None Detected	Cellulose Fiber 10% Fibrous Glass 2% Gypsum Quartz Carbonates Mica 88%
		LAYER 2 Joint Compound, Off White	No	None Detected	Carbonates Mica Quartz Binder/Filler 100%
0239577-031 HES-09A	THROUGHOUT C WING	LAYER 1 Gypsum Board, White/ Brown	No	None Detected	Cellulose Fiber 10% Fibrous Glass 2% Gypsum Quartz Carbonates Mica 88%
		LAYER 2 Joint Compound, Off White	Yes	Chrysotile 3%	Cellulose Fiber <1% Carbonates Mica Quartz Binder/Filler 96%

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Collected:	06/29/2020	Date Reported:	07/07/2020
Project Name:	HITEON ELEMENTARY HVAC UPGRADE	EPA Method:	EPA 600/R-93/116
Address:		Submitted By:	MATT CUDA
		Collected By:	

Lab ID Client ID	Sample Location	Layer Name / Sample Description	Asbestos Detected	Asbestos Type (%)	Non-Asbestos Constituents
0239577-032 HES-09B	THROUGHOUT C WING	LAYER 1 Gypsum Board, White/ Brown	No	None Detected	Cellulose Fiber 10% Fibrous Glass 2% Gypsum Quartz Carbonates Mica 88%
		LAYER 2 Joint Compound, Off White	Yes	Chrysotile 2%	Carbonates Mica Quartz Binder/Filler 98%
		LAYER 3 Texture, Off White	No	None Detected	Carbonates Mica Quartz Perlite Binder/Filler 100%
0239577-033 HES-09C	THROUGHOUT C WING	LAYER 1 Gypsum Board, White/ Brown	No	None Detected	Cellulose Fiber 10% Fibrous Glass 2% Gypsum Quartz Carbonates Mica 88%
		LAYER 2 Joint Compound, Off White	Yes	Chrysotile 2%	Carbonates Mica Quartz Binder/Filler 98%

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Project Name:	HITEON ELEMENTARY HVAC UPGRADE	EPA Method:	EPA 600/R-93/116
Address:		Submitted By:	MATT CUDA
		Collected By:	

Lab ID Client ID	Sample Location	Layer Name / Sample Description	Asbestos Detected	Asbestos Type (%)	Non-Asbestos Constituents
0239577-034 HES-10A	C WING MECHANICAL MEZZANINE THROUGHOUT PLUMBING SYSTEM	LAYER 1 Hard Fitting, Gray	No	None Detected	Cellulose Fiber 15% Mineral Wool 15%
					Carbonates Gypsum Quartz Perlite Binder/Filler 70%
		LAYER 2 Hard Fitting, Beige	No	None Detected	Cellulose Fiber 15% Wollastonite 5%
					Quartz Mica Gypsum Carbonates Binder/Filler 80%
		LAYER 3 Hard Fitting, White	No	None Detected	Cellulose Fiber 95%
					Carbonates Gypsum Binder/Filler 5%
0239577-035 HES-10B	C WING MECHANICAL MEZZANINE THROUGHOUT PLUMBING SYSTEM	LAYER 1 Hard Fitting, Gray	No	None Detected	Mineral Wool 30%
					Carbonates Gypsum Quartz Perlite Binder/Filler 70%
		LAYER 2 Hard Fitting, White	No	None Detected	Cellulose Fiber 95%
					Carbonates Gypsum Binder/Filler 5%

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Address:		Submitted By:	MATT CUDA
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Lab ID Client ID	Sample Location	Layer Name / Sample Description	Asbestos Detected	Asbestos Type (%)	Non-Asbestos Constituents	
0239577-036 HES-10C	C WING MECHANICAL MEZZANINE THROUGHOUT PLUMBING SYSTEM	LAYER 1 Hard Fitting, Yellow	No	None Detected	Fibrous Glass	95%
					Carbonates	5%
		LAYER 2 Hard Fitting, Gray	No	None Detected	Mineral Wool	30%
					Cellulose Fiber	5%
					Carbonates	
					Gypsum	
					Quartz	
					Perlite	
					Binder/Filler	65%
0239577-037 HES-11A	THROUGHOUT C WING	2x4 Ceiling Tile, White/ Gray	No	None Detected	Cellulose Fiber	75%
					Mineral Wool	5%
					Carbonates	
					Quartz	
					Perlite	
0239577-038 HES-11B	THROUGHOUT C WING	2x4 Ceiling Tile, White/ Gray	No	None Detected	Binder/Filler	20%
					Mineral Wool	65%
					Cellulose Fiber	15%
					Carbonates	
					Quartz	
0239577-039 HES-11C	THROUGHOUT C WING	2x4 Ceiling Tile, White/ Gray	No	None Detected	Perlite	
					Binder/Filler	20%
					Mineral Wool	65%
					Cellulose Fiber	15%
					Carbonates	

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Lab ID Client ID	Sample Location	Layer Name / Sample Description	Asbestos Detected	Asbestos Type (%)	Non-Asbestos Constituents
0239577-040 HES-12A	HVAC DUCTS THROUGHOUT	HVAC Duct Mastic, Gray	No	None Detected	Carbonates Quartz Binder/Filler 100%
0239577-041 HES-12B	HVAC DUCTS THROUGHOUT	HVAC Duct Mastic, Gray	No	None Detected	Carbonates Quartz Binder/Filler 100%
0239577-042 HES-12C	HVAC DUCTS THROUGHOUT	HVAC Duct Mastic, Gray	No	None Detected	Carbonates Quartz Binder/Filler 100%
0239577-043 HES-13A	ABOVE CEILING APPEARS TO BE FROM ROOFING	Mastic, Black	No	None Detected	Carbonates Quartz Binder/Filler 100%
0239577-044 HES-13B	ABOVE CEILING APPEARS TO BE FROM ROOFING	Mastic, Black	No	None Detected	Carbonates Quartz Binder/Filler 100%
0239577-045 HES-13C	ABOVE CEILING APPEARS TO BE FROM ROOFING	Mastic, Black	No	None Detected	Fibrous Glass Carbonates Quartz Binder/Filler 1% 99%

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Lab ID Client ID	Sample Location	Layer Name / Sample Description	Asbestos Detected	Asbestos Type (%)	Non-Asbestos Constituents
0239577-046 HES-14A	THROUGHOUT B WING	2x4 Ceiling Tile, White/ Gray	No	None Detected	Cellulose Fiber 75% Mineral Wool 5% Carbonates Quartz Perlite Binder/Filler 20%
0239577-047 HES-14B	THROUGHOUT B WING	2x4 Ceiling Tile, White/ Gray	No	None Detected	Cellulose Fiber 75% Mineral Wool 5% Carbonates Quartz Perlite Binder/Filler 20%
0239577-048 HES-14C	THROUGHOUT B WING	2x4 Ceiling Tile, White/ Gray	No	None Detected	Cellulose Fiber 75% Mineral Wool 5% Carbonates Quartz Perlite Binder/Filler 20%
0239577-049 HES-15A	THROUGHOUT B WING	LAYER 1 Gypsum Board, White/ Brown	No	None Detected	Cellulose Fiber 10% Fibrous Glass 2% Gypsum Quartz Carbonates Mica 88%
		LAYER 2 Joint Compound, Off White	No	None Detected	Carbonates Mica Quartz Perlite Binder/Filler 100%

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Lab ID Client ID	Sample Location	Layer Name / Sample Description	Asbestos Detected	Asbestos Type (%)	Non-Asbestos Constituents
0239577-050 HES-15B	THROUGHOUT B WING	LAYER 1 Gypsum Board, White/ Brown	No	None Detected	Cellulose Fiber 10% Fibrous Glass 2% Gypsum Quartz Carbonates Mica 88%
		LAYER 2 Joint Compound, Off White	No	None Detected	Carbonates Mica Quartz Perlite Binder/Filler 100%
0239577-051 HES-15C	THROUGHOUT B WING	LAYER 1 Gypsum Board, White/ Brown	No	None Detected	Cellulose Fiber 10% Fibrous Glass 2% Gypsum Quartz Carbonates Mica 88%
		LAYER 2 Joint Compound, Off White	No	None Detected	Carbonates Mica Quartz Binder/Filler 100%
0239577-052 HES-16A	THROUGHOUT A WING	2x4 Ceiling Tile, White/ Gray	No	None Detected	Cellulose Fiber 40% Mineral Wool 40% Carbonates Quartz Perlite Binder/Filler 20%
0239577-053 HES-16B	THROUGHOUT A WING	2x4 Ceiling Tile, White/ Gray	No	None Detected	Cellulose Fiber 40% Mineral Wool 40% Carbonates Quartz Perlite Binder/Filler 20%

EMC LABS, INC.

9830 S. 51st Street, Suite B109, Phoenix, AZ 85044
Phone: 800-362-3373 or 480-940-5294 - Fax: (480) 893-1726

Laboratory Report

0239577

Bulk Asbestos Analysis by Polarized Light Microscopy

NVLAP#101926-0

Client:	TRC SOLUTIONS	Job# / P.O. #:	401824
Address:	4105 SE INTERNATIONAL WAY, STE 505	Date Received:	07/01/2020
	MILWAUKIE OR 97222	Date Analyzed:	07/02/2020
Collected:	06/29/2020	Date Reported:	07/07/2020
Project Name:	HITEON ELEMENTARY HVAC UPGRADE	EPA Method:	EPA 600/R-93/116
Address:		Submitted By:	MATT CUDA
		Collected By:	

Lab ID Client ID	Sample Location	Layer Name / Sample Description	Asbestos Detected	Asbestos Type (%)	Non-Asbestos Constituents
0239577-054 HES-16C	THROUGHOUT A WING	2x4 Ceiling Tile, White/ Gray	No	None Detected	Cellulose Fiber 40% Mineral Wool 40% Carbonates Quartz Perlite Binder/Filler 20%
0239577-055 HES-17A	GYM STAGE	LAYER 1 1x1 Ceiling Tile, White/ Tan	No	None Detected	Cellulose Fiber 85% Carbonates Gypsum Binder/Filler 15%
		LAYER 2 Glue, Dk. Brown	No	None Detected	Cellulose Fiber 1% Carbonates Quartz Binder/Filler 99%
0239577-056 HES-17B	GYM STAGE	LAYER 1 1x1 Ceiling Tile, White/ Tan	No	None Detected	Cellulose Fiber 85% Carbonates Gypsum Binder/Filler 15%
		LAYER 2 Glue, Dk. Brown	No	None Detected	Cellulose Fiber <1% Carbonates Quartz Binder/Filler 99%
0239577-057 HES-17C	GYM STAGE	LAYER 1 1x1 Ceiling Tile, White/ Tan	No	None Detected	Cellulose Fiber 85% Carbonates Gypsum Binder/Filler 15%
		LAYER 2 Glue, Dk. Brown	No	None Detected	Carbonates Quartz Binder/Filler 100%

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Laboratory Report

0239577

Bulk Asbestos Analysis by Polarized Light Microscopy

NVLAP#101926-0

Client: TRC SOLUTIONS Job# / P.O. #: 401824
Address: 4105 SE INTERNATIONAL WAY, STE 505 Date Received: 07/01/2020
MILWAUKIE OR 97222 Date Analyzed: 07/07/2020
Collected: 06/29/2020 Date Reported: 07/07/2020
Project Name: HITEON ELEMENTARY HVAC UPGRADE EPA Method: EPA 600/R-93/116
Address: Submitted By: MATT CUDA
Collected By:

Lab ID Client ID	Sample Location	Layer Name / Sample Description	Asbestos Detected	Asbestos Type (%)	Non-Asbestos Constituents
0239577-058 HES-01A	THROUGHOUT ROOF - ADDITIONAL LAYERS	LAYER 1 Roofing, Black	No	None Detected	Fibrous Glass 20%
					Carbonates Quartz Binder/Filler 80%
		LAYER 2 Roofing, Black	No	None Detected	Fibrous Glass 20%
					Carbonates Quartz Binder/Filler 80%
		LAYER 3 Insulation, Tan	No	None Detected	Cellulose Fiber 85%
					Gypsum Quartz Perlite Binder/Filler 15%
0239577-059 HES-01B	THROUGHOUT ROOF - ADDITIONAL LAYERS	LAYER 1 Roofing, Black	No	None Detected	Fibrous Glass 20%
					Carbonates Quartz Binder/Filler 80%
		LAYER 2 Roofing, Black	No	None Detected	Fibrous Glass 20%
					Carbonates Quartz Binder/Filler 80%
		LAYER 3 Roofing, Black	No	None Detected	Fibrous Glass 17% Cellulose Fiber 3%
					Carbonates Quartz Binder/Filler 80%
		LAYER 4 Insulation, Tan	No	None Detected	Cellulose Fiber 85%
					Gypsum Quartz Perlite Binder/Filler 15%

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Laboratory Report

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Bulk Asbestos Analysis by Polarized Light Microscopy

NVLAP#101926-0

Client:	TRC SOLUTIONS	Job# / P.O. #:	401824
Address:	4105 SE INTERNATIONAL WAY, STE 505	Date Received:	07/01/2020
	MILWAUKIE OR 97222	Date Analyzed:	07/07/2020
Collected:	06/29/2020	Date Reported:	07/07/2020
Project Name:	HITEON ELEMENTARY HVAC UPGRADE	EPA Method:	EPA 600/R-93/116
Address:		Submitted By:	MATT CUDA
		Collected By:	

Lab ID Client ID	Sample Location	Layer Name / Sample Description	Asbestos Detected	Asbestos Type (%)	Non-Asbestos Constituents
0239577-060 HES-01C	THROUGHOUT ROOF - ADDITIONAL LAYERS	LAYER 1 Roofing, Black	No	None Detected	Fibrous Glass 20%
					Carbonates Quartz Binder/Filler 80%
		LAYER 2 Roofing, Black	No	None Detected	Fibrous Glass 20%
					Carbonates Quartz Binder/Filler 80%
		LAYER 3 Roofing, Black	No	None Detected	Fibrous Glass 20%
					Carbonates Quartz Binder/Filler 80%
		LAYER 4 Roofing, Black	No	None Detected	Fibrous Glass 17%
					Cellulose Fiber 3%
					Carbonates Quartz Binder/Filler 80%

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Laboratory Report

0239577

Bulk Asbestos Analysis by Polarized Light Microscopy

NVLAP#101926-0

Client: TRC SOLUTIONS Job# / P.O. #: 401824
Address: 4105 SE INTERNATIONAL WAY, STE 505 Date Received: 07/01/2020
MILWAUKIE OR 97222 Date Analyzed: 07/07/2020
Collected: 06/29/2020 Date Reported: 07/07/2020
Project Name: HITEON ELEMENTARY HVAC UPGRADE EPA Method: EPA 600/R-93/116
Address: Submitted By: MATT CUDA
Collected By:

Lab ID Client ID	Sample Location	Layer Name / Sample Description	Asbestos Detected	Asbestos Type (%)	Non-Asbestos Constituents
0239577-061 HES-01D	THROUGHOUT ROOF - ADDITIONAL LAYERS	LAYER 1 Roofing, Black	No	None Detected	Fibrous Glass 20%
					Carbonates Quartz Binder/Filler 80%
		LAYER 2 Roofing, Black	No	None Detected	Fibrous Glass 20%
					Carbonates Quartz Binder/Filler 80%
		LAYER 3 Roofing, Black	No	None Detected	Fibrous Glass 20%
					Carbonates Quartz Binder/Filler 80%
		LAYER 4 Roofing, Black	No	None Detected	Fibrous Glass 20%
					Carbonates Quartz Binder/Filler 80%
0239577-062 HES-01F	THROUGHOUT ROOF - ADDITIONAL LAYERS	LAYER 1 Roofing, Black	No	None Detected	Fibrous Glass 20%
					Carbonates Quartz Binder/Filler 80%
		LAYER 2 Roofing, Black	No	None Detected	Fibrous Glass 20%
					Carbonates Quartz Binder/Filler 80%
		LAYER 3 Roofing, Black	No	None Detected	Fibrous Glass 20%
					Carbonates Quartz Binder/Filler 80%

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Laboratory Report
0239577

Bulk Asbestos Analysis by Polarized Light Microscopy

NVLAP#101926-0

Client:	TRC SOLUTIONS	Job# / P.O. #:	401824
Address:	4105 SE INTERNATIONAL WAY, STE 505	Date Received:	07/01/2020
	MILWAUKIE OR 97222	Date Analyzed:	07/07/2020
Collected:	06/29/2020	Date Reported:	07/07/2020
Project Name:	HITEON ELEMENTARY HVAC UPGRADE	EPA Method:	EPA 600/R-93/116
Address:		Submitted By:	MATT CUDA
		Collected By:	

Lab ID Client ID	Sample Location	Layer Name / Sample Description	Asbestos Detected	Asbestos Type (%)	Non-Asbestos Constituents
0239577-063 HES-01H	THROUGHOUT ROOF - ADDITIONAL LAYERS	LAYER 1 Roofing, Black	No	None Detected	Fibrous Glass 20%
					Carbonates Quartz Binder/Filler 80%
		LAYER 2 Roofing, Black	No	None Detected	Cellulose Fiber 15%
					Fibrous Glass 5%
0239577-064 HES-01I	THROUGHOUT ROOF - ADDITIONAL LAYERS	LAYER 1 Roofing, Black	No	None Detected	Carbonates Quartz Binder/Filler 80%
					Fibrous Glass 15%
		LAYER 2 Roofing, Black	No	None Detected	Cellulose Fiber 5%
					Carbonates Quartz Binder/Filler 80%



Analyst - Octavio Gavarreteayestas



Signatory - Lab Director - Kurt Kettler

Distinctly stratified, easily separable layers of samples are analyzed as subsamples of the whole and are reported separately for each discernible layer. All analyses are derived from calibrated visual estimate and measured in area percent unless otherwise noted. The report applies to the standards or procedures identified and to the sample(s) tested. The test results are not necessarily indicative or representative of the qualities of the lot from which the sample was taken or of apparently identical or similar products, nor do they represent an ongoing quality assurance program unless so noted. These reports are for the exclusive use of the addressed client and that they will not be reproduced wholly or in part for advertising or other purposes over our signature or in connection with our name without special written permission. The report shall not be reproduced except in full, without written approval by our laboratory. The samples not destroyed in testing are retained a maximum of thirty days. The laboratory measurement of uncertainty for the test method is approximately less than 1 by area percent. Accredited by the National Institute of Standards and Technology, Voluntary Laboratory Accreditation Program for selected test method for asbestos. The accreditation or any reports generated by this laboratory in no way constitutes or implies product certification, approval, or endorsement by the National Institute of Standards and Technology. The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government. Polarized Light Microscopy may not be consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials.

EMC LABS, INC.

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Phone: 800-362-3373 or 480-940-5294 - Fax: (480) 893-1726

Laboratory Report
0239866

Bulk Asbestos Analysis by Polarized Light Microscopy

NVLAP#101926-0

Client:	TRC SOLUTIONS	Job# / P.O. #:	401824
Address:	4105 SE INTERNATIONAL WAY, STE 505	Date Received:	07/08/2020
	MILWAUKIE OR 97222	Date Analyzed:	07/10/2020
Collected:	06/29/2020	Date Reported:	07/10/2020
Project Name:	HITEON ELEMENTARY HVAC UPGRADE	EPA Method:	EPA 600/R-93/116
Address:	POINT COUNT LAB #239577	Submitted By:	MATT CUDA
		Collected By:	

Lab ID Client ID	Sample Location	Layer Name / Sample Description	Asbestos Detected	Asbestos Type (%)	Non-Asbestos Constituents
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0239866-001 HES-09A	THROUGHOUT C WING	Gypsum Board/ Joint Compound Composite, White/ Brown/ Off White	Yes	Chrysotile	0.5%	Cellulose Fiber Fibrous Glass Gypsum Quartz Carbonates Mica Binder/Filler	8.6% 1.7% 89.2%
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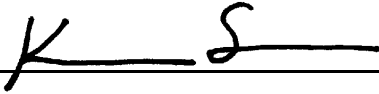
COMPOSITE ANALYSIS; 400 Pt. POINT COUNT

0239866-002 HES-09B	THROUGHOUT C WING	Gypsum Board/ Joint Compound Composite, White/ Brown/ Off White	Yes	Chrysotile	0.3%	Cellulose Fiber Fibrous Glass Gypsum Quartz Carbonates Mica Binder/Filler	8.6% 1.7% 89.4%
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COMPOSITE ANALYSIS; 400 Pt. POINT COUNT

0239866-003 HES-09C	THROUGHOUT C WING	Gypsum Board/ Joint Compound Composite, White/ Brown/ Off White	Yes	Chrysotile	0.4%	Cellulose Fiber Fibrous Glass Gypsum Quartz Carbonates Mica Binder/Filler	8.5% 1.7% 89.4%
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COMPOSITE ANALYSIS; 400 Pt. POINT COUNT



Analyst - Kenneth Scheske



Signatory - Lab Director - Kurt Kettler

Distinctly stratified, easily separable layers of samples are analyzed as subsamples of the whole and are reported separately for each discernible layer. All analyses are derived from calibrated visual estimate and measured in area percent unless otherwise noted. The report applies to the standards or procedures identified and to the sample(s) tested. The test results are not necessarily indicated or representative of the qualities of the lot from which the sample was taken or of apparently identical or similar products, nor do they represent an ongoing quality assurance program unless so noted. These reports are for the exclusive use of the addressed client and that they will not be reproduced wholly or in part for advertising or other purposes over our signature or in connection with our name without special written permission. The report shall not be reproduced except in full, without written approval by our laboratory. The samples not destroyed in testing are retained a maximum of thirty days. The laboratory measurement of uncertainty for the test method is approximately less than 1 by area percent. Accredited by the National Institute of Standards and Technology, Voluntary Laboratory Accreditation Program for selected test method for asbestos. The accreditation or any reports generated by this laboratory in no way constitutes or implies product certification, approval, or endorsement by the National Institute of Standards and Technology. The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government. Polarized Light Microscopy may not be consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials.

CHAIN OF CUSTODY

EMC Labs, Inc.
9830 S. 51st St., Ste B-109
Phoenix, AZ 85044
(800) 362-3373 Fax (480) 893-1726

LAB#: 239577
TAT: 3 day
Rec'd: JUL 01 AM

COMPANY NAME: **TRC SOLUTIONS**
4105 SE International Way, Suite 505
Milwaukie, Oregon 97222
CONTACT: Ron Landolt **Scan & Excel**
Phone/Fax: (503) 387-3251 / (503) 908-1318
Email: rlandolt@trccompanies.com and mcuda@trccompanies.com

BILL TO: (If Different Location)
Phoenix, AZ

Now Accepting: **VISA – MASTERCARD**

Price Quoted: \$ _____ / Sample \$ _____ / Layers

COMPLETE ITEMS 1-4: (Failure to complete any items may cause a delay in processing or analyzing your samples)

1. TURNAROUND TIME: [4hr rush] [8hr rush] [1-Day] [2-Day] [3-Day] [5-Day] [6-10 Day]

***Prior confirmation of turnaround time is required

***Additional charges for rush analysis (please call marketing department for pricing details)

***Laboratory analysis may be subject to delay if credit terms are not met

2. TYPE OF ANALYSIS: [Bulk-PCM] [Air-PCM] [Lead] [Point Count] [Fungi: AOC, W-C, Bulk, Swab, Tape]

3. DISPOSAL INSTRUCTIONS: [Dispose of samples at EMC] / [Return samples to me at my expense]

(If you do not indicate preference, EMC will dispose of samples 60 days from analysis.)

4. Project Name: Hiteon Elementary HVAC Upgrade

P.O. Number: _____ **Project Number:** 401824

EMC SAMPLE #	CLIENT SAMPLE #	DATE & TIME SAMPLED	LOCATION/MATERIAL TYPE	Samples Accepted Yes / No	AIR SAMPLE INFO / COMMENTS		
					ON	OFF	FLOW RATE
1	HES-01A	6-29-20	See Attached Field Logs	N			
				N			
				N			
				N			
				N			
				N			
				N			
57	HES-17C			N			
58			ADDITIONAL LOGS	N			
59				N			
60				N			
61				N			
62				N			
63				N			
64				N			

SPECIAL INSTRUCTIONS:

Sample Collector: (Print) Matt Cuda (Signature) *[Signature]* 918
Relinquished by: *[Signature]* Date/Time: 6-30-20 1500 Received by: *[Signature]* Date/Time: 7/1/20
Relinquished by: *[Signature]* Date/Time: 7/1/20 Received by: *[Signature]* Date/Time: 7/1/20
Relinquished by: _____ Date/Time: _____ Received by: _____ Date/Time: _____

** In the event of any dispute between the above parties for these services or otherwise, parties agree that jurisdiction and venue will be in Phoenix, Arizona and prevailing party will be entitled to attorney's fees and court costs.



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

ASBESTOS BULK SAMPLE CHAIN OF CUSTODY FORM

Client: Beaverton School District	Project Number: 401824	Inspector(s): Jason Stone, Matt Cuda
Project Name: Hiteon Elementary School HVAC Upgrade Project Hiteon Elementary School 13800 SW Brockman Street Beaverton, Oregon 97005	Tracking Number:	Requested TAT: 3 DAY
Email Results to: mcuda@trccompanies.com, rlandolt@trccompanies.com	Analytical Method: PLM EPA 600/R-93/116	Lab Comments:

ASBESTOS BULK SAMPLE INFORMATION

Date Collected	Sample Identification	Material Description	Homogeneous Area	Sample Location	Lab Identification (Lab Use Only)
2020-06-29	HES-01A	Built-up Roofing	Throughout Roof	See Diagram - C Wing roof	
2020-06-29	HES-01B	Built-up Roofing	Throughout Roof	See Diagram - C Wing roof	
2020-06-29	HES-01C	Built-up Roofing	Throughout Roof	See Diagram - play cover	
2020-06-29	HES-01D	Built-up Roofing	Throughout Roof	See Diagram - Gym Roof	
2020-06-29	HES-01E	Built-up Roofing	Throughout Roof	See Diagram - Hall/ Cafeteria Roof	
2020-06-29	HES-01F	Built-up Roofing	Throughout Roof	See Diagram - Cafeteria	
2020-06-29	HES-01G	Built-up Roofing	Throughout Roof	See Diagram - B rooms	
2020-06-29	HES-01H	Built-up Roofing	Throughout Roof	See Diagram - A wing roof	

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	Date Collected	Sample Identification	Material Description	Homogeneous Area	Sample Location	Lab Identification (Lab Use Only)
9	2020-06-29	HES-011	Built-up Roofing	Throughout Roof	See Diagram - A Wing Roof	
10	2020-06-29	HES-02A	Gray Roof Caulking		See Diagram - A Roof vent	
11	2020-06-29	HES-02B	Gray Roof Caulking		See Diagram - Cafeteria roof unit	
12	2020-06-29	HES-02C	Gray Roof Caulking		See Diagram - Roof	
13	2020-06-29	HES-03A	Roofing Felt Paper	Roof	See Diagram- Roof	
14	2020-06-29	HES-03B	Roofing Felt Paper	Roof	See Diagram	
15	2020-06-29	HES-03C	Roofing Felt Paper	Roof	See Diagram - Roof	
16	2020-06-29	HES-04A	Black Roof Caulking	Roofing At Edge of TPO roofing	See Diagram - Roof edge	
17	2020-06-29	HES-04B	Black Roof Caulking	Roofing At Edge of TPO roofing	See Diagram - Roof Edge	
18	2020-06-29	HES-04C	Black Roof Caulking	Roofing At Edge of TPO roofing	See Diagram - Roof Edge	
19	2020-06-29	HES-05A	Gray Roofing Mastic	Roof Edge at TPO ROOFING	See Diagram- Roof Edge	
20	2020-06-29	HES-05B	Gray Roofing Mastic	Roof Edge at TPO ROOFING	See Diagram-Roof Edge	
21	2020-06-29	HES-05C	Gray Roofing Mastic	Roof Edge at TPO ROOFING	See Diagram Roof Edge	
22	2020-06-29	HES-06A	HVAC Duct Tape	A wing Mechanical Mezzanine , Various HVAC duct components	See Diagram - A Wing Mechanical Mezzanine	
23	2020-06-29	HES-06B	HVAC Duct Tape	A wing Mechanical Mezzanine , Various HVAC duct components	See Diagram - A wing mechanical mezzanine	
24	2020-06-29	HES-06C	HVAC Duct Tape	A wing Mechanical Mezzanine , Various HVAC duct components	See Diagram - Hallway Outside Storage B2	
25	2020-06-29	HES-07A	Gray HVAC Caulking	A Wing Mechanical Mezzanine	See Diagram - A Wing Mechanical mezzanine	
26	2020-06-29	HES-07B	Gray HVAC Caulking	A Wing Mechanical Mezzanine	See Diagram - A Wing Mechanical Mezzanine	
27	2020-06-29	HES-07C	Gray HVAC Caulking	A Wing Mechanical Mezzanine	See Diagram - A-wing mechanical mezzanine	
28	2020-06-29	HES-08A	Gypsum Board and Joint Compound	Throughout A Wing	See Diagram - A wing Mechanical Mezzanine	

Date Collected	Sample Identification	Material Description	Homogeneous Area	Sample Location	Lab Identification (Lab Use Only)
2020-06-29	HES-08B	Gypsum Board and Joint Compound	Throughout A Wing	See Diagram- A Wing outside room A102	
2020-06-29	HES-08C	Gypsum Board and Joint Compound	Throughout A Wing	See Diagram - Room A112	
2020-06-29	HES-09A	Gypsum Board and Joint Compound	Throughout C Wing	See Diagram - C Wing Mechanical Mezzanine	
2020-06-29	HES-09B	Gypsum Board and Joint Compound	Throughout C Wing	See Diagram - C120	
2020-06-29	HES-09C	Gypsum Board and Joint Compound	Throughout C Wing	See Diagram - C106	
2020-06-29	HES-10A	Hard Fitting	C Wing Mechanical Mezzanine, Throughout Plumbing System	See Diagram - C Wing Mechanical Mezzanine	
2020-06-29	HES-10B	Hard Fitting	C Wing Mechanical Mezzanine, Throughout Plumbing System	See Diagram - C Wing Mechanical Mezzanine	
2020-06-29	HES-10C	Hard Fitting	C Wing Mechanical Mezzanine, Throughout Plumbing System	See Diagram - C106	
2020-06-29	HES-11A	2' x 4' Drop-in Ceiling Tile with fissures and Pinholes	Throughout C Wing	See Diagram - C Wing	
2020-06-29	HES-11B	2' x 4' Drop-in Ceiling Tile with fissures and Pinholes	Throughout C Wing	See Diagram - C112	
2020-06-29	HES-11C	2' x 4' Drop-in Ceiling Tile with fissures and Pinholes	Throughout C Wing	See Diagram - Room C106	
2020-06-29	HES-12A	Gray HVAC Duct Mastic	HVAC ducts throughout	See Diagram - C wing	
2020-06-29	HES-12B	Gray HVAC Duct Mastic	HVAC ducts throughout	See Diagram - Library	
2020-06-29	HES-12C	Gray HVAC Duct Mastic	HVAC ducts throughout	See Diagram - Library	
2020-06-29	HES-13A	Black Mastic	Above ceiling appears to be from roofing	See Diagram - C106	
2020-06-29	HES-13B	Black Mastic	Above ceiling appears to be from roofing	See Diagram	
2020-06-29	HES-13C	Black Mastic	Above ceiling appears to be from roofing	See Diagram	

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Date Collected	Sample Identification	Material Description	Homogeneous Area	Sample Location	Lab Identification (Lab Use Only)
46 2020-06-29	HES-14A	2' x 4' Drop-in Ceiling Tile, Pinholes	Throughout B Wing	See Diagram - Main Corridor	
47 2020-06-29	HES-14B	2' x 4' Drop-in Ceiling Tile, Pinholes	Throughout B Wing	See Diagram - Cafeteria	
48 2020-06-29	HES-14C	2' x 4' Drop-in Ceiling Tile, Pinholes	Throughout B Wing	See Diagram - Main Corridor	
49 2020-06-29	HES-15A	Gypsum Board and Joint Compound	Throughout B Wing	See Diagram - Cafeteria	
50 2020-06-29	HES-15B	Gypsum Board and Joint Compound	Throughout B Wing	See Diagram - Stage	
51 2020-06-29	HES-15C	Gypsum Board and Joint Compound	Throughout B Wing	See Diagram - Hall outside storage B2	
52 2020-06-29	HES-16A	2' x 4' Drop-in Ceiling Tile with Long Fissures and Pinholes	Throughout A Wing	See Diagram - A Wing	
53 2020-06-29	HES-16B	2' x 4' Drop-in Ceiling Tile with Long Fissures and Pinholes	Throughout A Wing	See Diagram - A112	
54 2020-06-29	HES-16C	2' x 4' Drop-in Ceiling Tile with Long Fissures and Pinholes	Throughout A Wing	See Diagram - A116	
55 2020-06-29	HES-17A	1'x1' Ceiling Tile and Glue	Gym, Stage	See Diagram- Gym	
56 2020-06-29	HES-17B	1'x1' Ceiling Tile and Glue	Gym, Stage	See Diagram - Gym	
57 2020-06-29	HES-17C	1'x1' Ceiling Tile and Glue	Gym, Stage	See Diagram - Stage	
Special Instruction to Laboratory:					
N/A					

CHAIN OF CUSTODY INFORMATION

Relinquished By:	Date	Time	Received By:	Date	Time
I. (Print): Matt Cuda	2020-06-30	13:45:52 PDT	I. (Print): <i>Donne</i>	7/1/20	
(Sign): <i>Matt Cuda</i>			(Sign): <i>Donne</i>		
II. (Print): <i>Donne</i>	7/1/20		II. (Print):		
(Sign): <i>Donne</i>			(Sign):		

Appendix C – Prior Documentation

ASBESTOS MATERIALS

The following materials either tested positive or are presumed to be asbestos-containing. Materials that had mixed results are considered positive. Materials not sampled or not listed in this report may contain asbestos and should be tested to verify asbestos content prior to impact, demolition, renovation, etc.

(+) Tested Positive, (M) Mixed Results, (P) Presumed Positive

Hiteon (HIT)			
Result	Material	Location	Quantity
P	MJP Pipe Fittings cmnt: One hard fitting by main hall roof access ragged, patched with duct tape. Continue to monitor - 2018 / [ID: 24749]	Attic	10 ea
M	Gypsum Wallboard/Joint Compound / Mixed Results, Cmmt: Tested <1% Chrysotile (19766.008-0008, -0009, -0010 phase 6) [ID: 27010]	Attic / Cafeteria	999 nq
P	Floor Tile and Mastic / Non-Visible PACM / / HSA 4,9,98,99, (Old Room: Main Building / Level 1 / C300 Commons), Cmmt: Carpeted [ID: 24848]	Level 1 / A Commons	150 sf
P	Floor Tile and Mastic / Visible-Positive / 12x12 / HSA 4,9,98,99, (Old Room: Main Building / Level 1 / C316), Cmmt: Encapsulated with white 12 x 12 tile during summer 2000. [ID: 24856]	Level 1 / A Hall Staff Room	330 sf
P	Floor Tile and Mastic / 12x12 / / , Cmmt: 120 SF visible in storage room. [ID: 27794]	Level 1 / A Hall Staff Room Storage	120 sf
P	Sheet Flooring Material and Mastic / PACM / / , (Old Room: Main Building / Level 1 / C308), Cmmt: 24 sq.ft. visible in restroom, remainder encapsulated with white 12x12 tile during Summer 2000. [ID: 24852]	Level 1 / A100	191 sf
P	Sheet Flooring Material and Mastic / PACM / / , (Old Room: Main Building / Level 1 / C310), Cmmt: 24 sq.ft. visible in restroom, remainder encapsulated with white 12x12 tile during Summer 2000. [ID: 24853]	Level 1 / A102	188 sf
M	Gypsum Wallboard/Joint Compound / Mixed Results, (Old Room: Main Building / Level 1 / C303), Cmmt: Non-Detect (19766.008-0025 phase 4) [ID: 26996]	Level 1 / A103 Restroom	999 nq
P	Sheet Flooring Material and Mastic / PACM / / , (Old Room: Main Building / Level 1 / C312), Cmmt: Encapsulated with white 12 x 12 tile during Summer 2000. [ID: 24854]	Level 1 / A104	160 sf

Hiteon (HIT)			
Result	Material	Location	Quantity
P	Sheet Flooring Material and Mastic / PACM / /, (Old Room: Main Building / Level 1 / C314), Cmmt: Encapsulated with white 12 x 12 tile during Summer 2000. [ID: 24855]	Level 1 / A106	200 sf
P	Sheet Flooring Material and Mastic / PACM / /, (Old Room: Main Building / Level 1 / C318), Cmmt: Encapsulated with white 12 x 12 tile during Summer 2000. [ID: 24857]	Level 1 / A108	258 sf
P	Sheet Flooring Material and Mastic / PACM / /, (Old Room: Main Building / Level 1 / C320), Cmmt: Encapsulated with white 12 x 12 tile during Summer 2000. [ID: 24858]	Level 1 / A110	180 sf
P	Sheet Flooring Material and Mastic / PACM / /, (Old Room: Main Building / Level 1 / C322), Cmmt: Encapsulated with white 12 x 12 tile during Summer 2000. [ID: 24859]	Level 1 / A112	170 sf
M	Gypsum Wallboard/Joint Compound / Mixed Results, Cmmt: Tested <1% Chrysotile (19766.008-0014 phase 4); Abated Summer 2008. [ID: 26986]	Level 1 / A112 - Reconfigured Summer 2008, now part of Library and hall	999 nq
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 4,9,98,99, Cmmt: Abated 685 SF - Summer 2008 [ID: 24835]	Level 1 / A112 - Reconfigured Summer 2008, now part of Library and hall	0 sf
+	Floor Tile and Mastic / Tested Positive, Cmmt: Tested 5% and 4% Chrysotile (19766.008-0034 phase 4) [ID: 27005]	Level 1 / A112 - Reconfigured Summer 2008, now part of Library and hall	999 nq
P	Sheet Flooring Material and Mastic / PACM / /, (Old Room: Main Building / Level 1 / C324), Cmmt: Encapsulated with white 12 x 12 tile during Summer 2000. [ID: 24860]	Level 1 / A114	135 sf
P	Sheet Flooring Material and Mastic / Non-Visible PACM / /, Cmmt: Abated 141 SF - Summer 2008 [ID: 24836]	Level 1 / A114 - Reconfigured Summer 2008, now part of Library and hall	0 sf
+	Black Sink Undercoating / Tested Positive, Cmmt: Tested 4% Chrysotile (19766.008-0012 phase 4); Abated Summer 2008. [ID: 26984]	Level 1 / A114 - Reconfigured Summer 2008, now part of Library and hall	0 ea
+	Floor Tile and Mastic / Tested Positive, Cmmt: Tested <1% Chrysotile (19766.008-0010 phase 4); Abated Summer 2008. [ID: 26982]	Level 1 / A114 - Reconfigured Summer 2008, now part of Library and hall	0 sf
P	Sheet Flooring Material and Mastic / PACM / /, (Old Room: Main Building / Level 1 / C326), Cmmt: Encapsulated with white 12 x 12 tile during Summer 2000. [ID: 24861]	Level 1 / A116	165 sf

Hiteon (HIT)			
Result	Material	Location	Quantity
P	Sheet Flooring Material and Mastic / PACM / /, (Old Room: Main Building / Level 1 / C328), Cmnt: Encapsulated with white 12 x 12 tile during Summer 2000. [ID: 24862]	Level 1 / A118	175 sf
+	Floor Tile and Mastic / Beige and Yellow/Tan / 12x12 / Tested Positive, Cmnt: 3% Chrysotile - Beige Tile (0017148-005, 007) Mastic Tested Negative. 12/14 Inspection-Cracked, loose tiles at B100. [ID: 29170]	Level 1 / B Hall	999 nq
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 4,9,98,99, (Old Room: Main Building / Level 1 / West Corridor), Cmnt: Abated 447 SF- June 2006 [ID: 24881]	Level 1 / B Hall / West	0 sf
P	Floor Tile and Mastic / Non-Visible PACM / / HSA 4,9,98,99, (Old Room: Main Building / Level 1 / B200), Cmnt: Carpeted [ID: 24844]	Level 1 / B100	860 sf
P	Boiler Insulation / / / HSA 1, Cmnt: new boiler 2008 [ID: 24846]	Level 1 / Boiler	0 sf
P	MJP Pipe Fittings /, Cmnt: 1 fitting removed Fall 2007 [ID: 24847]	Level 1 / Boiler	14 ea
+	Gypsum Wallboard/Joint Compound / Tested Positive, Cmnt: Tested <1% Chrysotile; Abated 9 SF - April 2009 [ID: 28161]	Level 1 / Boiler Room	1030 sf
+	Expansion Tank Insulation / Tested Positive, Cmnt: (19766.008-0028 phase 4); Abated Summer 2008. [ID: 26999]	Level 1 / Boiler Room	0 sf
P	Sheet Flooring Material and Mastic / Non-Visible PACM / /, (Old Room: Main Building / Level 1 / A100), Cmnt: Encapsulated with white 12 x 12 tile during Summer 2000. [ID: 24751]	Level 1 / C100	144 sf
P	Sheet Flooring Material and Mastic / Non-Visible PACM / /, (Old Room: Main Building / Level 1 / A102), Cmnt: Encapsulated with white 12 x 12 tile during Summer 2000. [ID: 24752]	Level 1 / C102	143 sf
P	Covebase/Mastic / Cmnt: Abated all grey cove base/mastic May 2019	Level 1 / C104	0
P	Sheet Flooring Material and Mastic / Non-Visible PACM / /, (Old Room: Main Building / Level 1 / A104), Cmnt: Encapsulated with white 12 x 12 tile during Summer 2000. [ID: 24753]	Level 1 / C104	203 sf

Hiteon (HIT)			
Result	Material	Location	Quantity
P	Covebase/Mastic / Cmnt: Abated all grey cove base/mastic May 2019	Level 1 / C106	0
+	Chalk Board Mastic / Tan / Tested Positive, (Old Room: Main Building / Level 1 / A106), Cmnt: 5% Chrysotile / behind new whiteboard. [ID: 26103]	Level 1 / C106	999 nq
P	Sheet Flooring Material and Mastic / Non-Visible PACM / / , (Old Room: Main Building / Level 1 / A106), Cmnt: Encapsulated with white 12 x 12 tile during Summer 2000. [ID: 24754]	Level 1 / C106	204 sf
P	Sheet Flooring Material and Mastic / Non-Visible PACM / / , (Old Room: Main Building / Level 1 / A108), Cmnt: Encapsulated with white 12 x 12 tile during Summer 2000. [ID: 24833]	Level 1 / C108	138 sf
P	Sheet Flooring Material and Mastic / Non-Visible PACM / / , (Old Room: Main Building / Level 1 / A110), Cmnt: Encapsulated with white 12 x 12 tile during Summer 2000. [ID: 24834]	Level 1 / C110	148 sf
P	Sheet Flooring Material and Mastic / Non-Visible PACM / / , (Old Room: Main Building / Level 1 / A116), Cmnt: Encapsulated with white 12 x 12 tile during Summer 2000. [ID: 24837]	Level 1 / C112	140 sf
P	Sheet Flooring Material and Mastic / Non-Visible PACM / / , (Old Room: Main Building / Level 1 / A118), Cmnt: Encapsulated with white 12 x 12 tile during Summer 2000. [ID: 24838]	Level 1 / C114	152 sf
P	Sheet Flooring Material and Mastic / Non-Visible PACM / / , (Old Room: Main Building / Level 1 / A120), Cmnt: Encapsulated with white 12 x 12 tile during Summer 2000. [ID: 24839]	Level 1 / C116	160 sf
P	Sheet Flooring Material and Mastic / Non-Visible PACM / / , (Old Room: Main Building / Level 1 / A122), Cmnt: Encapsulated with white 12 x 12 tile during Summer 2000. [ID: 24840]	Level 1 / C118	130 sf
P	Sheet Flooring Material and Mastic / Non-Visible PACM / / , (Old Room: Main Building / Level 1 / A124), Cmnt: Encapsulated with white 12 x 12 tile during Summer 2000. [ID: 24841]	Level 1 / C120	130 sf

Hiteon (HIT)			
Result	Material	Location	Quantity
M	Cove Base and Mastic / Mixed Results, Cmmt: Tested <1% Chrysotile (19766.008-0021 phase 4); Abated Summer 2008. [ID: 26993]	Level 1 / Cafeteria	0 sf
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 4,9,98,99, Cmmt: Abated 2045 SF Summer 2008 & Winter 2008. [ID: 24863]	Level 1 / Cafeteria	0 sf
+	Floor Tile and Mastic / Tested Positive, Cmmt: Tested 3% and 3% Chrysotile (19766.008-0023 phase 4); Abated Summer 2008. [ID: 26994]	Level 1 / Cafeteria	0 sf
P	Floor Tile and Mastic / Non-Visible PACM / / HSA 4,9,98,99, (Old Room: Main Building / Level 1 / B202), Cmmt: Abated Dec. 2008 [ID: 24845]	Level 1 / Conference Rm	0 sf
P	Transite Panel / / / HSA 55 [ID: 24864]	Level 1 / Custodial Office	40 sf
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 4,9,98,99, Cmmt: Some gouging noted at 12/13 inspection. Cracking at doorway noted 6/14 inspection. Broken tile at stage noted 12/14 i	Level 1 / Gym	4259 sf
+	Gypsum Wallboard/Joint Compd.	Level 1 / Gym / Right of stage / under paneling	999
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 4,9,98,99, Cmmt: Minor cracking at entrance. [ID: 24866]	Level 1 / Gym Office	95 sf
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 4,9,98,99, Cmmt: Minor cracking across from A 128 noted by inspector. [ID: 24750]	Level 1 / Hall	311 sf
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 4,9,98,99, (Old Room: Main Building / Level 1 / Restroom Unisex 1), Cmmt: Abated Summer 2008 [ID: 24873]	Level 1 / Health Restroom	0 sf
+	Gypsum Wallboard/Joint Compound / Mixed Results, Cmmt: (19766.008-0020 phase 4); Abated Summer 2008. [ID: 26992]	Level 1 / Health Room - Reconfigured Summer 2008	0 sf
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 4,9,98,99, Cmmt: Abated 172 SF - Summer 2008 [ID: 24867]	Level 1 / Health Room - Reconfigured Summer 2008	0 sf
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 4,9,98,99, Cmmt: Abated 59 SF - Summer 2005 [ID: 24868]	Level 1 / Kitchen	0 sf

Hiteon (HIT)			
Result	Material	Location	Quantity
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 4,9,98,99 [ID: 24869]	Level 1 / Kitchen Storage	180 sf
+	Gypsum Wallboard/Joint Compound / Tested Positive, Cmmt: Tested 2% Chrysotile (19766.008-0003 phase 10); Abated 120 SF - December 2008. [ID: 27954]	Level 1 / Locker Room Boys (Boys 2)	412 sf
+	Gypsum Wallboard/Joint Compound / Tested Positive, Cmmt: Tested 2% Chrysotile (19766.008-0006 phase 10); Abated 120 SF - December 2008. [ID: 27956]	Level 1 / Locker Room Girls (Girls 2)	416 sf
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 4,9,98,99, Cmmt: Abated 12 SF - November 2004 / Abated 440 SF- Summer 2006 [ID: 24870]	Level 1 / Main Corridor	810 sf
+	Window Glazing Compound / Tested Positive, Cmmt: Abated 120 SF - Summer 2008 [ID: 27542]	Level 1 / Main Entrance	0 ea
P	Floor Tile and Mastic / Non-Visible PACM / / HSA 4,9,98,99, Cmmt: Abated 375 SF - Summer 2008 [ID: 24871]	Level 1 / Main Office - Reconfigured Summer 2008	0 sf
P	Floor Tile and Mastic / Non-Visible PACM / / HSA 4,9,98,99, (Old Room: Main Building / Level 1 / C302), Cmmt: Carpeted [ID: 24849]	Level 1 / Office A2	143 sf
P	Floor Tile and Mastic / Non-Visible PACM / / HSA 4,9,98,99, (Old Room: Main Building / Level 1 / C304), Cmmt: Carpeted [ID: 24850]	Level 1 / Office A3	146 sf
P	Floor Tile and Mastic / Non-Visible PACM / / HSA 4,9,98,99, (Old Room: Main Building / Level 1 / C306), Cmmt: Carpeted [ID: 24851]	Level 1 / Office A4	146 sf
P	Floor Tile and Mastic / Non-Visible PACM / / HSA 4,9,98,99, (Old Room: Main Building / Level 1 / A126), Cmmt: Carpeted [ID: 24842]	Level 1 / Office C1	187 sf
P	Floor Tile and Mastic / Non-Visible PACM / / HSA 4,9,98,99, (Old Room: Main Building / Level 1 / A128), Cmmt: Carpeted [ID: 24843]	Level 1 / Office C2	216 sf
P	Floor Tile and Mastic / Non-Visible PACM / / HSA 4,9,98,99, Cmmt: Abated 283 SF - Summer 2008 [ID: 24872]	Level 1 / Principal - Reconfigured Summer 2008	0 sf

Hiteon (HIT)			
Result	Material	Location	Quantity
P	Sheet Flooring Material and Mastic / PACM / / [ID: 24875]	Level 1 / Restroom Unisex 3	37 sf
P	Sheet Flooring Material and Mastic / PACM / / , Cmnt: Cracked across entryway and behind toilet. [ID: 24876]	Level 1 / Restroom Unisex 4	19 sf
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 4,9,98,99, Cmnt: Abated 359 SF - Summer 2008 [ID: 24877]	Level 1 / Staff - Reconfigured Summer 2008	0 sf
+	Window Glazing / Tested Positive, Cmnt: 19766.008-0016 phase 4); Abated 100 SF - Summer 2008. [ID: 26988]	Level 1 / Staff Room - Reconfigured Summer 2008	0 lf
M	Gypsum Wallboard/Joint Compound / Mixed Results, Cmnt: Tested <1% Chrysotile (19766.008-0032 phase 4) [ID: 27003]	Level 1 / Staff Room - Reconfigured Summer 2008	0 sf
P	Asbestos Insulated Wiring	Level 1 / Stage / White Cloth Wiring From Ceiling outlets to lights at front of stage	4 ea
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 4,9,98,99 [ID: 24878]	Level 1 / Storage 2	175 sf
P	MJP Pipe Fittings / [ID: 24880]	Level 1 / Storage 4	4 ea
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 4,9,98,99, Cmnt: One damaged tile on hallway side of door noted by inspector. [ID: 24879]	Level 1 / Storage 4	123 sf
+	Pink Sink Undercoating / Tested Positive, Cmnt: 19766.008-0019 phase 4); Abated Summer 2008. [ID: 26991]	Level 1 / Work Room - Reconfigured Summer 2008	0 ea
P	Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 4,9,98,99, Cmnt: Abated 273 SF Summer 2008 [ID: 24882]	Level 1 / Work Room - Reconfigured Summer 2008	0 sf
+	Floor Tile and Mastic / Tested Positive, Cmnt: Tested 2% and 10% Chrysotile (19766.008-0029 phase 4); Abated Summer 2008. [ID: 27000]	Level 1 / Work Room - Reconfigured Summer 2008	0 sf
+	Hard Fittings / Tested Positive, Cmnt: 11 fittings removed Nov. 2007 [ID: 26208]	Level 2 / Cafeteria Mezzanine Mechanical Rm	0 ea
+	Transite Panels / Tested Positive, Cmnt: Abated 140 SF- July 2004 [ID: 25980]	Roof	0 sf

MATERIALS THAT TESTED NEGATIVE

The following materials tested negative. Although no asbestos was detected, it is possible that further sampling could indicate asbestos content. It may be prudent to test prior to impact, demolition, renovation, etc.

Hiteon (HIT)	
Material	Location
Duct Felt Tape	A wing; penthouse, thin white duct tape
Mechanical Isolation Cloth / Tested Negative, Cmnt: Non-Detect (19766.008-0011 phase 6) [ID: 27011]	Attic / Cafeteria
Floor Tile and Mastic / Light Gray and Yellow/Tan / 12x12 / Tested Negative, Cmnt: Non Detect (0017148-003, 001) [ID: 29168]	Level 1 / A 100
Sheet Flooring Material / Pebble Pattern and Gray / Tested Negative, Cmnt: Non Detect (0017148-001,002) [ID: 29169]	Level 1 / A 100
Chalk Board Mastic / Brown / Tested Negative, (Old Room: Main Building / Level 1 / C308), Cmnt: Non-Detect [ID: 26101]	Level 1 / A100
Lay-in Ceiling Tile / Tested Negative, (Old Room: Main Building / Level 1 / C303), Cmnt: Non-Detect (19766.008-0024 phase 4) [ID: 26995]	Level 1 / A103 Restroom
Duct Felt Tape / Tested Negative, (Old Room: Main Building / Level 1 / C303), Cmnt: Non-Detect (19766.008-0026 phase 4) [ID: 26997]	Level 1 / A103 Restroom
Chalk Board Mastic / Brown / Tested Negative, (Old Room: Main Building / Level 1 / C312), Cmnt: Non-Detect [ID: 26099]	Level 1 / A104
Chalk Board Mastic / Yellow with Foil / Tested Negative, (Old Room: Main Building / Level 1 / C318), Cmnt: Non-Detect [ID: 26100]	Level 1 / A108
MJP Pipe Fittings / Tested Negative, Cmnt: Non-Detect (19766.008-0033 phase 4) [ID: 27004]	Level 1 / A112 - Reconfigured Summer 2008, now part of Library and hall
Cove Base and Mastic / Tested Negative, Cmnt: Non-Detect (19766.008-0011 phase 4) [ID: 26983]	Level 1 / A114 - Reconfigured Summer 2008, now part of Library and hall
Floor Tile and Mastic / Light Gray and Yellow/Tan / 12x12 / Tested Negative, Cmnt: Non-Detect (00117148-004,006) [ID: 29171]	Level 1 / B Hall
Lay-in Ceiling Tile / Tested Negative, (Old Room: Main Building / Level 1 / West Corridor), Cmnt: Non-Detect (19766.008-0004, -0005, -0006 phase 4) [ID: 26980]	Level 1 / B Hall / West
Lay-in Ceiling Tile / Tested Negative, (Old Room: Main Building / Level 1 / A Hall), Cmnt: Non-Detect (19766.008-0007, -0008, -0009 phase 4) [ID: 26981]	Level 1 / B Hall Main Building / Main Corridor
Hard Fitting / Gray / Tested Negative, Cmnt: Non-Detect (0014473-001 HES-01 Layer 1 and 2) [ID: 28833]	Level 1 / Boiler Room

Hiteon (HIT)	
Material	Location
Exterior Boiler Insulation / Tested Negative, Cmnt: Non-Detect (19766.008-0005, -0006, -0007 phase 6) [ID: 27009]	Level 1 / Boiler Room
Interior Boiler Insulation / Tested Negative, Cmnt: Non-Detect (19766.008-0002, -0003, -0004 phase 6) [ID: 27008]	Level 1 / Boiler Room
Boiler Door Gasket / Tested Negative, Cmnt: Non-Detect (19766.008-0001 phase 6) [ID: 27007]	Level 1 / Boiler Room
Chalk Board Mastic / Compressed Fibers / Tan / Tested Negative, (Old Room: Main Building / Level 1 / A106), Cmnt: Non-Detect [ID: 26102]	Level 1 / C106
New construction summer 2008- Asbestos Free [ID: 27809]	Level 1 / D Hall (All rooms)
Off White Debris / Tested Negative, Cmnt: Non-Detect (H-01 0018116-001) Off White debris on stairs 06/05/14 [ID: 29197]	Level 1 / Gym Storage
Ceramic Tile and Grout / Tested Negative, Cmnt: Non-Detect (19766.008-0030 phase 4) [ID: 27001]	Level 1 / Kitchen
Floor Tile and Mastic / Visible-Positive / 12 x 12 / HSA 4,9,98,99, (Old Room: Main Building / Level 1 / Restroom Unisex 2), Cmnt: Covered by new sheet flooring winter 08-09. [ID: 24874]/ Abated 11/06	Level 1 / Kitchen Restroom
Lay-in Ceiling Tile / Tested Negative, Cmnt: Non-Detect (19766.008-0013 phase 4) [ID: 26985]	Level 1 / Library
Carpet Mastic and Leveling Compound / Tested Negative, Cmnt: Non-Detect (19766.008-0015 phase 4) [ID: 26987]	Level 1 / Library
Ceramic Tile/Grout / Tested Negative, Cmnt: Non-Detect (19766.008-0001 phase 10) [ID: 27952]	Level 1 / Locker Room Boys (Boys 2)
Wall and Ceiling Plaster / Tested Negative, Cmnt: Non-Detect (19766.008-0002 phase 10) [ID: 27953]	Level 1 / Locker Room Boys (Boys 2)
Ceramic Tile/Grout / Tested Negative, Cmnt: Non-Detect (19766.008-0004, -0005 phase 10) [ID: 27955]	Level 1 / Locker Room Girls (Girls 2)
Wall and Ceiling Plaster / Tested Negative, Cmnt: Non-Detect (19766.008-0007 phase 10) [ID: 27957]	Level 1 / Locker Room Girls (Girls 2)
Glued-on Ceiling Tiles / Tested Negative, Cmnt: Non-Detect (19766.008-0001, -0002, -0003 phase 4) [ID: 26979]	Level 1 / Main Corridor
Brick Mortar / Tested Negative, Cmnt: Non-Detect (19766.008-0017 phase 4) [ID: 26989]	Level 1 / Main Entrance

Hiteon (HIT)	
Material	Location
MJP Pipe Fittings / Tested Negative, Cmnt: Non-Detect (19766.008-0035, -0036 phase 4) [ID: 27006]	Level 1 / Main Entrance
New construction summer 2008- Asbestos Free [ID: 27805]	Level 1 / Main Office
New construction summer 2008- Asbestos Free [ID: 27806]	Level 1 / Office B1
New construction summer 2008- Asbestos Free [ID: 27807]	Level 1 / Office B2
New construction summer 2008- Asbestos Free [ID: 27808]	Level 1 / Office B3
Sheet Flooring and Mastic / Tan / Tested Negative, Cmnt: Non-Detect (HES -02 1324313A, HES -02 1324314B) [ID: 28838]	Level 1 / Restroom 4
Sheet Flooring and Mastic / Tan / Tested Negative, Cmnt: Non-Detect (HES -03 1324314A, HES -03 1324314B) [ID: 28839]	Level 1 / Restroom 4
Grey Sink Undercoating / Tested Negative, Cmnt: Non-Detect (19766.008-0018 phase 4) [ID: 26990]	Level 1 / Staff Room - Reconfigured Summer 2008
MJP Pipe Fittings / Tested Negative, Cmnt: Non-Detect (19766.008-031 phase 4) [ID: 27002]	Level 1 / Storage 4
Door Insulation / Off White / Tested Negative, Cmnt: Non-Detect (0017861-001) Doors between West B and A Wing [ID: 28819]	Level 1 / West B Hall / A Wing Doors
Carpet Mastic / Tested Negative, Cmnt: Non-Detect (19766.008-0027 phase 4) [ID: 26998]	Level 1 / Work Room - Reconfigured Summer 2008
Hard Fitting on Fiberglass Insulated Line / Fibrous Powder / Tan / Tested Negative, Cmnt: non-detect (19766.008-0001 - 0006 phase 100) [ID: 28218]	Level 2 / Cafeteria Mech Loft

ASBESTOS SUMMARY

The following shows asbestos activities and projects. For more detailed information or related documents see the individual activity information in the database.

June 2003 to September 2003 - HIT2019-2

Activity: Inspection/Survey - Location: HIT

January 2004 to December 2012 -

Activity: Database Update - Location: HIT

HIT Import Historical Materials without samples

January 2004 to December 2012 - 19766.008 p04

Activity: Database Update - Location: HIT p04

HIT Import Historical materials with Samples

January 2004 to December 2012 - 19766.008 p06

Activity: Database Update - Location: HIT p06

HIT Import Historical materials with Samples

January 2004 to December 2012 - 19766.008 p10

Activity: Database Update - Location: HIT p10

HIT Import Historical materials with Samples

January 2004 to December 2012 - 19766.017 p100

Activity: Database Update - Location: HIT p100

HIT Import Historical materials with Samples

October 2006 to November 2006 - HIT2019-3

Activity: Major Abatement - Location: HIT

Example example example

April 2016 to April 2016 - HITsampling1

Activity: Sampling - Location: Level 1 / gym

February 2017 to February 2017 - PBS23816.133

Activity: Renovation/Repair/Painting - Location: Attic Space adjacent to kitchen & roof penhouse

Abatement Company **PAS**

Daily Log **x**

DEQ Notification

Disposal Manifest

TEM Air Clearance Samples **n/a**

Floor Plan **x**

Area Abated Entered Into Database

Asbestos Abatement Contractor Invoice Received **x**

Asbestos Abatement Consultant Invoice Received **x**

Asbestos Abatement Consultant Close Out Documentation Received **x**

May 2017 to May 2017 - HITabatement2

Activity: O & M - Location: Level 1 / gym

x Floor Plan

x Daily Log

x Contractor Invoice

DEQ Notification

Disposal Manifest

n/a Air clearance samples

x Consultant Close out documentation in Verdant

x Consultant Invoice

April 2018 to April 2018 - 1

Activity: Reinspection - Location: Hiteon

REINSPECTION SUMMARY

The 2018 Asbestos Hazard Emergency Response Act (AHERA) 3-Year Asbestos Reinspection for Hiteon Elementary School was completed on April 5, 2018, in accordance with the requirements of 40 CFR, Part 763, Asbestos-Containing Materials in Schools; Final Rule and Notice.

May 2019 to May 2019 - HIT2019-1

Activity: O & M - Location: C104/C016

Floor Plan X

Daily Log x

Contractor Invoice x

DEQ Notification x

Disposal Manifest

Air clearance samples

Consultant Close out documentation in Verdant x

Consultant Invoice x

February 2020 to February 2020 - HIT2020-1

Activity: Sampling - Location: HIT

- _ Floor plan
- _ Results received
- _ Results in Verdant
- _ Daily log
- _ Consultant Invoice
- _ Contractor Invoice
- _ DEQ Notification
- _ Disposal Manifest
- _ Lab samples in Verdant
- _ TEM Air clearance samples
- _ Consultant Close out documents in Verdant
- _ BOLI Form
- _ Certified Payroll dates

Sampled thin duct taping in A-Wing mechanical penthouse accessible through roof access ladder. All samples negative.

ACTIVITIES

The following shows historic activities and projects. For more detailed information or related documents see the individual activity information in the database.

Activity Type	Location	Start Date	Related Documents
Major Abatement	HIT	03/23/2020	Yes
Sampling	HIT	02/06/2020	Yes
O & M	C104/C016	05/08/2019	Yes
Reinspection	Hiteon	04/05/2018	Yes
O & M	Level 1 / gym	05/27/2017	Yes
Renovation/Repair/Painting	Attic Space adjacent to kitchen & roof penhouse	02/02/2017	Yes
Water Testing	Throughout	06/25/2016	Yes
Sampling	Level 1 / gym	04/01/2016	Yes
Major Abatement	HIT	10/01/2006	Yes
Database Update	HIT	01/01/2004	No
Database Update	HIT p04	01/01/2004	No
Database Update	HIT p06	01/01/2004	No
Database Update	HIT p10	01/01/2004	No
Database Update	HIT p100	01/01/2004	No
Inspection/Survey	HIT	06/01/2003	Yes

Appendix D – Inspector Certification(s)

The Environmental Institute

Matthew Cuda

Social Security Number - XXX-XX-8274

TRC - 4105 SE International Way - Milwaukie, OR 97222

*Has completed 4 hours of coursework and satisfactorily
passed an examination that meets all criteria required for
EPA/AHERA/ASHARA (TSCA Title II) Approved Reaccreditation*

Asbestos in Buildings: Inspector Refresher

January 31, 2020

Course Date

17792

Certificate Number

January 31, 2020

Examination Date

January 30, 2021

Expiration Date


David W. Hogue - Principal Instructor / Training Manager


Rachel G. McCain - Exam Administrator



(Approved by the ABIH Certification Maintenance Committee for 1/2 CM point - Approval #11-577)

(Florida Provider Registration Number FL49-0001342 - Course #FL49-0002805)

TEI - 1395 S. Marietta Parkway SE - Building 100, Suite 124 - Marietta, GA 30067

Phone: 770-427-3600 - Website: www.tei-atl.com

Certificate of Completion

This is to certify that

Jason Stone

has satisfactorily completed
4 hours of refresher training as an
AHERA Building Inspector

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

EPA Provider # 1085

175978

Certificate Number



Dec 9, 2019 Expires in 1 year.

Date(s) of Training

Exam Score: N/A
(if applicable)

Instructor

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